UzAssystem

STONE CITY ENERGY (1600 MW) CCPP PROJECT

ENVIRONMENTAL & SOCIAL IMPACT ASSESSMENT REPORT

SCE-P5-ENV-REP-UZ-001

Rev	Date	Purpose of issue	Issuer	Checker	Approver
0	15/10/2021	Initial	U.GÜNGÖR	H.BEKAR	A. PONSARDIN.
1	15/11/2021	Revision	U.GÜNGÖR	H.BEKAR	A. PONSARDIN.
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Contents

NON-TECHNICAL SUMMARY

The materials of the first stage of the environmental impact assessment of construction planning of a Combined-Cycle Power Plant (CCPP) with a total capacity of 1600 MW in Angor district of Surkhandarya region were submitted for the State ecological expertise. The implementation of this Project is carried out on the basis of the President Decree of the Republic of Uzbekistan dated July 24, 2021, No. PD-5193 "On measures for construction planning of a combined cycle power plant with a capacity of 1500-1600 MW in Surkhandarya region."

The main activity of the planned enterprise is the generation and supply of electricity to industrial enterprises, social facilities, and the population of Angor, Muzrabad, Termez districts and part of the territory of Termez city, Surkhandarya region.

This report is prepared in the pursuance of the agreement mutually signed between FC "SCE-QUVVAT" LLC and JV "UzAssystem "LLC. UzAssystem is appointed to undertake an Environmental and Social Impact Assessment Report (ESIA) in compliance with International Finance Corporation (IFC) Standards for the project of the CCPP.

The design capacity of the planned CCPP of the planned enterprise is 1600 MWh.

Administratively, the planned CCPP will be located on the territory of the village community assembly Kattakum in Angor district of Surkhandarya region, 14 km North of Termez city and 2.7 km North-East of the urban-type settlement Uchkizil, on the right the shore of the lake "Uchkizil".

The boundaries of the territory of a combined power plant are: - from the North, West and East - uncultivated and unused lands in agriculture; from the West - at a distance of 550 meters "Zang" canal flows, flowing into Uchkizil Lake; from the South - Lake Uchkizil is located. From the North, North-East, along the border from the site of the combined power plant, there is the M-39 main road; from the South, at the distance of 7 km - the main railway line "Kagan-Termez-Dushanbe".

By the decision of the Khokim (Governor of Region) of Angor district No. 131–8–0–Q dated 30.09.2021, a land plot in Kattakum village community assembly, with a total area of 73.4 hectares, was allocated for the implementation of the planned project, of which: 80,000 m^2 - for building; 25, 800 m^2 - for a hard surface; 21,500 m^2 - for green spaces; 382,700 m^2- ground cover, other areas 22, 400 m^2.

The distance of the designed combined cycle power plant to the border of the nearest residential buildings of the village Uchkizil, located to the south, is 1.5 km, to private residential buildings located to the west of the allocated site - 1.35 km.

In accordance with the requirements of SanPiN No. 0350-17 "Sanitary standards and rules for the protection of atmospheric air in populated areas of the Republic of Uzbekistan", taking into account the capacity of the planned CCPP - 1600 MW, the activities of the planned power plant belong to the first class of sanitary classification (clause 6.2), where the size of the sanitary protection zone is set at 500 m.

The closest surface watercourse is Lake Uchkizil, which is located 70 meters south of the allocated site for the construction of a CCPP with a useful volume of 80.0 million m^3, which does not contradict the requirements of the Regulation "On the Procedure for Establishing Water Protection Zones and Sanitary Protection Zones water bodies of the Republic of Uzbekistan ", approved by the Resolution of the Cabinet of Ministers of the Republic of Uzbekistan No. 981 dated 11.12. 2019, where the width of

water protection zones around reservoirs and reservoirs with a volume of less than ≈0.2 billion m^3 is 150 meters.

In terms of compliance with the requirements of the resolution of the Cabinet of Ministers of the Republic of Uzbekistan, the enterprise will ensure the implementation of appropriate measures to ensure the protection of waters from pollution, clogging and depletion, as well as improve the state and regime of water use in Lake Uchkizil.

In particular, in the water protection zone with a width of at least 150 meters from industrial buildings and structures to the water edge of Lake Uchkizil.

The number of employ of the combined cycle power plant will be 300 employees of whom 45 are AUP and engineering personnel, 255 are workers, security guards, etc.

Working hours: workers - in three shifts, 8 hours per shift, 365 days a year; Engineering and technical staff - in one shift for 8 hours 260 days a year.

Resolution of the Cabinet of Ministers of the Republic of Uzbekistan No. 541 dated 07.09.2020 "On further improvement of the mechanism for assessing environmental impact", objects of I and II categories of environmental impact are subject to the procedure for passing public hearings about environmental impact.

Considering that the CCPP with a capacity of 1600 MW belongs to the objects of the I category of impact on the environment, the management of the enterprise under construction together with representatives of Authorities of Angor District, the Inspectorate for Ecology and Environmental Protection, "Kattakum" village community assembly on 17.08.2021 public hearings were organized and held in accordance with the established procedure. During the public hearings, residents of the Kattakum village community assembly did not have any objections to the construction of a CCPP.

According to the Termez weather station, the average annual air temperature is 17.5 °C, the average January temperature is 3.9 °C, the average July temperature is 29.9 °C, the absolute minimum air temperature is -23.9 °C, the absolute maximum is 47.0 °C, average annual rainfall 155 mm. Due to high temperatures and moisture deficit, the region is characterized by intense chemical and physical weathering.

The duration of winter is 1.5 months on average. The coldest month is January with an average monthly air temperature of minus 2.1 °C, the average duration of the frost-free period is 246 days, the longest is 309 days. Summers are long, hot and dry. The hottest month of the year is July, with an average monthly temperature of + 32 °C.

The construction site for a new power plant is located on the shore of the Uchkizil artificial lake. Uchkizil lake is located in the lower reaches of the river. Surkhandarya, 18 km north-west of the city of Termez. The lake basin occupies a natural horseshoe-shaped hollow within the Kattakum natural boundaries in the area of Uchkizil crossing loop. The lake is seasonal filling, where the useful volume of water is 80 million m^3, and serves to accumulate the autumn-winter runoff of the river. Surkhandarya. It is filled from the main channel "Zang" through the lower Zang lateral canal, and the feeder drain.

The water in Lake Uchkizil is characterized by an increased salt content (1.2 MPC), including sulfates (3 MPC), and increased hardness (mainly due to the content of hydrocarbonates and sulfates). Regardless of the distance from the shore, the water in Lake Uchkizil in the area of the construction site for a CCPP with a capacity of 1600 MW is characterized as water with a relatively high salinity (salt content 0.5-1.0 g/l) and hard (hardness more than 8.0 mg-equal/L).

Groundwater and interstratal waters in the foothills are formed due to atmospheric precipitation and the inflow of groundwater from the mountains, occur at a depth of 3-10 m in river valleys, and at a depth of 50 m in the mountainous part. In the mountains, in some places they pinch out in the form of springs. There are no green spaces (woody and herbaceous vegetation) on the construction site of a combined power plant. Arboreal plantations (from decorative – thuja, pine, mulberry, from fruit-flavored, and stone fruits - apple, apricot, walnut, almond), as well as grapes are found on the territory of the nearest village "Uchkizil".

According to the local Environmental Impact Statement (EIS) draft, during the construction of the CCPP on the territory of the Kattakum village community assembly of Angor district of Surkhandarya region, no transplantation or cutting of trees is planned.

Construction of a new combined power plant in Surkhandarya region with an installed capacity of 1600 MW with two gas turbine units of 551 MW each and a steam turbine of 538 MW will make it possible to optimally use the country's fuel resources using advanced combined-cycle technologies.

The proposed combined-cycle power plants are the most promising in the energy sector and differ from traditional TPPs by a reduction in fuel consumption at times and high efficiency, where the Efficiency output of electric power production is approximately 60%.

At present, in world practice, to save fuel and energy resources, the production of electrical and thermal energy is carried out by utilizing the heat of the exhaust steam in steam turbine plants and gas in gas turbine plants.

When lay out of CCPP with steam turbine plants, labor productivity is also increased, operating costs are reduced, the environmental situation in the zone of influence of the combined-cycle power plant is improved, and energy efficiency is generally increased.

The CCPP has in its design the corresponding blocks, separate from each other - new generation CCPPs of the type - 2 units. (manufacturer "Siemens", Germany), i.e. the efficiency of double action is achieved by obtaining secondary electrical energy using a steam turbine of 1 unit. ("Siemens" manufacturer Germany).

The proposed CCPPs are designed to obtain the maximum (primary and secondary from hot exhaust gases) amount of electricity.

As a result, the specific consumption of the equivalent fuel used to produce 1 kWh of electricity will decrease by 164.3 gr. reference fuel kWh (at traditional TPP 500-600 gr. reference fuel), which will save 488.6 million cubic meters of natural gas per year and, accordingly, a significant reduction in the amount of pollutant emissions into the atmosphere.

The main fuel for the operation of power plant is sulfur-free natural gas. The consumption of natural gas at the new combined power plant as a whole will amount to based on HR Kj /KwH (%60) gas consumption is 2.313 million m^3/year.

The production of electricity at the first stage will occur due to the combustion of the supplied gaseous fuel into the cylindrical combustion chamber of steam-gas plants, which contributes to the combustion of gaseous fuel at a constant pressure. Combustion products enter the gas turbine, where the kinetic energy of the gas flow is converted into mechanical work of the turbine rotor spinning, where electrical energy is obtained. The gas temperature in front of the gas turbine, depending on the turbine series, is in the range of 1100-1500 °C.

After the Combined Cycle Gas Turbine (CCGT) units, the exhaust gases at a temperature of 670 °C are fed into a heat recover steam generator (HRSG), where steam is generated by transferring thermal energy from gases from the gas turbine to feed water and steam. The gases from the heat recover steam generator are discharged into the atmosphere through the chimney/stack at a temperature of about 85-140 °C.

The generated steam in two heats recover steam generators enters a steam turbine, where the kinetic energy of the steam drives the turbine, generating secondary mechanical energy and, according to the receipt of additional (secondary) electrical energy.

The CCGT consists of two separate units: a steam power unit and a gas turbine unit. In combined-cycle gas turbines, the first generator is located on the same shaft as the gas turbine, which, due to the rotation of the rotor, generates an electric current. Passing through the gas turbine, the combustion products give it only part of their energy and still have a high temperature at the outlet of the turbine. Further, the combustion products enter the steam power plant, into the HRSG, where water vapor is heated. The temperature of the combustion products is sufficient to bring the steam to the state necessary for the rotation of the steam turbine and to produce additional electrical energy.

Gas will be supplied to the territory of the section of the combined cycle power plant with a total capacity of 1600 MW through newly constructed pipelines. Fuel gas enters to the gas conditioning point, equipped with coarse filters and a commercial gas flow meter, and then to the gas control point, where it is cleaned for subsequent throttling before afterburning (if necessary), then to the gas booster compressor station, where it is cleaned, compressed and supplied into the main body for combustion in the combustion chamber of the gas turbine.

The maximum consumption of natural gas at each CCGT unit is 144,550 m^3/h or 289,100 m^3/h for two CCGT units. The consumption of natural gas at the new combined power plant will amount to 2.313 million m^3/year.

Flue gases from the installed CCGT units containing nitrogen oxides (NO, NO_2), carbon monoxide (CO) and sulfur dioxide (SO_2), will be discharged through two individual chimney/stack with a height of 65 m and a mouth diameter of 8.24 m.

During construction phase of the project, possible impacts of dust emissions, gaseous emissions from the construction equipment, volatile organic compounds emissions and odours are evaluated and due to nature of the construction, these impacts are temporary. No major residual impact is anticipated with the defined mitigation measures.

Activities associated with the operational phase of the Project will result in the emissions of gaseous pollutants from the operation of the CCGT power blocks. These emissions will occur under combined cycle operating modes using natural gas fuel only. Impacts from the CCGT are likely to be associated with emissions from the two main stacks associated with the HRSG.

The key pollutants arising from natural gas combustion and emitted via the stacks will be oxides of nitrogen (NO and NO_2) and carbon monoxide (CO). Air quality dispersion modelling studies are conducted for these pollutants to determine possible impact due to operation of the CCPP. According to modelling results, for all periods highest level concentration values are under both National Ambient Ari Quality Standards, IFC/WB EHS Guideline Fundamental Principles and EU Environmental Standards. When the total pollution values of concern (baseline measurements+modelling results), one time MPC excess is expected. However, the contribution of the Project to the NO2 pollution is 11.6%.

During construction and installation works, water is used to prepare mortar, watering the territory in order to reduce dusting, as well as for the household needs of builders. Water supply during construction works is imported.

For the drinking needs of builders, imported bottled water is partly used, which is purchased independently by the construction contractor. Drinking water storage meets sanitary and hygienic requirements.

Then, the total water consumption during the construction will be 168.98 m³ / day. or 29,347.88 m³ / year, of which for: production needs - 8.773 m³ / day. or 3,202.5 m³ / year; household and drinking needs - 91.44 m³ / day. or 33,375.6 m³ / year; irrigation of the territory - 146.8 m³ / day. or 14,680.0 m³ / year.

Total water consumption for commissioning phase is approximately 93,000 m^3 in total.

The total water disposal (effluent) of household wastewater during the construction of a CCPP will be: 91.44 m³ / day. or 33,375.6 m³ / year.

Household wastewater generated during construction is planned to be directed to a temporarily installed storage tank (a waterproof cesspool) with subsequent removal to the nearest treatment facilities in the city of Termez.

Water consumption during the operation of a combined power plant for industrial and household needs will be carried out from the Boz-su canal and the city water supply network of the Kibray region.

Water consumption for production needs is made up of water consumption: for feeding the circulating cooling system of auxiliary equipment; to make up the steam-water cycle; for the need for additional water of the chemical water treatment system No. 1 and No. 2.

Household and drinking needs consist of the consumption of water for the drinking needs of the working personnel, the consumption of water for showers for the working personnel, the needs of the canteen for cooking, wet cleaning of the premises, watering the territory.

The total volume of water intake from Lake Uchkizil and the direction for the needs of chemical water treatment (primary sand filter, demineralization section, chemical treatment section, primary and secondary reverse osmosis and others) will amount to 69.90 m^3 / hour, 1.677 thousand m^3 / day. or 587,121 thousand m^3 / year.

In total, the standard volume of water consumption during the operation of the combined cycle power plant will amount to 1,776 thousand m³ / day 600 thousand m³ / year, of which: for production needs – 1.677 thousand m³ / day 587,121 thousand m³ / year; for household and drinking needs - 0.098 thousand m³ / day 12.879 thousand m³ / year.

Domestic wastewater with a total volume of 21 m3 / day (with the assumption of all water consumed for drinking, household, kitchen and cleaning will be convert into wastewater) or 6.687 thousand m3 / year, generated during the operation of the combined-cycle power plant, is planned to be sent to a temporarily installed storage tank (waterproof cesspools, 2 units) with a volume of 30 m3 each, with subsequent removal to the treatment facilities of the city of Termez. These storage tanks can hold wastewater generated during 3 days.

Conditionally clean water generated during the operation of a CCPP (make-up, blowdown, flushing, cooling - 36.9 m3 / hour, 0.887 thousand m3 / day or 310.55 thousand m3 / year, other consumption for production needs - 7, 5 m3 / hour, 0.179 thousand m3 / day or 62.763 thousand m3 / year) in the total volume of 1.066 thousand m3 / day. or 373.313 thousand m3 / year is planned to be sent to Lake Uchkizil.

At the projected power plant, with a capacity of 1600 MW in the Tashkent region, after commissioning, 18 types of waste will be generated, both of an industrial and household nature.

Calculations showed that during the construction of the facility, 8 types of waste are generated in the amount of 437.56 tons/year. The temporarily generated waste includes ferrous metal scrap - 5.0 t/year, welding rod stub - 1.3 t/year, cleaning rags - 1.2 t/year, worn-out overalls - 0.78 t/year, food waste - 4.38 t/year, SHW - 20.0 t/year, estimates - 382.7 t/ear.

After commissioning, the projected power plant with a capacity of 1600 MW in Angor district Surkhandarya region after commissioning, 22 types of industrial and household waste will be generated in the amount of 2,432.037 tons per year, of which: 29.335 t/year of hazard class 2 (3 types of waste); 1,221 t/year of hazard class 3 (2 types); 2,310.960 t/year of 4 hazard classes (14 types); 90.518 t / year, 5 hazard class (3 types).

Household, construction, and industrial wastes generated during the construction of the facility, as well as during operation, are planned to be exported in the prescribed manner by specialized organizations, in particular, the State Unitary Enterprise "Toza Hudud" in the Surkhandarya region in accordance with the concluded contracts.

The adopted technical and technological solutions during the operation of a combined power plant correspond to the best existing technologies to produce electrical energy, based on the latest technological advances, aimed at reducing the consumption of fuel and energy resources and, accordingly, reducing environmental pollution.

The State Environmental Review of the project showed that the submitted materials meet the requirements of environmental legislation for the first stage of environmental impact assessment.

The State Committee of the Republic of Uzbekistan on Ecology and Environmental Protection approves the draft Statement on the environmental impact of the organization for the construction of a CCPP with a total capacity of 1600 MW in Angor district of Surkhandarya region.

The conclusions of the state environmental expertise on the admissibility of the project does not replace or cancel the need to obtain the relevant permits in the manner prescribed by law.

The conclusions of the state environmental expertise on the admissibility of the project is legally valid for three years, the conclusion of the state environmental impact assessment is terminated in the following cases: non-compliance by the customer with the requirements specified in the conclusion of the state environmental impact assessment, and in other cases in the manner prescribed by law.

ABBREVIATIONS & DEFINITIONS

AELs	**Air Emission Limits**
%	**Percent**
°C	**Centigrade Degree**
AAS	**Atomic Absorption Spectrometry**
ACC	**Air-Cooled Condenser**
AEL	**Air Emission Limits**
AQMS	**Air Quality Monitoring Station**
As	**Arsenic**
B	**Boron**
Ba	**Barium**
BAT	**Best Available Techniques**
BERN	**Berne Convention on the Conservation of European Wildlife and Natural Habitats**
BOD	**Biochemical Oxygen Demand**
BPI	**Biotic Periphyton Index**
BREFs	**Eu Best Available Techniques Reference Documents**
BWO	**Basin Water Office**
CA	**Competent Authority**
CAREC	**Central Asia Regional Economic Cooperation**
CCGT	**Combined Cycle Gas Turbine**
Cd	**Cadmium**
CE	**Critically Endangered**
CH_4	**Methane**
CITES	**Convention On International Trade In Endangered Species Of Wild Fauna And Flora**
CM	**The Cabinet Of Ministers**
cm	**Centimeter**
CO	**Carbon Monoxide**
CO_2	**Carbon dioxide**
COD	**Chemical Oxygen Demand**

Conductivity	**A Measure Of A Material's Ability To Conduct An Electric Current**
Cr	**Chromium**
CR	**Critical**
CT	**Cooling Tower**
Cu	**Copper**
dB	**Decibel**
DCS	**Distributed Control System**
DD	**Data Deficient**
deg	**Degree**
dm	**Decimeter**
E	**East**
E&S	**Environmental And Social**
EHS	**Environmental Health And Safety**
EIA	**Environmental Impact Assessment**
EIS	**Environmental Impact Statement**
EN	**Endangered**
EP	**Equator Principles**
ESIA	**Environmental And Social Impact Assessment**
ESMS	**Environmental And Social Management System**
EU	**European Union**
EU BAT	**European Union Best Available Techniques**
EW	**Extinct In The Wild**
EX	**Extinct**
F	**Fluoride**
FC "SCE-QUVVAT" LLC CCPP	**Stone City Energy- Quvvat-Combined Cycle Power Plant Joint**
FGD	**Focus Group Discussions**
g	**Gram**
GBV	**Gender Based Violation**
g/dm^3	**Gram Per Cubic Decimeter**
GIIP	**Good International Industry Practice**

GIP	**Good International Practice**
GN	**Guidance Notes**
GRP	**Gross Regional Product**
Goskompriroda	**State Committee For Nature Protection**
GOST	**Gosudarstvennyy Standart**
GOU	**Government Of The Republic Of Uzbekistan**
GSE	**General Secondary Education**
GT	**Gas Turbine**
HAZMAT	**Hazardous Material**
ha	**Hectare (1 Ha = 10,000 M2)**
HES	**Higher Education System**
HFCs	**Hydrofluorocarbons**
Hg	**Mercury**
HRSG	**Heat Recovery Steam Generator**
Hz	**Hertz**
IAQM	**UK's Institute of Air Quality Management**
IBA	**International Bird Area**
ICWC	**Interstate Coordination Water Commission Of Central Asia**
IEC	**International Electrotechnical Comity**
IFC-PS's	**International Finance Corporation Project Standards**
IFI	**International Financial Institutions**
ILO	**International Labor Organization**
IPCC	**Intergovernmental Panel On Climate Change**
ISO	**International Organization for Standardization** **It Is a Worldwide Federation of National Standards Bodies (ISO Member Bodies). The Work Of Preparing International Standards Is Normally Carried Out Through ISO Technical Committees.**
IT	**Information Technology**
IUCN	**International Union For Conservation Of Nature**
IWWTS	**Industrial Wastewater Treatment System**
JSC "Uztransgaz	**Uzbekistan gas supplier ad gas transportation company**
KBA	**Key Biodiversity Area**

kg	**Kilogram**
Khokim	**The Heads Of Local District, City And Regional Administrator Appointed By The Central Government (Governor Of Region)**
KMK/SHNK	**National acronym for Construction Norms and Regulations**
LA_{eq}	**Equivalent Continuous Sound Level**
LA_{max}	**Maximum Equivalent Continuous Sound Level**
LC	**Least Concern**
LCP	**Large Combustion Plant**
LRP	**Livelihood Restoration Plan**
m	**Meter**
m/s	**Meter Per Second**
MAC	**Maximum Allowable Concentration**
MAE	**Maximum Allowed Emissions**
MBI	**Modified Biotic Index**
MCR	**Maximum Continuous Rating** **It Is Defined as The Maximum Output (MW) That an Electric Power Generating Station Is Capable of Producing Continuously Under Normal Conditions Over a Year. Under Ideal Conditions, The Actual Output Could Be Higher Than The MCR**
mg/m^3	**Milligram Per Cubic Meter**
min	**Minute**
MELR	**Ministry of Employelement and Labour Relations**
mln m^3	**Million cubic meter**
mm	**Millimeter**
mmHg	**Millimeter Of Mercury**
Mn	**Manganese**
MPC	**Maximum Permissible Concentration**
MPD	**Maximum Permissible Discharges**
MPE	**Maximum Permissible Emission**
MPI	**Methodology Of The Accredited Laboratuvar**
MSDS	**Material Safety Data Sheet**
MVI	**Methodology Of The Accredited Laboratuvar**
MW	**Megawatt Watt Is A Unit Of Power In The International System Of Units (1 MW = 106 Watt)**

N	**North**
NE	**Northeast**
NE	**Not Evaluated**
N_2O	**Nitrous Oxide**
NO_3-N	**Nitrate Nitrogen**
NT	**Near Threatened**
NW	**Northwest**
O'z DSt	**Uzbekistan State Standard**
O'z O'U	**Uzbekistan O'Ichov Uslubiyati**
O_2	**Oxygen**
OHSAS	**Occupational Health And Safety Assessment Series**
OHS	**Occuputional Health andSafety**
OM	**Oliy Majlis Supreme Assembly Of Parliament Of Uzbekistan**
OVOS	**OVOS National Acronym For EIA**
P	**Phosphorus**
Pb	**Lead**
PDS	**National Acronym Of The Ecological Normative Regarding Water**
PDV	**National Acronym Of The Ecological Normative Regarding Air**
PFCs	**Perfluorocarbons**
pH	**A Scale Used To Specify The Acidity Or Basicity Of An Aqueous Solution**
PLC	**Power Line Control**
POWTS	**Plant Oily Water Treatment System**
PPE	**Personal Protective Equipment**
Project	**Stone City Energy 1600 Mw-Combined Cycle Power Plant**
PS	**Performance Standard**
PSEI	**Preliminary Statement Of The Environmental Impact**
PZVOS	**National Acronym Of The Concept Statement On Environmental Impact**
Resolution	**Resolution of The President of the Republic of Uzbekistan Dated 04.10.2019 No. PP-4477**
Reservoir	**Uchkizil Lake**
RUz	**Republic of Uzbekistan**

S	**Sulfur**
S	**South**
S	**Saprobe Indicators**
SanPin	**Sanitary Norms And Regulations Of The Russian Federation**
Sb	**Antimony**
SC	**State Committee**
SCE-CCPP	**Stone City Energy-1600 Mw Combined Cycle Power Plant**
SCEEP	**The State Committee on Ecology and Environmental Protection**
SCNP	**The Main Governmental Organization Responsible For Nature Protection In Uzbekistan**
Se	**Selenium**
SE	**Southeast**
sec	**Second**
SEC	**Statement on Environmental Consequences**
SEA	**Sexual Exploitation and Abuse**
SEE	**State Environmental Expertise**
SF6	**Sulfur Hexafluoride**
SEP	**Stakeholder Engagement Plan**
SIA	**Social Impact Assessment**
SO_2	**Sulfur Dioxide**
SPT	**Standard Test Method for Standard Penetration Test**
ST	**Steam Turbine**
STD	**Sexually Transmitted Diseases**
STI	**Sexually Transmitted Illnesses**
SSVE	**Secondary Specialized Vocational Education**
SW	**Southwest**
TKN	**Total Kjeldahl Nitrogen**
Total-N	**Total Nitrogen**
TSEL	**Approximately Safe Exposure Levels**
Uchkizil	**Uchkizil Lake**
UNDP	**United Nations Development Programme**
UNECE	**United Nations Economic Commission For Europe**

UNFCCC	**United Nations Framework Convention On Climate Change**
UNGP	**United Nations Guiding Principles On Business And Human Rights**
UzRDB	**Uzbekistan Red Data Book**
Viloyat	**Region**
VOC	**Volatile Organic Compounds**
VR	**Vulnerable**
VU	**Vulnerable**
W	**West**
WBG	**World Bank Group**
ZEP	**National Acronym Of The Statement On Environmental Consequences**
Zn	**Zinc**
ZVOS	**National Acronym Of The Statement On Environmental Impact**

1. Introduction

1.1 PURPOSE OF THIS REPORT

The government of the Republic of Uzbekistan aims modernize and increase the electricity production in the country in order to foster economic growth.

Uzbekistan is an energy intensive country. The investment in CCGT technology will assist Uzbekistan in moving towards a low carbon economy. Power generation from burning gas in a CCGT is the cleanest method of generation using fossil fuels. The CCGT turbines burning natural gas produce significantly less greenhouse gases than traditional coal or oil fired thermal power stations, as a result of both the less greenhouse intensive nature of natural gas and the greater inherent energy conversion efficiency of CCGT technology. The introduction of CCGT technology will therefore begin the process in Uzbekistan of reducing the average greenhouse intensity of power generation. This process will accelerate as older less efficient plants burning coal or oil are retired and more CCGT plants are added to the total asset mix.

Expanding clean technology is also a core operating area under the ADB Strategy 2020. ADB's Energy Policy also aims to help developing member countries provide reliable, adequate, and affordable energy for inclusive growth in a socially, economically, and environmentally sustainable manner.

In addition, Uzbekistan is actively involved in energy trading with neighboring countries and is an active participant of the Central Asia Regional Economic Cooperation (CAREC). In 2008, the CAREC countries defined their long-term strategy for developing the region's energy sector as" to ensure energy security through the balanced development of the region's energy infrastructure and economic growth through energy trade." Uzbekistan would like to increase the amount of gas exported to the region, and so any reduction in domestic gas consumption means that there is more gas available for export.

This report is prepared in the pursuance of the agreement mutually signed between FC "SCE-QUVVAT" LLC and JV "UzAssystem "LLC. UzAssystem is appointed to undertake an Environmental and Social Impact Assessment Report (ESIA) in compliance with International Finance Corporation (IFC) Standards for the project of the CCPP.

The SCE-QUVVAT 1600 MW CCPP will be referred to as "The Project" entire of the report.

1.2 OBJECTIVES OF THE ESIA

The main objectives of this ESIA in relation to the Project are as follows:

- Provide an overview of the Project design, identification of sensitive receptors in the Project's area of influence and assessment of Project alternatives including Best Alternative Technique (BAT);
- Assessment of baseline conditions (existing conditions) prior to the development of the Project through review of available data and conducting surveys;
- Assessment of the Project's environmental and social impacts for the construction and operational phases;

- Review of compliance obligations, including applicable Uzbekistan regulations and international regulations and standards as well as international lender requirements;
- To engage with key stakeholders and Project affected people to disclose Project information, study outcomes, gain lay knowledge about the local environmental and social context and seek feedback on Project;
- Determination of applicable mitigation and management measures including monitoring requirements to be implemented in order to avoid or minimize potential impacts and maximize potential environmental and social gains;
- Prepare a framework from which the construction, commissioning and operational phases respective environmental and social management systems and plans can be developed and implemented.

1.3 STRUCTURE OF THE ESIA

In order to comply with the requirements for environmental and social assessment established by international good practice, this report is presented in the following format developed by UzAssystem:

- Non-Technical Summary (Non-Technical Summary of the ESIA, including the main outcomes, and conclusions).
- Abbreviation, list of Tables and list of Figures
- Framework for Environmental and Social Management
- Attachments

Comprises the main text of the ESIA and full impact assessment, with mitigation, management and monitoring measures identified.

- Introduction
- Project Information
- Regulatory Framework
- Approach to ESIA
- Air Emissions and Ambient Air Quality
- Noise Level
- Water Resources and Water Environment
- Ecology
- Soil, Geology and Groundwater
- Solid Waste and Wastewater Management
- Traffic and Transportation
- Archaeology and Cultural Heritage
- Landscape and Visual Amenity
- Climate Affairs
- Socio-Economics
- Public Consultations
- Livelihood Restoration
- Labor and Working Conditions
- Community Health, Safety & Security
- Human Rights Impact Assessment

- References

The framework for the development of the Construction, Commissioning and Operational Environmental and Social Management Systems (including associated management plans) based on the findings from this ESIA. The intention is that this Section (alongside the full ESIA package and other E&S documents) will be issued to the EPC Contractor and O&M Company to develop and implement project specific management processes respectively.

ESIA report comprises Attachments, which are as follows:

- Attachment A – Letter & Conclusions from State Committee on Ecology & Environmental Protection.
- Attachment B – Overall Project Layout
- Attachment C – Water Balance Diagram
- Attachment D – List of Archaeological & Cultural Sites within the Surkhandarya Region
- Attachment E – Laboratory Analyzes Results
- Attachment F – Stakeholder Engagement Plan (SEP)
- Attachment G – Socio-Economic Annex
- Attachment H – Environmental Social Action Plan (ESAP)
- Attachment I – Environmental Social Management Plan (ESMP)

2. PROJECT INFORMATION

2.1 PROJECT LOCATION

The Project site is located in the Angor district of the Surkhandarya Region of the Republic of Uzbekistan, on the north-eastern coast of the Uchkizil lake. Distance to the regional center - Uchkizil village - 2.0 km, to the regional center the city of Termez – 14 km. General project site location is presented in Figure 1 and the Project location (regional) is presented in Figure 2.

According to the project area sent by the Client, The Project Area boundary is approximately 74ha. By the decision of the Khokim (Governor of Region) of Angor district No. 131–8–0–Q dated 30.09.2021, a land plot in Kattakum village community assembly, with a total area of 73.4 hectares, was allocated for the implementation of the planned project, of which: 80,000 m^2 - for building; 25, 800 m^2 - for a hard surface; 21,500 m^2 - for green spaces; 382,700m^2- ground cover, other areas 22, 400 m^2.

The Site is at an elevation of about +337 m above sea level. The level of the Uchkizil water reserve is +318 m above sea level.

Figure 1: General Project Site Location

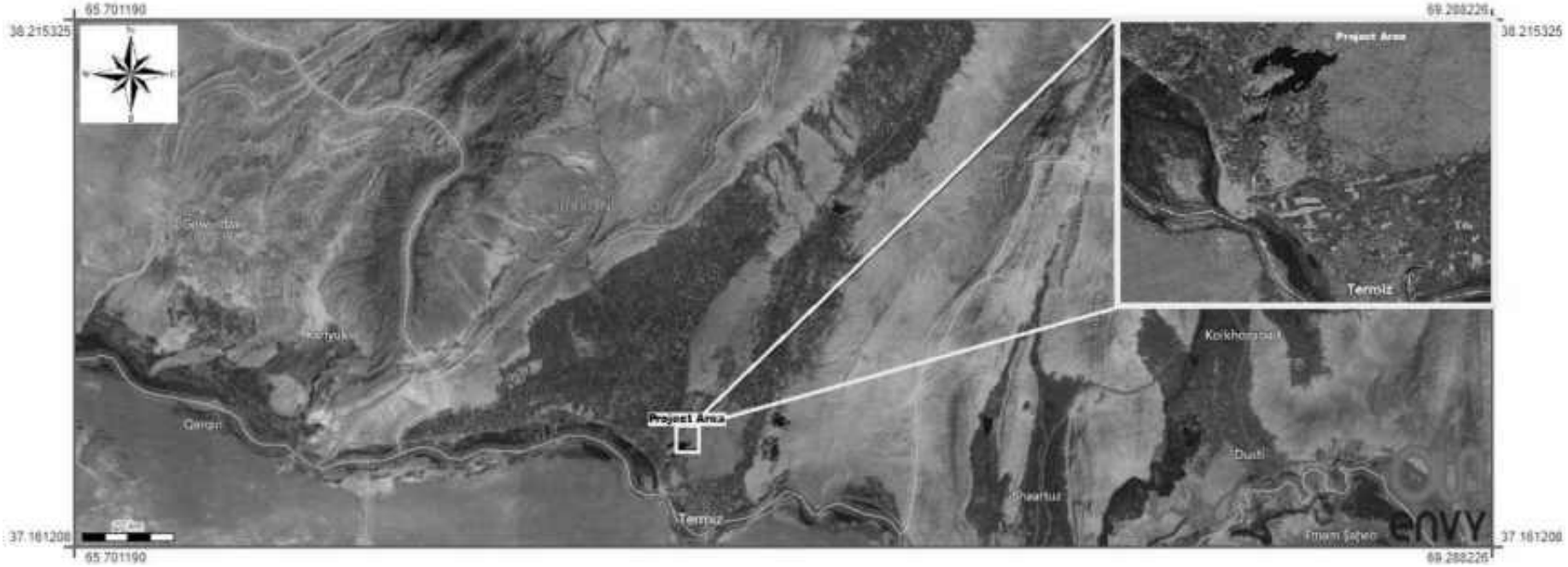


Figure 2: Project Location (Regional Context)

2.2 LAND USE AND SITE CONDITION

The three largest land use categories in Uzbekistan are: agricultural land (46.1% or 20,473 thousand ha); lands of the forest fund (21.7% or 9 635 thousand ha), as well as lands of the reserve (27.6% or 12,262 thousand ha). In total, these land categories cover more than 42 million hectares (95% of the country).

The construction of a combined-cycle power plant with a capacity of 1600 MW with auxiliary equipment is planned in the Surkhandarya region in the south of the Republic of Uzbekistan.

The construction site for a new combined cycle power plant consisting of two CCGT and a steam turbine (1 unit) is located in the Angor district of the Surkhandarya region, 14 km north of the city of Termez and 2.7 km north-east of the urban settlement type Uchkizil, on the right bank of Lake Uchkizil.

For the construction of the combined cycle power plant, unused agricultural land of the Kattakum with an area of 73.4 hectares was allocated.

The boundaries of the territory of the combined cycle power plant are: from the north, west and east - uncultivated and unused lands in agriculture; from the west - at a distance of 450-550 meters the "Zang" canal flows, flowing into Lake Uchkizil; from the south - Lake Uchkizil is located. From the north, northeast, along the border from the site of the combined cycle power plant, there is the M-39 main road; from the south, at a distance of 7 km - the main railway line "Kagan-Termez-Dushanbe".

Nearest residential buildings are located in south (Uchkizil Village, ~1.5 km) and in west (Kattakum Village, ~1.35 km) (see Table 1 and Figure 3).

Table 1: Geographic Coordinates of the Planned Combined Cycle Power Plant

Geographic Coordinate System WGS 84		
No	**Y**	**X**
1	**37 ° 22'25.33 "N**	**67 ° 14'54.80 "WD**
2	**37 ° 22'54.68 "N**	**67 ° 14'50.03 "WD**
3	**37 ° 22'54.70 "N**	**67 ° 14'49.93 "WD**
4	**37 ° 22'55.63 "N**	**67 ° 14'56.58 "WD**
5	**37 ° 22'56.17 "N**	**67 ° 15'1.55 "WD**
6	**37 ° 22'56.21 "N**	**67 ° 15'5.65 "WD**
7	**37 ° 22'55.87 "N**	**67 ° 15'10.66 "WD**
8	**37 ° 22'55.28 "N**	**67 ° 15'15.08 "WD**
9	**37 ° 22'54.50 "N**	**67 ° 15'19.19 "WD**

Geographic Coordinate System WGS 84		
No	**Y**	**X**
10	**37 ° 22'52.25 "N**	**67 ° 15'24.44 "WD**
11	**37 ° 22'25.74 "N**	**67 ° 15'20.23 "WD**
12	**37 ° 22'20.01 "N**	**67 ° 15'1.14 "WD**

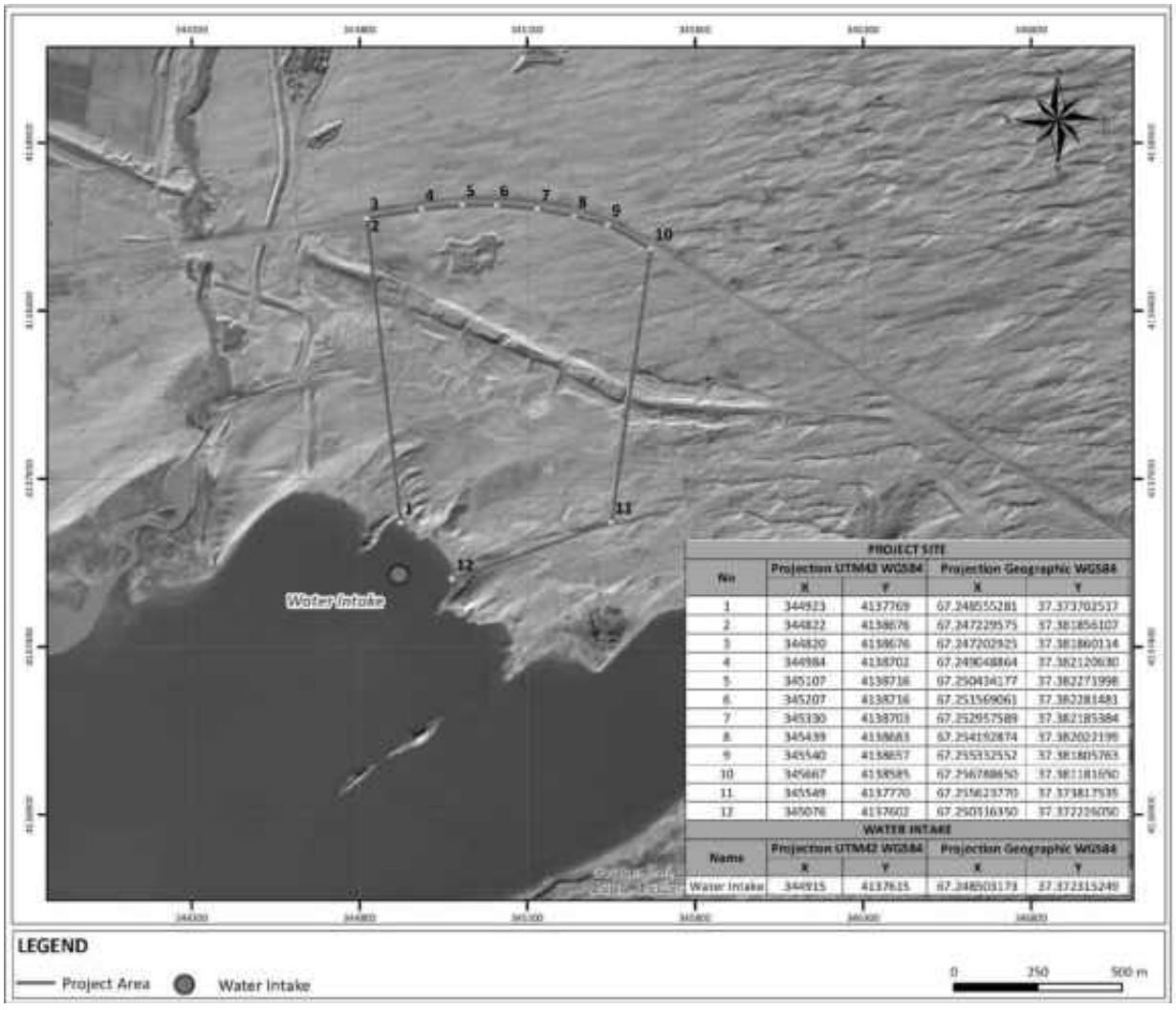


Figure 3: Overview shot of the location of the Project

2.2.1 Land Ownership

According to the 1998 Land Code of the Republic of Uzbekistan, all land in Uzbekistan is state property and permits for use of land are granted and monitored by the State through the rayon and oblast administrations.

2.3 PROJECT DESCRIPTION

The proposed Project is a CCPP project. The combined cycle power plant consisting of two CCGT and a steam turbine (one unit). The baseload capacity of the Project is 1,600 MWe. The fuel to be used at the plant is natural gas and it will be supplied from a pipeline to be constructed by the Government. The electrical high voltage system of the plant will have a 500 kV grid connection with air-insulated switchyard to be constructed at the Project area. The plant will have two transformers (600 MVA), two auxiliary transformers (27/44 MVA), and various auxiliary transformers.

In the CCPPs, compressed air and natural gas enters the combustion section of the gas turbine plant. Combustion products in a gas turbine with a temperature of approximately 1500°C enter the gas turbine converting kinetic energy into mechanical energy. After the gas turbine, the exhaust gases at a temperature of 670°C enters into the heat recovery steam generator, in which steam is generated by transferring thermal energy from the feed water. Exhaust gases from the heat recovery steam generator are discharged into the atmosphere through the stack at a temperature of 85° to 140°C, depending on the content of sulfur. The exhaust gas that loses its heat leaves the power plant via the stack and is emitted to the atmosphere via two stack 65 m in height and 8.24 m in diameter.

The generated steam in the two heat recovery steam generators enters into the steam turbine, where the kinetic energy of the steam drives the turbine, generating mechanical energy. The exhaust steam is sent to the condenser and, due to heat exchange with the cooling air, is converted into condensate, which is then sent back to the boiler. To replenish the technological losses of steam and water, the power unit is continuously fed with demineralized water. In this process, additional electricity is generated without the use of additional fuel. The Schematic Illustration of a Combined-Cycle Gas Power Plant is presented in Figure 4.

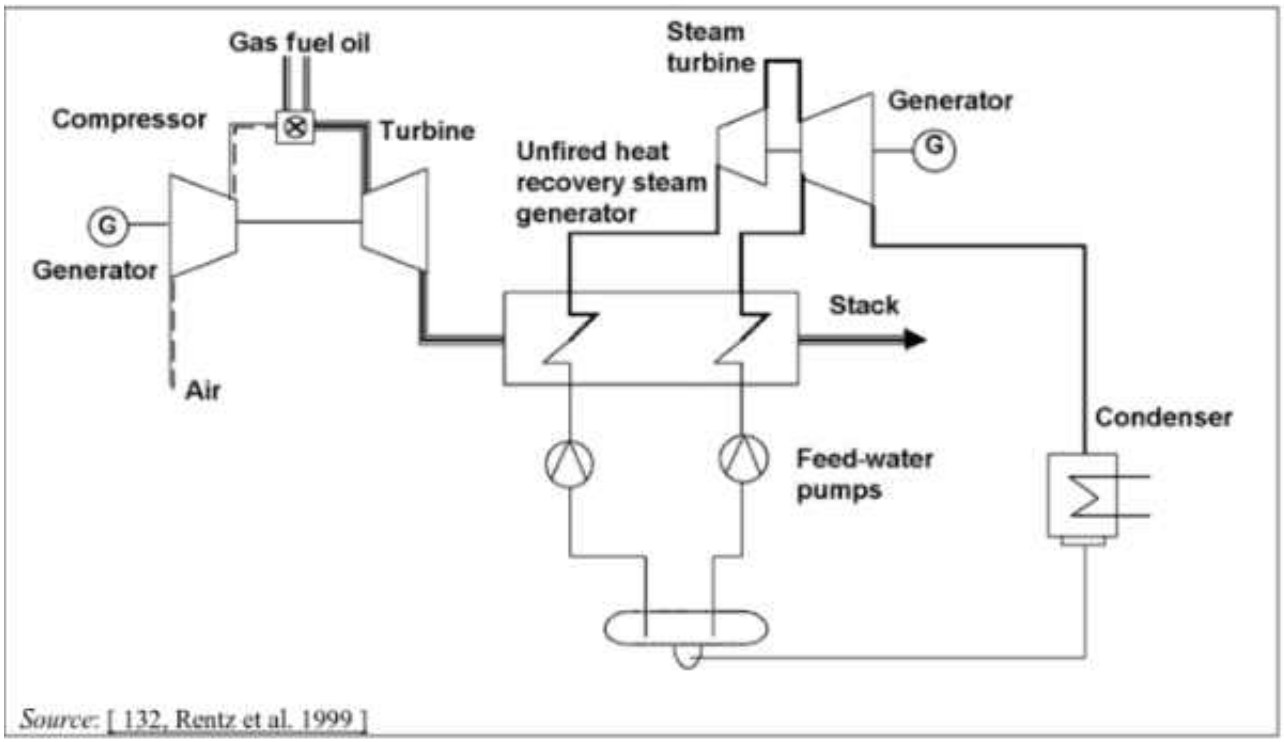


Figure 4:Sample of the Schematic Illustration of a Combined-Cycle Gas Power Plant [1]

The water consumption for service and sanitary water will be equal. That means the difference of water consumption is the use of ACC or CTs. Solutions consume for the needs of a gas turbine unit (make-up, blowdown, flushing, cooling) - 52.4 m^3 / hour, 1.258 thousand m^3 / day. or 440,172 thousand m^3 / year

2.3.1 Project Facilities

The technical information of the power plant is presented Table 2. The overall project layout with legend is provided in Attachment B.

2.3.1.1 Design and principle of operation of a combined cycle power plant.

The air compressed in the CCGT compressor continuously enters the combustion chamber, where it promotes the combustion of gaseous fuel at constant pressure. The combustion products enter the gas turbine, where the kinetic energy of the gas flow is converted into mechanical work of the turbine rotor rotation, where electrical energy is obtained. The gas temperature in front of the gas turbine, depending on the turbine series, is in the range of 1100-1500 ° C.

After the CCGT unit, the exhaust gases at a temperature of 670 ° C are fed into a waste-heat generator (waste-heat boiler), in which steam is generated by transferring thermal energy from gases from the gas turbine to feed water and steam. The gases from the waste heat boiler are discharged into the atmosphere through the chimney/stack at a temperature of about 85-140 ° C.

The generated steam in two waste heat generators enters a steam turbine, where the kinetic energy of the steam drives the turbine, generating secondary mechanical energy and, accordingly, obtaining additional electrical energy.

The combined cycle plant consists of two separate units: a steam power unit and a gas turbine unit. In combined cycle plants, the first generator is located on the same shaft as the gas turbine, which generates an electric current due to the rotation of the rotor. Passing through the gas turbine, the combustion products give it only part of their energy and still have a high temperature at the outlet of the turbine. Further, the combustion products enter the steam power plant, into the waste heat boiler, where water vapor is heated. The flue gas temperature is sufficient to bring the steam to the state required for rotation steam turbine and additional electrical energy (temperature 500 degrees Celsius and pressure 80 atmospheres) (see Figure 5).

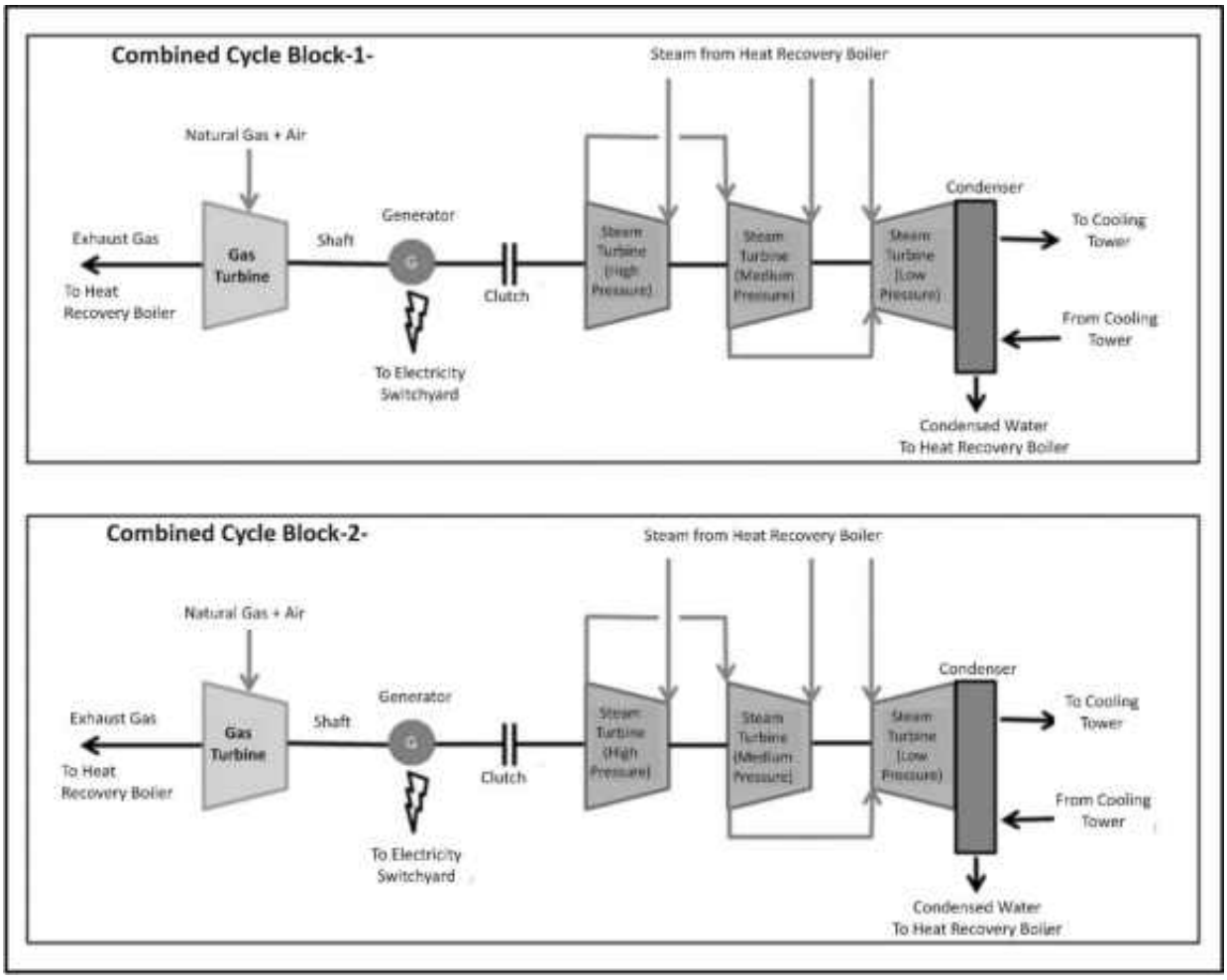


Figure 5: Process Flow Chart for Electricity Generation

The exhaust steam is sent to the condenser and, due to heat exchange with the cooling air, is converted into condensate, which is then sent back to the boiler. To replenish the technological losses of steam and water, the power unit is constantly fed with chemically demineralized water.

Gas will be supplied to the territory of the section of the combined-cycle power plant with a total capacity of 1600 MW through newly constructed pipelines. Fuel gas enters the gas treatment station, equipped with coarse filters and a commercial gas flow meter, and then to the gas control station (GRP), where it is cleaned for subsequent throttling before afterburning (if necessary), then to the gas booster compressor station and then to the enters the main body for combustion in the combustion chamber of the gas turbine.

It is expected that the efficiency of each of the two CCGT units will be 60%, which is 1.6-1.7 times higher than the efficiency of the existing power plants of the energy system of Uzbekistan (34-37% on average).

The maximum consumption of natural gas at each CCGT unit is 144,550 m^3 / h (i.e. 289,100 m^3 / h for two CCGT units). The consumption of natural gas at the new combined cycle power plant as a whole will amount to 289,100 m^3/h x 8.000 h = 2.312,8 billion m^3 / year (working hours per year will be 8000h).

A gas booster compressor station (GDCS) is used to supply natural gas to the CCGT combustion chambers.

The gas booster station is designed to compress a mixture of hydrocarbon gases, which serves as a fuel for a gas turbine, during continuous operation of a combined cycle power plant with necessary breaks for preventive maintenance (topping up oil, cleaning filters, etc.). The booster compressor station is designed to operate the CCGT unit with the maximum gas consumption. Gas is supplied to the compressor station with a pressure of at least 9 kg / cm^2 and is supplied from the gas compressor station to the CCGT unit to the input block for operational regulation and measurement of the gas flow rate.

Flue gases from the installed CCGT units, containing nitrogen oxides (NO,NO_2), carbon monoxide (CO) and sulfur dioxide (SO_2 negligible), will be discharged through two individual chimney/stack 65 m high and 8.24 m in diameter.

The main advantage of the proposed design solution from the standpoint of ecology is the reduction of nitrogen oxide emissions in comparison with the currently operated power units, which is achieved due to the use of combustion chambers with dry low-toxic burners when burning natural gas.

At each source of emissions from CCGT units, an automated system for tracking emissions is provided, which provides for continuous instrumental measurements of the concentrations of pollutants (NOx, SO_2, CO). In addition, the following parameters of flue gases will be monitored: volumetric flow rate of flue gases, temperature, pressure, total carbon, water vapor.

The new installation will be controlled using an automated control system, which, along with operational control, will create high operational reliability and reduce emergency risks.

Table 2: Main characteristics of the designed combined cycle power plant

Feature	Description
Type of technology	**Combined Cycle Power Plant**
The total area of the allocated land for construction	**73.4 hectares.**
Number of units of combined cycle plants	**2**
Power Generation	**1600 MW**
Capacity of each unit	**Gas Turbine – 551 MW**

Feature	Description
	Gas Turbine – 551 MW **Steam Turbine – 538 MW**
Configuration	**2 Gas Turbines + 2 Heat Recovery Steam Generators + 1 Steam turbine**
CCGT type	**Siemens**
CCGT efficiency	**60%**
Working hours per year	**8000 h**
Fuel	**Natural gas**
Natural gas consumption per hour for one unit	**289,100 m³/h / 2 = 144,550 m³/h**
Annual consumption of natural gas	**289,100 m³/h x 8.000 h = 2.312,800.000 m³/year**
Condenser cooling type	**Water cooled**
Cooling tower type	**Dry cooler system**
Source water - cooling water	**Source water comes from the lake "Uchkizil"**
Initial water	**Uchkizil Lake**
Process water - for boilers	**Process demineralized water will be supplied from our own demineralization plant through a connection to the demineralized water system**
Stack height	**65 m**
Stack diameter	**8,24 m**
Auxiliary equipment	**- Feed Water and Steam System** **- Fuel Gas System Incl. Gas Compressor Station** **- Dry Cooler System** **- Closed Condenser System** **- Water Treatment System** **- Waste Water System** **- Sampling System** **- Dosing System** **- Firefighting System** **- Lifting System**

Feature	Description
	- Electrical System **- Standby Diesel Generator** **- C&I System** **- Civil Works System**
Number and type of transformers	**2 transformers 600 MVA,** **2 auxiliaries 27/44 MVA,** **various auxiliary transformers**

The source of raw water is the Uchkizil lake.

- A purification system will be used for water purification, which includes:
  - Pre-processing systems;
  - Demineralization systems; demineralization system (reverse osmosis or anion axion filters) volume
  - Drinking water treatment systems.

The operating mode of the new combined cycle power plant is basic, year-round, round-the-clock with the maximum possible number of hours of electric power use.

The main power generation equipment consists of:

- New generation combined cycle plants of the type - 2 units. (manufacturer "Siemens", Germany) (see Figure 6);
- Steam turbine - 1 unit. ("Siemens" manufacturer Germany) (see Figure 7).

Figure 6: Sample of the Combined Cycle Gas Turbines with a capacity of 1600 MW

Figure 7: Sample of the Steam turbine "Siemens"

The overall electrical efficiency of the proposed CCGT unit is ~ 60%. The proposed CCGT unit belongs to a relatively new type of power plant operating on natural gas. Combined-cycle power plants are designed to obtain the maximum (primary and secondary from hot exhaust gases) amount of electricity. The main characteristics of the steam turbine presented in Table 3.

Table 3: The main characteristics of the steam turbine

Characteristic	Description / meaning
Rotational speed	**15,000 rpm**
Steam pressure	**30 bar**
Steam temperature	**400 °C**
Rated frequency	**50-60 Hz**

Composition of natural gas used as fuel for CCGT unit, according to JSC "Uztransgaz" (gas supply and gas transport company in Uzbekistan) is given below in

Table 4.

Table 4: Natural gas composition

Components	Calculated gas composition in% molar
Methane	**98.72**
Ethane	**0.48**
Nitrogen	**0.74**
Carbon dioxide	**0.056**
Oxygen	**absent**
Hydrogen sulfide, g / m^3	**0.0044**
Mercaptan sulfur, g / m^3	**<0.001**
The lowest heat of combustion in terms of 20 ° C and 101.32 kPa, MJ / m^3	**33.23**
Mechanical impurities weight, g / m^3	**absent**
Gas density at standard conditions, kg / m^3	**0.675**
Molecular weight of gas, g / mol	**16.2**

2.3.2 Ancillary/Support Facilities

The following elements of the plant will also be part of the Project:

- Site entrance and security building;
- Administration building, offices and amenities;
- Central Control Room;
- HVAC system;
- Electrical Systems;
- Laboratory;
- Workshops;
- Warehouse and stores;
- Emergency Diesel Generator;
- Fire-fighting system; and
- Other mobile plant and vehicles.

A dedicated fire-fighting team will be based on-site during operations.

2.4 PROJECT ALTERNATIVES

2.4.1 Uzbekistan 2030 Energy Strategy

The Uzbekistan 2030 Energy Strategy defines the mid-term and long-term objectives and directions for the development in the power sector between 2020-2030. The main objectives include:

- Satisfying the country's electrical power demand in full through domestic generation without dependence on energy imports and thus ensuring energy security;
- Improvement of national economy's energy efficiency with parallel reductions in energy intensity achieved through, inter alia, creation of economic mechanisms to stimulate rational use of electrical power to consumers;
- Increase energy efficiency of generation, transmission and distribution of electrical power to satisfy the growing demand;
- Reduction of power equipment wear through consistent renewal, increasing reserves in generation and transmission assets;
- Development and expansion of renewables use and their integration into the unified power system; and
- Development of efficient basic electricity market model.

In order to efficiently fulfill the objectives above and achieve the targeted goals, implementation the strategy calls for the implementation of the following measures:

- Improvement of efficiency and rationale use of electricity at all stages of technological processes based on the use of energy saving technologies and optimization of generating assets;
- Ensuring diversification in power and heat energy sectors through increased share of renewable energy sources and creation of renewable energy investment project mechanism utilizing PPP approaches, enhancement of government policies related to development of renewable energy sources, demonstration of renewable energy projects;
- Development of comfortable, rule of law based, administrative environment for investments and wholesale power sales with a view to attract long term investments first of all foreign direct investments;
- Enhancement of corporate governance, increasing transparency of state-own power enterprises' financial and economic operations;
- Expansion of trans-boundary trade and strengthening of regional cooperation through the reinstatement and modernization of transmission lines connected to neighbouring countries' power systems; and
- Development of market relations through step-by-step liberalizing and reduction of government role, creation of a new market model based on clear separation of rights and responsibilities between actors in this sector at each step of market evolution, starting from Single Buyer and all the way to establishment of competitive wholesale and retail markets.

In regard to the Project, its development is in line with the use of energy efficient technologies to ensure the power sector's overall sustainability. The strategy aims to increase efficiency of the plant

during construction of new power plants operating in base-load condition, the use of combined cycle technologies with generator efficiency over 60%.

The government of the Republic of Uzbekistan through the Ministry of Energy aims to modernize and increase the electricity production in the country to foster economic growth and develop public-private partnership in the country's energy sector. The project forms part of the Ministry of Energy's plan to increase and modernize electricity production in the country.

The project also forms part of the Strategy of Action for the Five Priority Development Areas of Uzbekistan (2017 -2021) to introduce new technologies for generating thermal energy as the Project is being implemented as heat recovery in order to generate electricity.

2.4.2 Alternative Design Options

In recent years, significant positive changes have been observed in the legislation of the Republic of Uzbekistan, aimed at both increasing the efficiency of the energy industry enterprises, introducing energy efficient technologies, and increasing the investment attractiveness of this sector of the economy as a whole.

It should be noted that within the framework of the "Concept for the provision of the Republic of Uzbekistan with electric energy for 2020-2030" it is provided:

- Increase in electricity production from 63.6 billion kwh·h up to 120.8 kw·h;
- Reducing the consumption of natural gas in the production of electricity from 16.5 billion cubic meters to 12.1 billion cubic meters;
- Reduction of losses during transmission of electricity to 2.35% and losses during distribution - to 6.5% (1.85 times less than in 2019).

The implementation of these plans will ensure the country's energy security, taking into account the forecasts that in 10 years' energy consumption in Uzbekistan will almost double.

At the same time, today the bulk of generating capacities (about 85%) are thermal power plants, in connection with which, by 2030, it is predicted to commission 15.6 GW of new and modernized small generating capacities of thermal power plants. At the same time, decommissioning of 6.4 GW of physically obsolete equipment of generating capacities at large TPPs is forecasted.

It is noted that plans to reform the electric power industry of Uzbekistan until 2030 have already voice dearlier in the summer of 2019. It was assumed that the structure of generating capacities by 2030 will look as follows: power units using natural gas will reach 16.3 GW, or 51% of the total capacity (year 2020 33%), HPPs - 3.8 GW, or almost 12% (year 2020 - 16%), power units using coal, 2.6 GW, or 8.2% (year 2020 - 11%).

Decentralization and construction of low-power TPPs, such as the proposed project for the construction of a combined-cycle power plant with a capacity of 1600 MW in the Angora district of the Surkhandarya region will lead to a significant reduction in electrical energy losses during its transportation, as well as a reduction in fuel consumption and, accordingly, emissions of pollutants into the atmospheric air.

When considering the issue of commissioning additional capacities for the production of electrical energy and the construction of a thermal power plant in the Surkhandarya region, it was also assumed to obtain electrical energy using diesel generators working on diesel fuel.

The proposed diesel generator is designed to generate electricity in conditions of unstable or no power supply. A diesel generator also converts mechanical energy from the combustion of diesel fuel into electrical energy.

Analysis of all parameters, including the type of fuel used, fuel consumption per 1 kW / h of about 150 g, efficiency and, accordingly, the amount of electricity produced showed that, in comparison with diesel generators, combined-cycle plants operating on gas to generate electricity consume 2.5 times less fuel and efficiency will be 60%.

In this regard, it was decided to build a combined cycle power plant - a new generation, with a capacity of 1600 MW in the Angora region to supply power to the border regions (Muzrabad, Termez) districts of the Surkhandarya region, as well as the city of Termez.

Also, an alternative to the decisions made can be a "zero" option, i. E. abandonment of the planned activities and preservation of the existing situation in the region. In this case, there will be no:

- Ensured the accelerated development and increase in the competitiveness of the country's energy sector;
- Active attraction of foreign direct investment in the construction of new generating facilities;
- The growing demand for electricity and heat was satisfied;
- Reduction of specific indicators of fuel consumption in comparison with traditionally used power units;
- Increasing production efficiency.

2.4.3 Cooling Technology

The Cooling methods are a particularly key aspect of alternative analysis. Water availability in Uzbekistan (including the Project area) is highly variable, relatively scarce, and a vital resource to the local agriculture. Furthermore, it is possible that regional water scarcity could increase as a result of climate change, although local climate models also predict an increase in river flow (up to 2050 and for the period of the Project's Power Purchase Agreement) due to additional meltwater from glaciers that (in part) feed these rivers. A range of cooling techniques are available and have been considered in the design of the Project. These include 'Wet Cooling Towers'; and 'Air-Cooled Condensers'. Schematic illustrations of these techniques are provided below between Figure 8 - Figure 10.

Table 5: Natural gas composition

2-2-1 SGT 9000HL GTCC @ 17°C / 55% RH	Unit	Air-Cooled Condenser Value	Wet Cooling Tower-1	Wet Cooling Tower-2
Gas Turbine Gross Power	**[MW]**	**1103**	**1103**	**1103**
Steam Turbine Gross Power	**[MW]**	**533**	**534**	**563**
Gross Power	**[MW]**	**1636**	**1637**	**1666**
Aux. Load & Transformer Losses	**[MW]**	**33**	**34**	**37**

Net Power	**[MW]**	**1603**	**1603**	**1629**
Net Electrical Efficiency	**[%]**	**62.01**	**62.02**	**63.02**
Cooling Tower Blowdown & Spray Losses / Drift	**[t/h]**	**-**	**240.5**	**241.5**
Cooling Tower Water Evaporation	**[t/h]**	**-**	**962**	**966**
Steam Cycle Makeup				
@ 1% HRSG Blowdown	**[t/h]**	**13.08**	**13.14**	**13.76**
@ 2% HRSG Blowdown	**[t/h]**	**25.51**	**25.63**	**26.22**
Cooling System		**See Figure 8**	**see Figure 9**	**see Figure 10**

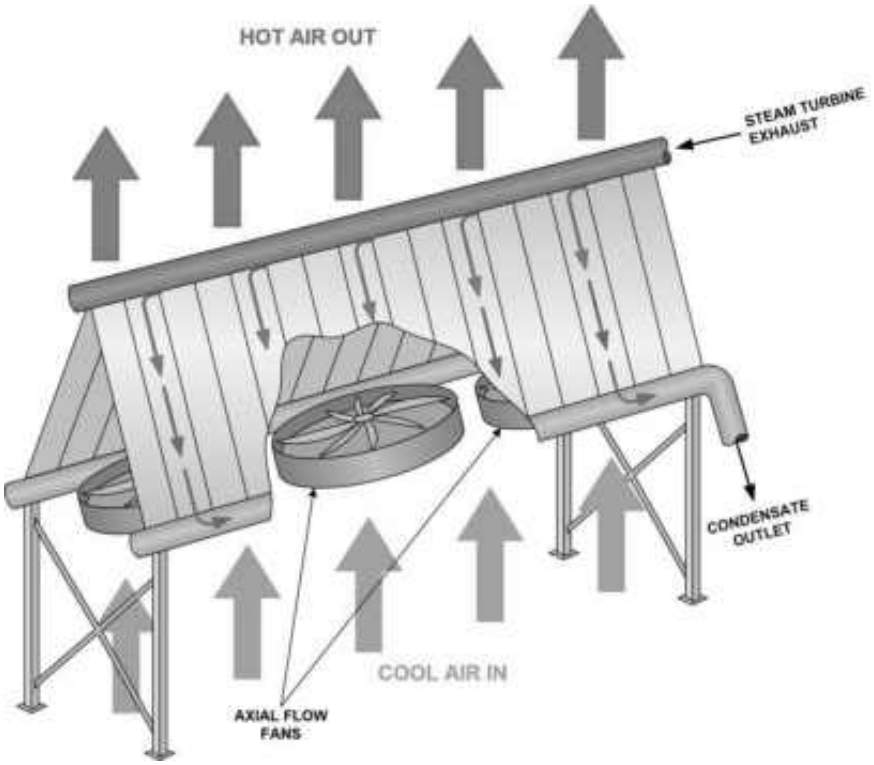


Figure 8: Sample of the Air-Cooled Condenser System [2]

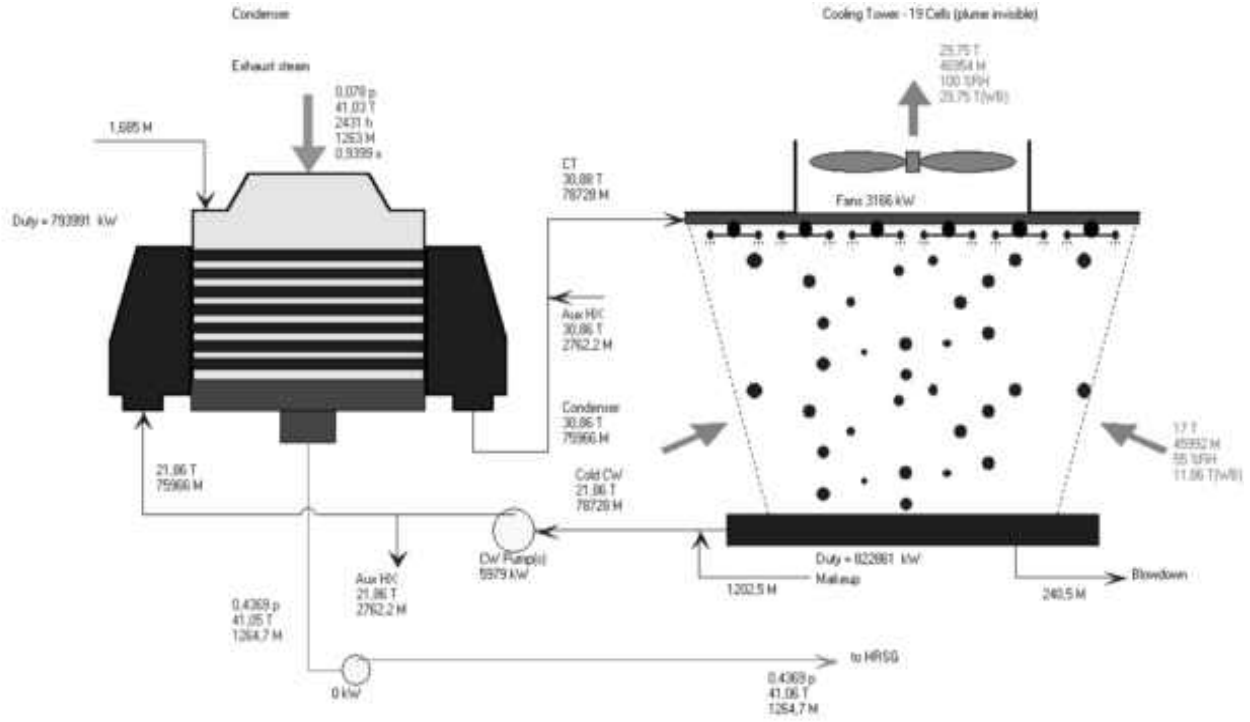


Figure 9: Sample of the Wet Cooling Tower System-1

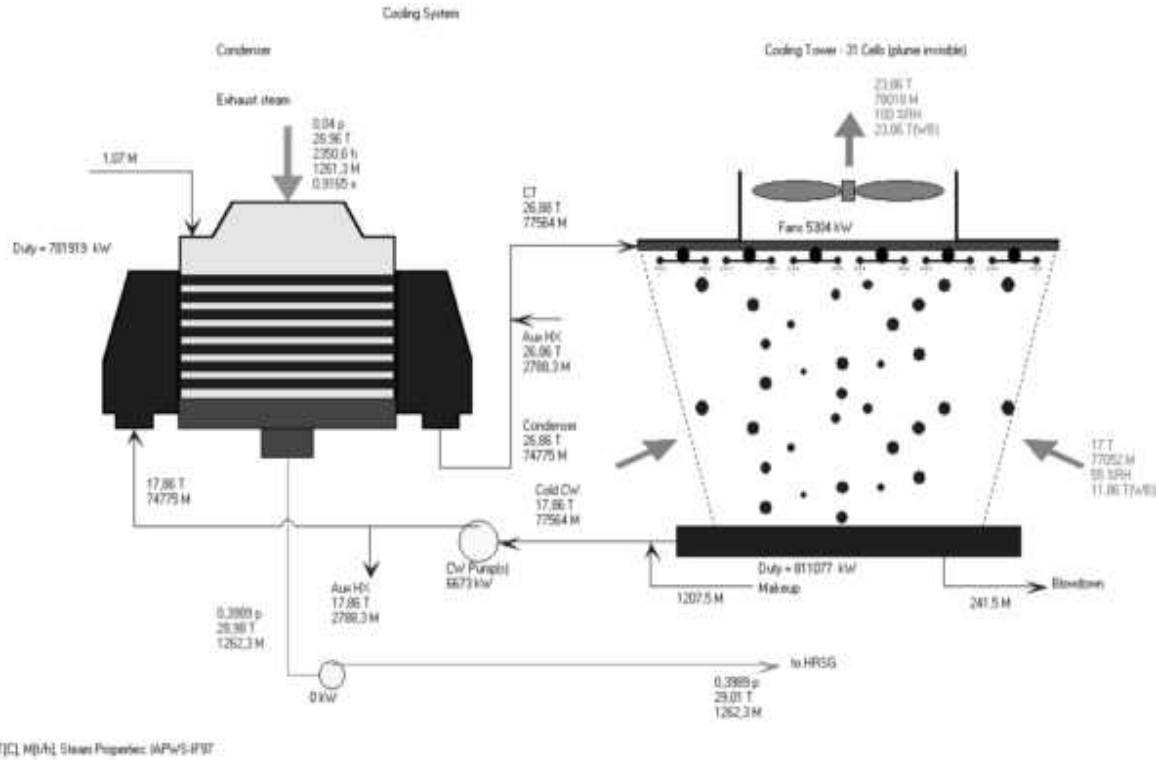


Figure 10: Sample of the Wet Cooling Tower System-2

3. REGULATORY FRAMEWORK

All phases of the E&S management of the proposed the Project shall be conducted in compliance with national and international regulations and standards as well as the standards of financial institutions. The legal framework is explained in the following sections.

3.1 NATIONAL ENVIRONMENTAL POLICY AND LEGAL FRAMEWORK

The Republic of Uzbekistan (RUz) is a presidential constitutional republic, whereby the President of Uzbekistan is both head of state and head of government. According to the Constitution which was signed by the President of Uzbekistan and taken by Oliy Majlis (OM) on December 8, 1992 (as amended on 08.02.2021), have the highest legal power.

On the basis of Article 94 of Constitution Law, "*The President of Uzbekistan, shall issue decrees, resolutions and ordinances binding on the entire territory of the Republic on the basis of and for enforcement of the Constitution and laws of the RUz*".

The Cabinet of Ministers (CM) in accordance with the current legislation issues resolutions and ordinances binding on all bodies, enterprises, institutions, organizations, officials and citizens on the entire territory of the RUz.

Moreover, Article 104 of Constitution Law states, "*The Khokim (Governor of Region) within his vested powers adopt decisions which are binding on all enterprises, institutions, organizations, associations, as well as officials and citizens on the relevant territory."*

The environmental policy of the RUz is aimed at creating favorable conditions for environmental safety and environmental protection of the country, improving the environmental situation, preventing harmful impacts of waste on the environment, improving the quality and standard of living of the population work.

The National environmental legal framework is based on the regulations of the Constitution of Uzbekistan. The Constitution and environmental legislation establish the right of citizens to live in a safe environment. Constitution of the RUz addresses environment protection issues within specific articles are:

- Article 36: "Everyone shall have the right to own property."
- Article 50: "All citizens shall protect the environment";
- Article 53: "The State shall guarantee freedom of economic activity, entrepreneurship and labor with due regard for the priority of consumers' rights, equality and legal protection of all forms of ownership";
- Article 54: "Any property shall not inflict harm to the environment"; and
- Article 55: "Land, subsoil, flora, fauna, and other natural resources are protected by the state and considered as resources of national wealth subject to sustainable use".

In addition, Uzbekistan has enacted several supporting laws and legislation acts for management of environmental, land rights, labor and health and safety requirements, and is a party to several international and regional environmental agreements and conventions. In order to implement the laws

efficiently, the majority of them require additional administrative and/or legal instructions for full execution and these are set out in various subordinate regulations, acts and sanitary norms [3]. The most relevant legislation for the Project is described in the following sections.

3.1.1 Environmental Regulator

State administration in the field of ecology, environmental protection, rational use and reproduction of natural resources in accordance with laws and other regulatory legal acts is carried out in the RUz by:

- The Cabinet of Ministers (CM),
- The State Committee on Ecology and Environmental Protection (SCEEP), and
- Government bodies on places.

CM (the Government) is the executive power body of the RUz, ensuring guidance over effective functioning of the economy, social and cultural development, execution of the laws, and other decisions of the Supreme Assembly, as well as decrees and resolutions issued by the President of the RUz.

The RUz are regulated numerous legislative documents, on land, water, forest, subsoil legislation, on the protection and use of atmospheric air, flora and fauna, and other acts of legislation. Relations in the field of environmental protection and rational use of natural resources are carried out by public authorities and regulatory bodies and departments/agencies specifically responsible for nature protection. The SCEEP is the main regulatory governmental body in charge of ecology, environmental protection and rational use of natural resources [3].

The authorized RUz organizations responsible for the nature protection are:

- Cabinet of Ministers;
- State Committee on Ecology and Environmental Protection;
- Ministry of Health;
- Ministry for Emergency Situations;
- Ministry of Labor and Social Welfare;
- State Committee on Industrial Safety;
- Ministry of Internal Affairs;
- Ministry of Agriculture;
- Ministry of Water Resources;
- State Committee on Geology and Mineral Resources;
- Uzbek Hydrometeorological Services (Uzhydromet) and;
- Cadastral Agency under the State Tax Committee.

3.1.2 Key Environmental Laws of Uzbekistan

The key environmental law is the "Law "On Nature Protection (No: 754-XII, dated December 09,1992, as amended on 21.04.2021)". The current Law establishes legal, economic and organizational fundamentals for the preservation of conditions of natural environment and rational use of natural resources. Its purpose is to ensure balanced relations between man and nature, to protect the environmental system and to guarantee the rights of the population of a clean environment. The influence of economic activity on nature environment is limited by norms and quality standards

established for various components of the natural environment to guarantee ecological safety of population, production and protection of nature resources.

Article 12 of the Law states that *"Residents of the RUz are obliged to use natural resources rationally, treat natural resources with care, and comply with environmental requirements"*.

Article 25 of the Law states, *"State Environmental Expertise (SEE) is a mandatory measure for environmental protection; preceded to the decision-making process"* as saying *"the implementation of the project without a positive conclusion of SEE is prohibited"[3]*.

Furthermore, the other laws, regulating different areas of management and environmental protection are *[3]*:

- Law "On Environmental Control", No. 63 dated December 27, 2013, (as amended on September 30, 2020);
- Law "On Ecological Expertise", No. 73-II dated May 25, 2000 (as amended on November 22, 2018);
- Law "On Environmental Audit", No. 678 dated March 15, 2021;
- Law "On Ecological Control", No. 363 dated December 27, 2013 (as amended on August 17, 2021);
- Law "On Ambient Air Protection", No. 353-I dated December 27, 1996 (as amended on April 21, 2021);
- Law "On Protection and Use of Flora (new edition)", No. 409 dated September 21, 2016 (as amended on April 21, 2021);
- Law "On Protection and Use of Fauna (new edition)", No. 408 dated September 19,2016 (as amended on April 21, 2021);
- Law "On Protected Natural Territories", No. 13 dated January 08, 2018 (as amended on December 28, 2020);
- Law "On Forests (new edition)", No. 475 dated April 16, 2018 (as amended on April 21, 2021);
- Law "On Subsoil (new edition)", No. 444-II dated December 13, 2002 (as amended on April 21, 2021);
- Law "On Waste", No. 362-II dated April 05, 2002 (as amended on April 21, 2021);
- Law "On Water and Water Use", No. 837-XII dated May 06, 1993 (as amended on April 21, 2021);
- Law "On Rational Use of Energy", No. 412-I dated April 25, 1997 (as amended on July 15, 2020);
- Law "On Industrial Safety of Hazardous Production Facilities", No. 57 dated September 28, 2006;
- Law "On the Protection and Use of Cultural Heritage", No. 269-II dated August 30, 2001 (as amended on April 19, 2019).
- Law "On Accession of the RUz to the Cartagena Protocol on Biosafety to the Convention on Biological Diversity", No: 569 dated October 14,2019;
- Law "On Ratification of the Stockholm Convention on Persistent Organic", No.535 dated May 08, 2019; and
- Law "On Ratification of the Paris Agreement", No. 491 dated October 02,2018.

The decrees of the President of the RUz are *[3]*:

- "On Approval of the Concept on Environmental Protection in the RUz until 2030" No. 5863 dated October 30, 2019 (as amended on March 17, 2021);
- "On Improving the Public Administration System in the Field of Ecology and Environmental Protection" No. 5024 dated April 21, 2017;
- "On Additional Measures to Improve the Public Governance System in the Ecology and Environmental Protection" No. 3956 dated October 03, 2018;
- "On Measures for Cardinal Improvement and Development of the Waste Management System" No. 2916 dated April 21, 2017; and
- "On Approval of the Strategy on Solid Waste Management in the RUz for the Period 2019-2028" No. 4291 dated April 17, 2019.

The resolutions of the Cabinet of Ministers are *[3]*;

- "On the Improvement of the System of Environmental Monitoring in the RUz" No. 737 dated September 05,2019;
- "On Approval of the Regulations on the Order of Establishment of Water Protection Zones and Sanitary Protection Zones of Water Bodies in the Territory of the RUz" No. 981 dated December 11, 2019;
- "On Approval of the Regulation on the Procedure for Exercising State Environmental Control" No. 216 dated August 05, 2014;
- Resolution No.14, "On Approval of the Regulations on the Procedure for the Development and Coordination of Proposed Environmental Standards", 2014;
- "On Approval of Regulatory Legal Acts in the Field of Environmental Control" No. 286 dated October 08, 2015;
- "On the Further Improvement of the Environmental Impact Assessment Mechanism No. 541 dated September 07, 2020;
- "On Measures to Further Improve the Regulation of imports into the RUz and exports from the RUz of Ozone-depleting Substances and Products Containing Them" No. 17 dated January 09, 2018;
- "On Measures to Organize the Preparation, Publication and Maintenance of the Red Book of the RUz" No. 1034 dated December 19, 2018;
- "On Approval of Regulatory Acts Aimed at Implementing the Provisions of the Law of the RUz on Protected Natural Territories" No. 339 dated May 04, 2018;
- "On Improving the Monitoring System of the Natural Environment in the RUz" No. 737 dated September 05, 2019;
- "On Measures to Further Improve the Economic Mechanisms for The Protection of Nature" No.820 dated October 11, 2018;
- "On the Further Improvement of the Economic mechanisms of Environmental Protection in the Territory of the RUz" No. 202 dated April 12, 2021;
- "On Approval of the Strategy for the Conservation of Biological Diversity in the RUz for the period, 2019–2028" No. 484 dated June 11, 2019;
- "On Measures to Implement the National Sustainable Development Goals and Targets for the Period Until 2030" No. 841 dated October 20, 2018;
- "On Measures for Further Improvement of the Order of Order of Use of Trees and Shrubs Not Included in the State Forest Fund, as well as Issuing Permits in the Field of Their Use", No.43, dated January 17, 2019; and

- "On Additional Measures for Preserving Valuable Varieties of Trees and Shrubs Not Included in the State Forest Fund" No.93, dated February 18, 2020.

The State standards, and sanitary rules and norms are *[3]*:

- SanPiN No: 0350-17 "Protection of atmospheric air in populated places of the RUz";
- SanPiN No. 0267-09 "On acceptable noise levels in the premises of residential, public buildings and in residential areas";
- SanPiN No. 0293-11 "List of hygiene standards regarding Maximum allowed concentration (MACs) values of air-polluting substances in populated areas in the RUz";
- SanPiN No: 0318-15 "Hygienic anti-epidemic Requirements for the Protection of Water in reservoirs on the Territory of the RUz";
- SanPiN No. 0255-08 "The main criteria for hygienic assessment of the degree of pollution of water and water bodies in terms of danger to public health in Uzbekistan";
- SanPiN No. 0300-11 "Sanitary rules and standards for the organization of collection, inventory, classification, neutralization, storage and disposal of industrial waste in Uzbekistan";
- SanPiN No. 0325-06 "Sanitary norms and rules to ensure acceptable noise levels in the workplace";
- SanPiN No. 0326-16 "Sanitary Standards for general and local vibration at workplace",
- SanPiN No. 0372-20 (new edition) "Temporary sanitary rules and norms for organizing the activities of state bodies and other organizations, as well as business entities during the application of restrictive measures during the COVID-19 pandemic";
- O'zDSt 1057:2004 "Vehicles. Safety requirements for technical conditions" and O'zDSt 1058:2004 "Vehicles. Technical inspection. Method of control";
- O'zDSt 950:2011 "Drinking water. Hygiene requirements and quality control" (replaces O'zDSt 950:2000);
- O'zDSt 951:2011 "Sources of centralized drinking water supply. Hygiene, technical requirements and selection rules" (replaces O'zDSt 951:2000);
- O'zRH 84.3.6, "Instructions on setting limit values for the discharge of pollutants into water bodies and the ground according to technically achievable indicators of wastewater treatment", 2004.

3.1.3 Land Rights, Acquisition and Resettlement Laws

Land expropriation for public needs in Uzbekistan is carried out under the Land Code. The main objectives of the land legislation are to regulate the relations for the purpose of;

- Providing for the benefit of the present and future generations of evidence-based,
- Rational use and protection of lands,
- Reproduction and increase in fertility of soils,
- Preserving and improvements of the environment,
- Creation of conditions for equal development of all forms of managing,
- Protection of the rights of legal entities and physical persons to the parcels of land, and
- Strengthening of legality in this sphere, including by the prevention of corruption offenses.

The national laws and regulations with which the project will be compliance regarding the land rights, acquisition, and resettlement are *[3]*:

- Constitution of the RUz dated December 08, 1992 (as amended on February 08, 2021);
- Land Code of the RUz, No. 598-I dated April 30, 1998 (as amended on December 23, 2020);
- Civil Code of the RUz, No. 163-I dated December 21, 1995 (as amended on January 22, 2020);
- Law of the RUz "On State Land Cadastre", No. 666-I dated August 28, 1998 (as amended on July 24, 2018);
- Presidential Decree of the RUz "On Additional Measures to Simplify Procedures for the Implementation of Public Property Objects and Rights to Land Plots" No. 5552 dated October 11, 2018.
- Presidential Decree of the RUz "On Measures for Effective Use of Land and Water Resources in Agricultural Industry" No. 5742 dated June 17, 2019;
- Presidential Decree of the RUz "On Measures to Ensure Equality and Transparency in Land Relations, Reliable Protection of Land Rights and Transfer them into a Market Asset" No. 6243 dated June 08, 2021;
- Presidential Decree of the RUz "About Additional Measures to Strengthen the Protection of Private Property and Guarantees of Owners 'Rights, to Redual Improvement of the System of Organization of Works to Support Entrepreneurial Initiatives and the Support of Initiatives" No. 5780 dated August 13, 2019;
- Decree of the RUz Cabinet Minister "On Additional Measures to Improve the Procedure for Providing Compensations for the Removal and Provision of Land Plots and Providing a Guarantee of Property Rights of Individuals and Legal Entities" No. 911 dated November 16, 2019; and
- Decree of the RUz Cabinet Minister "On Measures for Further Improvement of Procedures for Providing Vacant Land Plots for Business and Urban Construction" No. 1023 dated December 20, 2019.

3.1.4 Employment and Labor Laws

Article 37 of the Constitution of Uzbekistan mentions that *"each has the right to work, to free choice of work, fair terms of work and protection against unemployment under the law"*. Uzbekistan pursues a purposive policy of creating a legal framework for the protection of human rights and freedoms in accordance with international standards.

As a fully-fledged member of the United Nations Organization, Uzbekistan accedes to international human rights acts thus assuming an obligation to comply with them and apply them in its state and legal practice. The Constitution of the RUz includes all the provisions of the Universal Declaration of Human Rights. RUz has already ratified 17 conventions and 1 protocol of International Labor Organization (ILO) (including 8 fundamental conventions) of which 18 are in force.

The bedrock principle of state policy in the field of occupational safety and health is the priority of the life and health of the worker over the results of production activities as well as coordination of occupational safety and health activities with other areas of economic and social policy, all the principles proclaimed under the Law.

The Labor Code of the RUzof 21.12.1995 (as amended on August 02, 2021) treats labor legislation with due account of the interests of the employees, employers and the state and fair and safe labor conditions and the protection of the labor rights and health of the workers.

The national laws and regulations with which the project will be in compliance regarding labor and working conditions, and occupational health and safety issues are *[3]*:

- Labor Code of the RUz, 1995;
- Law "On Compulsory Insurance of Third-Party Liability of Employers", No. 210 dated April 16, 2009;
- Law "On Occupational Health and Safety" No. 410 dated September 22, 2016;
- Law "On Compulsory Industrial Accident and Occupational Disease Insurance", No. 174 dated September 10, 2008;
- Law "On Public Pension Provisions" No. 938-XII dated September 03, 1993;
- Decree "On Improving the Procedure for Determining the Size of Wages, Pensions and Other Payments" No.5723 dated May 21, 2019;
- Decree "On Additional Measures to Create Favorable Conditions for Certain Categories of Pensioners Engaged in Labour Activities", No.5291 dated December 28, 2017;
- Resolution "On Measures to Further Strengthen Guarantees for Labour Rights and Support of Women's Entrepreneurship", No.4235 dated March 07, 2019;
- Decree of the Ministry of Employment and Labor and the Ministry of Health of the RUz "On Approval of the List of Hazardous Occupations for Women Not Recommended to be Used to Employ Women", No.48 dated July 22, 2019;
- Resolution "On Measures to Create Favorable Conditions for Labor Activity in the RUz for Qualified Foreign Specialists", No.4008 dated November 07, 2018;
- Resolution "On Additional Measures to Improve the System of External Labor Migration in the RUz", No.3839 dated July 05, 2018; and
- Resolution "On Measures to Improve Cooperation with International and Foreign Financial Institutions", No.3439 dated December 20, 2017.

3.1.5 National Environmental Impact Assessment Process

There are specific requirements as to the content, development procedure and examination of Environment Impact Assessment (EIA) documents. These are governed by the following legislative acts of the RUz *[3]*:

- Law "On Nature Protection" No. 754-XII dated December 9, 1992 (as amended on November 15 2019).
- Law "On Ecological Expertise" No. 73-II dated May 25, 2000 (as amended on November 22, 2018).
- Regulation "On the further improvement of the environmental impact assessment mechanism", approved by the Decree of the Cabinet of Ministers of the RUz No. 541 dated September 07, 2020. The regulation defines the legal requirements for EIA in Uzbekistan (referred to as OVOS).
- Regulation "On approval of the regulations on the order of design and approval of draft environmental standards", approved by the Decree of the Cabinet of Ministers of the RUz No 14 dated January 21, 2014.

According to the Regulation on SEE approval of the EIA/OVOS process, should be carried out by specialized expert divisions (also referred to as the competent authority) to review the compliance of the planned activities with environmental requirements, and determine the permissibility of the project under examination. The SEE is carried out by one of the following specialized expert divisions of the SCEEP based upon the category of risk:

- The national state unitary enterprise, the Centre of the State Environmental Expertise of the SCEEP, classifies the projects as I and II as per their risk (high and medium risk)"; and
- The state unitary enterprise, the Centre of the State Environmental Examination of the Surkhandarya Region, classifies the projects as III and IV as per their environmental impact (low and local impact).

According to the Decree of the CM No.541 dated September 07, 2020, all types of activities are classified into one of four categories ranging from Category I (High Risk) to Category IV (Local Impact):

- Category I is "high risks" of environmental impact (SEE is conducted by the "Centre of State Environmental Expertise" within 20 days, all stages of the EIA are required);
- Category II is "medium risks" of environmental impact (SEE is conducted by "Centre of State Environmental Expertise" within 15 days, all stages of the EIA are required);
- Category III is "low risk of impact" (SEE is conducted by the regional offices of the "Centre of State Environmental Examination" within 10 days, all stages of the EIA are required); and
- Category IV is "minor risk of environmental impact, local impact" SEE is conducted by regional offices of the "Centre of State Environmental Examination" within 5 days, only the first phase of the EIA process needs to be completed (Draft Statement on Environmental Impact).

The SEE Regulation describes the procedure for arranging the SEE and the procedure undertaken by the Centre of the State Environmental Expertise. The three EIA stages and their required deliverables are summarized in below Table 6 as per the regulation *[3]*.

Table 6: Stages of EIA process

Stage of EIA/OVOS Process	Required Deliverables
Stage I : "A Preliminary Statement of the Environmental Impact ("PSEI") **('PZVOS' is the national acronym)**	**To be conducted at the planning stage of the proposed project prior to development funds being allocated.** ***Public hearing is needed only for this stage.*** ***PZVOS valid until the end of construction.*** ***PZVOS will not be valid for the commissioning time***
Stage II : The "Statement of the Environmental Impact" ("SEI") **('ZVOS' is the national acronym)**	**To be completed where it was identified by the Center for State Environmental Expertise/Regional Center for State Environmental Expertise at Stage I that additional investigations or analyses were necessary. The Statement shall be submitted to the Center for State Environmental Expertise/Regional Center for State Environmental Expertise prior to the beginning of construction.**

Stage of EIA/OVOS Process	Required Deliverables
	***Usually this stage is skipped*.**
Stage III : The "Statement on Environmental Consequences" ("SEC") **('ZEP' is the national acronym)**	**The final stage of the SEE process and is to be performed before the project is commissioned. The report details the modifications to the project design that have been made from the Center for State Environmental Expertise/Regional Center for State Environmental Expertise review at the first two stages of the EIA process, the comments received during the public consultation, the environmental standards applicable to the project and environmental monitoring requirements associated with the project and principal conclusions.**

Article 29 of the Law on Environmental Protection states ensuring stakeholder participation is crucial for improving the efficiency of environmental monitoring in the implementation of state and other environmental programs. Uzbekistan, public hearings as part of the EIA is regulated by Appendix 3 of Decree of the Cabinet of Ministers No 541 dated 07.09.2020. According to the Decree all objects divided in four categories and public hearings are mandatory for categories I and II (*almost similar to World Bank A and B categories*). There are no requirements for public hearing or EIA disclosure for Category III and IV projects.

These responsibilities include:

- Public notification (20 days before the public hearings, the customer announces the time and place in the mass media and the Organizer's website in Uzbek and other languages);
- Conducting the consultation (District (city) government (khokimiyat) are the organizers of public hearings and the minimum number of stakeholder participants is 10. For public hearings, a non-technical summary is prepared for disclosure the Project);
- Recording the significant findings, conclusions, recommendations and next steps.

The aim of public hearing is to encourage views of participant (groups or individuals) who may be affected by the Project regarding their environmental concerns. Prior to the scoping meeting, with the intention to inform the public about the investment and gather their opinions and suggestions on the project. In the meeting, the public is informed and consulted and their opinions and suggestions are taken. Any significant issues, established during the public consultation, should be incorporated into the EIA document.

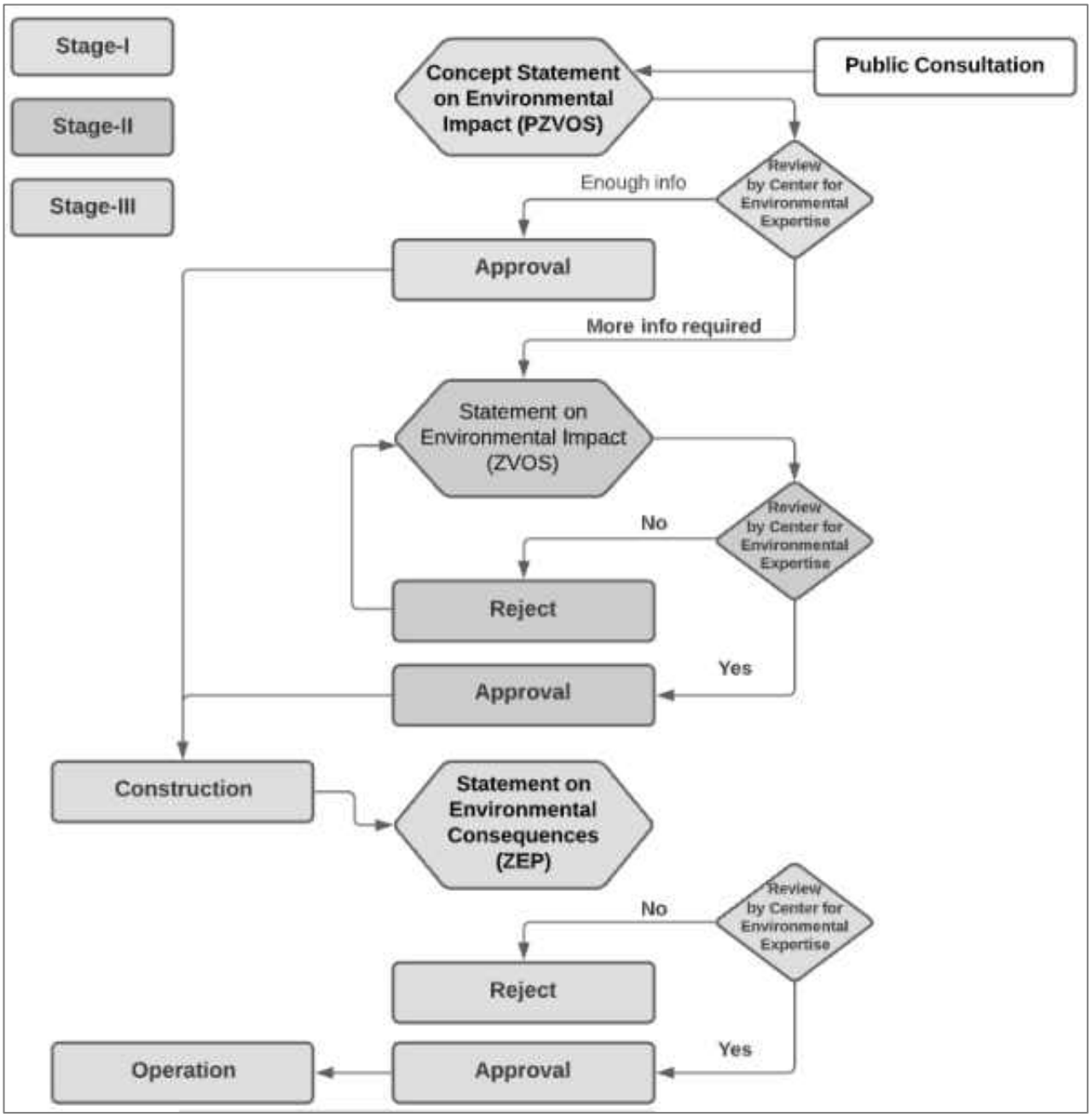


Figure 11: Local EIA Process Flowchart

The conclusion of the SEE is valid for three years from the date of issue. If the project is not implemented within three years from the date of issue of the Conclusion, the EIA report needs to be revised and re-submitted to the Center for environmental expertise for revision and approval. In case of expansion, reconstruction, technical re-equipment or changes in the technological process of existing facilities, affecting the quantitative and qualitative characteristics of emissions, discharges and waste, changes in legislative requirements, as well as by decision of the relevant authorities exercising state control in the field of environmental protection, environmental standards are subject to revised as part of an EIA with a subsequent three-year period. After three years of facility commissioning, it is obligatory to design the ecology normative.

The ecology normative is designed in three directions air (PDV is the national acronym), water (PDS is the national acronym) and wastes (PDO is the national acronym). Ecology normative valid for 5 years. Designing of ecology normative is not in scope of EIA, because decision has made and facility is commissioning.

Ecology normative - the legal limits of permissible negative impact on the environment, environmental standards must be observed by absolutely all economic entities that are included in the list of four categories according to the Decree of the Cabinet of Ministers of the RUz No. 541 dated 07.09.2020 *[3]*.

Three types of normative are designed for the followings:

- Maximum Permissible Emission: the mass of pollutants in emissions per unit of time, forming surface concentrations that do not exceed the maximum permissible quotas established for atmospheric air.
- Maximum Allowable Discharge: the mass of a substance in wastewater, the maximum allowable for disposal in the established mode at a given point per unit of time in order to ensure water quality standards at the control point.

Maximum Permissible Wastes: the maximum amount of waste allowed for disposal for a certain period in certain place.

3.1.5.1 The Project Environmental Impact Assessment (EIA) Process

The proposed project is categorized as a "Category I" project under the Decree of the Cabinet of Ministers of the RUz No 541 dated 07.09.2020 (high risk, paragraph 32 "Thermal power plants, and other power plants for combustion of the thermal capacity of 300 MW or more") *[3]*.

Consultation activities for the Project have been initiated in accordance with the National EIA Stages. The stages of EIA is given comprehensively in Section 3.1. Decree of the Cabinet of Ministers of the RUz No 541, objects of I and II categories of environmental impact are subject to the procedure for passing public hearings about environmental impact. Considering that the combined cycle power plant with a capacity of 1600 MW belongs to the objects of the I category of impact on the environment, the management of the enterprise under construction together with representatives of Authorities of Angor District, the Inspectorate for Ecology and Environmental Protection, "Kattakum" village community assembly on 17.08.2021 public hearings were organized and held in accordance with the established procedure. During the public hearings, residents of the Kattakum village community assembly did not have any objections to the construction of a combined cycle power plant.

The Public Hearing provided the opportunity for potential stakeholders to be informed about the project and to express their opinions and concerns. As the next phase of the public hearing, The EIA Report has been prepared and submitted to the Centre of SEE, in present, the positive decision of the Center is awaited but not received, yet.

3.2 INTERNATIONAL CONVENTIONS/PROTOCOL

The legal framework valid for the Project also comprises the international conventions/protocols and agreements signed and ratified by the RUz. The relevant international conventions/protocols and agreements with the project are listed in Table 7. In some cases, these have been integrated into national regulations. Moreover, Article 53 of Law "On Nature Protection" requires that *"in cases, when international agreement, concluded by Uzbekistan, states rules other than that contained in the*

present Law or other legislative act of Uzbekistan on nature protection, the rules of international agreement are applied, excluding cases when legislation of Uzbekistan established stricter requirements".

Table 7: Relevant ratified conventions by Uzbekistan relevant to the Project

Convention Name
Applicable ratified conventions of the Environment / Climate Change
United Nations Framework Convention on Climate Change (ratified by Uzbekistan in 1993)
Kyoto Protocol (ratified by Uzbekistan in 1993)
Paris Agreement (ratified by Uzbekistan in 2017)
United Nations Convention on Biological Diversity (ratified by Uzbekistan in 1995)
Agreement on Cooperation in the Field of Ecology and Environmental Protection (ratified by Uzbekistan in 1992)
Agreement on Cooperation in The Field of Joint Water Resources Management and Conservation of Interstate Sources (ratified by Uzbekistan in 1992)
Agreement on The Conservation of African-Eurasian Migratory Water birds (ratified by Uzbekistan in 2004)
Agreement between the Government of Kazakhstan, the Government of Kyrgyzstan and the Government of Uzbekistan on management of water resources in Central Asia (ratified by Uzbekistan in 1996)
Agreement on Joint Activities in Addressing the Aral Sea and The Zone Around the Sea Crisis, Improving the Environment, And Ensuring the Social and Economic Development of The Aral Sea Region (ratified by Uzbekistan in 1993)
United Nations Convention on Desertification to Combat Desertification (ratified by Uzbekistan in 1995)
Convention on the Prohibition of Military or Any Other Hostile Use of Environmental Modification Techniques (ratified by Uzbekistan in 1993)
Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal (ratified by Uzbekistan in 1996)
Paris Convention Concerning the Protection of the World's Cultural and Natural Heritage (ratified by Uzbekistan in 1993)
Convention for the Safeguarding of the Intangible Cultural Heritage (ratified by Uzbekistan in 2008)
Convention on International Trade in Endangered Species of Wild Fauna and Flora (ratified by Uzbekistan in 1997)
Convention on the Conservation of the Migratory Species of Wild Animals (Bonn Convention) (ratified by Uzbekistan in 1998)

Convention Name
Convention on Wetlands of International Importance Especially as Waterfowl Habitat (ratified by Uzbekistan in 2002)
Convention on Wetlands of International Importance especially the Water Fowl Habitats of Aquatic Birds (Ramsar Convention) (1975) (ratified by Uzbekistan in 2001)
Convention to Combat Desertification in Those Countries Experiencing Serious Drought And/or Desertification, Particularly in Africa (ratified by Uzbekistan in 1996)
UNECE Convention on The Protection and Use of Transboundary Watercourses and International Lakes (ratified by Uzbekistan in 2007)
Vienna Convention for the Protection of the Ozone Layer (ratified by Uzbekistan in 1993).
Montreal Protocol on Substances That Deplete the Ozone Layer (ratified by Uzbekistan in 1993)
Statute of the Interstate Commission for Water Coordination of Central Asia (ratified by Uzbekistan in 1992)
Applicable ratified conventions of the International Labor Organization
C029 - Forced Labor Convention, 1930 (No. 29))(ratified by Uzbekistan in 1992)
C087 - Freedom of Association and Protection of the Right to Organize Convention, 1948 (No. 87) (ratified by Uzbekistan in 2016)
C098 - Right to Organize and Collective Bargaining Convention, 1949 (No. 98) (ratified by Uzbekistan in 1992)
C100 - Equal Remuneration Convention, 1951 (No. 100) (ratified by Uzbekistan in 1992)
C105 - Abolition of Forced Labor Convention, 1957 (No. 105) (ratified by Uzbekistan in 1997)
C111 - Discrimination (Employment and Occupation) Convention, 1958 (No. 111) (ratified by Uzbekistan in 1992)
C138 - Minimum Age Convention, 1973 (No. 138) (ratified by Uzbekistan in 2009)
C182 - Worst Forms of Child Labor Convention, 1999 (No. 182) (ratified by Uzbekistan in 1992)
C081 - Labor Inspection Convention, 1947 (No. 81) (ratified by Uzbekistan in 2020)
C122 - Employment Policy Convention, 1964 (No. 122) (ratified by Uzbekistan in 1992)
C129 - Labor Inspection (Agriculture) Convention, 1969 (No. 129) (ratified by Uzbekistan in 2020)
C144 - Tripartite Consultation (International Labor Standards) Convention, 1976 (No. 144) ratified by Uzbekistan in 2019)
C047 - Forty-Hour Week Convention, 1935 (No. 47) (ratified by Uzbekistan in 1992)
C052 - Holidays with Pay Convention, 1936 (No. 52) (ratified by Uzbekistan in 1992)
C103 - Maternity Protection Convention (Revised), 1952 (No. 103) (ratified by Uzbekistan in 1992)

Convention Name
C135 - Workers' Representatives Convention, 1971 (No. 135) (ratified by Uzbekistan in 1992)
C154 - Collective Bargaining Convention, 1981 (No. 154) (ratified by Uzbekistan in 1997)
Others
Universal Declaration of Human Right (1948), (ratified by Uzbekistan in 1991)
Convention on the Elimination of All Forms of Discrimination against Women (1979), ratified by Uzbekistan in 1995
International Covenant on Civil and Political Rights (1966), (ratified by Uzbekistan in 1995)
Convention on the Elimination of All Forms of Intolerance and of Discrimination Based on Religion or Belief (1981), (ratified by Uzbekistan in 1997)
EU Partnership and Cooperation Agreement (ratified by Uzbekistan in 1996)

3.3 INTERNATIONAL ENVIRONMENTAL STANDARDS

The EIA Report of the proposed Project was prepared as per the applicable national laws, regulations, standards and guidelines; whereas the ESIA Report has been carried out in accordance with the following requirements as the Company aims to seek international financing for the Project:

- The Equator Principles (EP),
- International Finance Corporation (IFC) Performance Standards on Environmental and Social Sustainability,
- International protocols and conventions to which our country is a party relating to environmental protection, and
- Applicable National Laws, Regulations, Standards and Guidelines.

In this regard, the most stringent regulation or standards are accepted as project limit or project standard.

3.3.1 Equator Principles (EP)

The EP is a framework for determining, assessing and managing the social and environmental impacts that may arise from financing the projects. The Project, will be conducted under the EP_4 (November 18, 2019) as listed below:

- Principle 1: Review and Categorization;
- Principle 2: Environmental and Social Assessment;
- Principle 3: Applicable Environmental and Social Standards;
- Principle 4: Environmental and Social Management System and Equator Principles Action Plan;
- Principle 5: Stakeholder Engagement;
- Principle 6: Grievance Mechanism;

- Principle 7: Independent Review;
- Principle 8: Covenants;
- Principle 9: Independent Monitoring and Reporting; and
- Principle 10: Reporting and Transparency.

The EPs reresent a framework for project financing, which is underpinned by the revised IFC Performance Standards (PS). EP_4 establishes the minimum Environmental & Social standards to be adopted by EP Financial Institution which are from IFC Performance Standards on Environmental and Social Sustainability (Performance Standards), the World Bank Group Environmental, Health and Safety Guidelines and/or the relevant host country laws, regulations and permits that pertain to environmental and social issues.

3.3.2 IFC Standards

IFC is a member of the World Bank Group and is the largest global development institution focused exclusively on the private sector in developing countries. The IFC Performance Standards (PSs) are an international benchmark for identifying and managing environmental and social risk and has been adopted by many organizations as a key component of their environmental and social risk management.

The Project will be implemented the requirements of the IFC as set out in the following standards and guidelines:

- IFC Environmental and Social Sustainability Policy (2012);
- IFC E&S Performance Standards (PSs) 2012 and supporting Guidance Notes (GN) (as relevant);
    - PS1 – Assessment and Management of Environmental and Social Risks and Impacts;
    - PS2 – Labor and Working Conditions;
    - PS3 – Resource Efficiency and Pollution Prevention;
    - PS4 – Community Health, Safety, and Security;
    - PS5 – Land Acquisition and Involuntary Resettlement;
    - PS6 – Biodiversity Conservation and Sustainable Management of Living Natural Resources;
    - PS7 – Indigenous Peoples
    - PS8 – Cultural Heritage.

However, the PS7 and PS8 are considered not applicable for the Project. There are no known communities thought to be living in the project area of influence that meets the criteria of Indigenous Peoples as characterized in IFC's PS 7.

Site visit observations and discussions have not highlighted the presence of critical cultural heritage as characterized in IFC's PS 8. Moreover, The Ministry of Culture of the RUz has an official letter stating that there are no archaeological or cultural sites near or within the proposed Project Site. A chance finds procedure may be required for the construction phase to address potentially unidentified items of cultural significance during the construction works.

In addition to the PSs, the following guidelines and good international industry practice (GIIP) are relaxant for the Project:

- World Bank Group (WBG) Environment, Health and Safety (EHS) Guidelines; including
    - WBG General EHS Guidelines (April 30, 2007) which cover four areas of GIIP related to: Environmental Occupational Health & Safety; Community Health & Safety; Construction; and, Decommissioning,
    - WBG EHS Guidelines Thermal Power Plants (2007 / draft 2017); and
    - WBG EHS Guidelines Electric Power Transmission and Distribution (April 2007).

The EHS Guidelines are technical reference documents with general and industry-specific examples of Good International Industry Practice (GIIP) and are referred to in the World Bank's Environmental and Social Framework and in IFC's Performance Standards. The EHS Guidelines contain the performance levels and measures that are normally acceptable to the World Bank Group, and that are generally considered to be achievable in new facilities at reasonable costs by existing technology The World Bank Group requires borrowers/clients to apply the relevant levels or measures of the EHS Guidelines. When host country regulations differ from the levels and measures presented in the EHS Guidelines, projects will be required to achieve whichever is more stringent. If less stringent levels or measures than those provided in these EHS Guidelines are appropriate, in view of specific project circumstances, a full and detailed justification for any proposed alternatives is needed as part of the site-specific environmental assessment.

3.3.3 Other Relevant Standards, Guidelines and Good Practices

The Project will be implement the requirements of the EU Directives and Standards, including;

- Best available techniques (BAT) conclusions for large combustion plant (LCP) of 31 July 2017 were published in the Official Journal on 17 August 2017 (2017/1442/EU),
- Use of Security Forces: Assessing and Managing Risks and Impacts (February 2017),
- Worker's Accommodation: Processes and Standards (Guidance Note by IFC and EBRD, 2009),
- Scottish Natural Heritage Environmental Impact Assessment Handbook, 2014,
- Guidelines for Landscape and Visual Impact Assessment 3rd Edition, 2013,
- EIA Directive 2014/52/EU,
- Birds Directive 2009/147/EC
- Habitats Directive 92/43/EEC,
- Water Framework Directive 2000/60/EC,
- Dutch Intervention Values 2013 (Soil Remediation Circular Jul, 2013).
- Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on Ambient Air Quality and Cleaner Air for Europe and National Regulation;
- EU BAT Air Emission Limits (AELs), July 31, 2017,
- ASTM D 1586/ D1586M-18: Standard Test Method for Standard Penetration Test (SPT) and Split-Barrel Sampling of Soils,
- Basel Convention on The Control of Transboundary Movements of Hazardous Wastes and Their Disposal.

All phases of the E&S management of the proposed project shall be conducted in compliance with national and international regulations and standards as well as the standards of financial institutions. The legal framework is explained in the following sections.

4. APPROACH TO ESIA

4.1 ESIA TEAM

UzAssystem has engaged is preparing Local EIA and ESIA Report to this project. This includes supporting Project consortium up to Financial Close with their prospective lenders.

In order to ensure that the Project meets the requirements of the State Committee on Ecology and Environmental Protection, UzAssystem has sub-contracted, who will be responsible for some elements of the ESIA process, including baseline studies, stakeholder identification and engagement/consultation and liaison with relevant government authorities in Uzbekistan.The team of the ESIA Project is presented Table 8.

Table 8: Project ESIA Team

Name	Position	Profession
Merve ACIRLI	**Project Director**	**Environmental Engineer**
Ulas GUNGOR	**Project Manager**	**Environmental Engineer**
Ugur AKCAY	**ESIA Specialist**	**Environmental Engineer**
Ayse AKKURT	**ESIA Specialist**	**Chemist**
Eylul KIRBAC	**ESIA Specialist**	**Environmental Engineer**
Elif ALTUNTAS	**ESIA Specialist**	**Environmental Engineer**
Farrukh SATTAROV	**Local EIA Specialist**	**Environmental Expert**
Ozden AFACAN	**GIS Manager**	**GIS Engineer**
Burcu SAHIN	**GIS Specialist**	**Geological Engineer**
Damla SARACMAVIS	**GIS Specialist**	**Geological Engineer**
Mert EKER	**Geology Manager**	**Geological Engineer**
Bijan DIZECI	**Project Engineer**	**Geological/Geophysical Engineer**
Huseyin EKICI	**Project Engineer**	**Civil Engineer**
Gizem ARIKAN	**Biodiversity Specialist**	**Biologist**
Ozge CELIK	**Social Specialist**	**Sociologist**

4.2 ESIA METHODOLOGY

This section provides information about the data collection and consultation process undertaken to inform the ESIA and the methodology that has been used to describe the sensitivity of environmental

and social receptors; predict the magnitude of environmental and social impacts and assess the significance of impacts upon applicable environmental parameters.

The purpose of an ESIA is to identify the positive and negative impacts caused by project implementation. This is assessed through an analysis of the effects resulting from interaction between environmental and social components and the various activities of a project and its development, including temporary (for example, during construction) and associated facilities.

The international ESIA flowchart is presented in Figure 12.

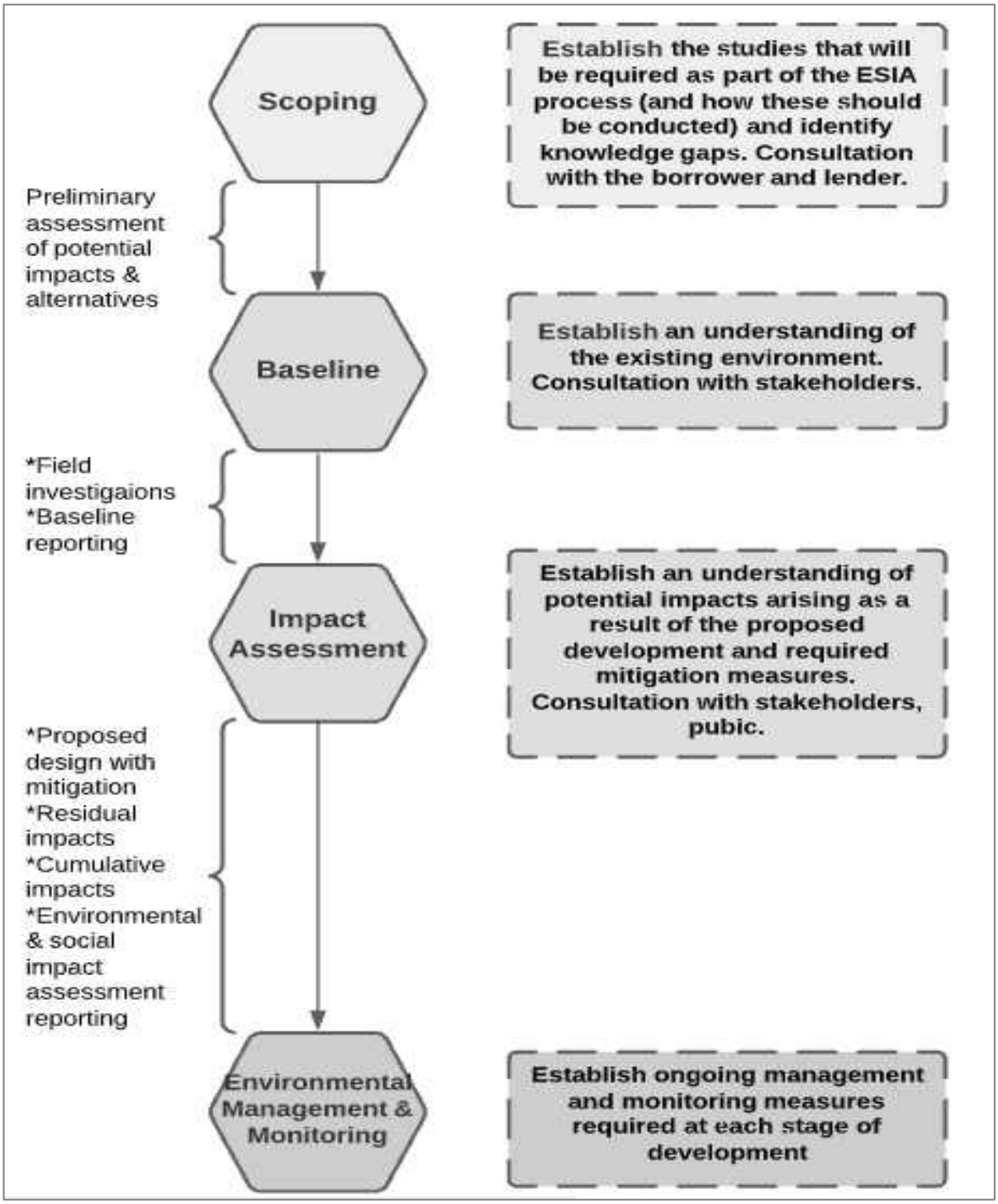


Figure 12: International ESIA Process Flowchart

4.3 SIGNIFICANCE DETERMINATION METHODOLOGY

Environmental and Social impacts can be characterized as interactions between some of the project's features and some of the surrounding environment's features. The assessment of significant effects or impacts is an essential concept, which limits the consideration of the effects or impacts a project may have on the environment to those, which are significant or important enough to merit the costs of assessment, review, and decision-making.

The assessment of significance relies on experts' judgements about what is important, desirable or acceptable with regards to changes triggered by the project in question.

At present, there is no international consensus among practitioners on a single or common approach for assessing the significance of impacts. This makes sense considering that the concept of significance differs across the varying political, social, and cultural contexts that Projects face.

Nevertheless, the determination of impacts' significance can vary considerably, depending on the approach and methods selected for the assessment. The choice of appropriate procedures and methods for each judgement varies depending on the Project's characteristics. Several methods, be they quantitative or qualitative, can be used to identify, predict, and to evaluate the significance of an impact.

A common approach used is the application of a multi-criteria analysis. The severity of the impacts and the probability of occurrence have been used as criteria to evaluate the significance of the predicted effect from the Project as presented in Table 9.

Table 9: Significance Determination Matrix

Severity	**Probability**			
	Unlikely	**Likely**	**Very Likely**	**Certain**
Severe	Moderate	High (H)	High	High (H)
Critical	Moderate	Moderate (M)	High	High (H)
Marginal	Minor	Moderate (M)	Moderate	High (H)
Negligible	Minor	Minor	Minor	Moderate
Positive	Positive (P)			

The definitions of the terms in Table 9 are as follows:

Significance:

- Minor: impacts affect specific localized environment over a short time period, which can be controlled via good management mitigation measures.
- Moderate: impacts affect a portion of environment, which are subject to all applicable mitigation measures. Thus, the impacts can be reduced to an acceptable level. These impacts should be monitored during project activities.
- High: impacts affect an entire environment in sufficient magnitude to cause a change. Compensation measures should be applied.

Severity:

- Positive: beneficial impact, which enhances the environment.
- Negligible: any impacts below the minor category.
- Marginal: minor or moderate impacts, which cause damage sufficiently large to impact the environment. No permanent impact on the environment.
- Critical: minor, moderate or high impacts, which cause repeated exceedance of limits, affecting neighborhood, requires spontaneous recovery of limited damage within one year.
- Severe: impacts, which cause severe environmental damage and extended breaches of limits.

Probability:

- Unlikely: the impact has no potential to occur but very rare.
- Likely: the impact has potential to occur but rare.
- Very likely: the impact has potential to occur sometime.
- Certain: the impact has potential to occur several times.

4.4 SCOPE AND OBJECTIVES OF ESIA

The project investor plans to apply to international finance institutions (IFIs) for the financing of the Project. Therefore, the Project owner requested this ESIA to meet the IFIs' requirements in accordance with IFC.

The purpose of this ESIA is, like local EIA, to identify potential environmental and social impacts to be originated from the project activities during construction, operation and decommissioning phases, and to propose concrete measures to avoid, reduce or mitigate such potential impacts and risks to the extent possible.

The most significant disparity between the local EIA and international ESIA processes is baseline environmental surveys. However, there are similar approaches for illuminating the public about the project and presenting EIA to the public. In accordance with World Bank processes, at ESIA procedure period at the beginning phase of the work, acknowledgment of the public process is conducted. During this process, it may be easily presented that the public become sensitive and has valued issues and expectations about decreasing the environmental impacts to the lowest level.

ESIA processes are being conducted in compliance with European Union EIA instructions (97/11/EC numbered instruction and varied 85/337/EEC numbered instruction). On the other hand, the projects financed jointly with the World Bank's common finance supply are accepted by other finance institutions. To determine the environmental and social expectations from the projects, the standard assessment and examination procedure has been applied that is called "IFC-PS's" which is accepted by most of the finance corporations.

The national EIA procedure usually does not bring out the need for conduction of a socio-economic survey, usually existing literature data is satisfactory to make a social impact assessment of a project for both projects. Therefore, further studies were carried out for understanding the existing socio-economic conditions and the perception of the affected communities about the project with the intention to get the real impacts of the project on the communities in compliance with the IFIs' requirements. The social study was initiated with the determination of the objectives of the study and the desktop studies to gather secondary data. During the following data collection process, determination of the study area covering the potentially affected settlements, design, and selection of

the sampling, training of the personnel to be assigned for the site survey and the data collection were the steps. This phase of the social study is followed by the analysis of the data collected, evaluation of identified impacts and mitigation, and reporting. The primary data was collected through literature data.

During the following data collection process, determination of the study area covering the potentially affected settlements, design, and selection of the sampling, training of the personnel to be assigned for the site survey and the data collection were the steps. This phase of the social study is followed by the analysis of the data collected, evaluation of identified impacts and mitigation, and reporting. The primary data was collected by using questionnaires, interviews with the authorities, and stakeholders.

Another difference between the national EIA Report coverage and internationally accepted ESIA Report coverage is the need for the development of appropriate environmental and social monitoring program. For this purpose, the Environmental and Social Management System (ESMS) was developed.

Other additional studies conducted within the context of the international ESIA Report coverage are as follows:

- Detailed social and environmental impact assessment was conducted.
- Applicable national and international social and environmental standards are presented.
- Environmental Management System is explained for application during the implementation of the project.
- A grievance procedure is developed to forward any complaints, which the public may be faced, to a competent person/authority, promptly and transparently.

Furthermore, the agreements including all the commitments mentioned in the Report should be prepared and signed mutually with construction and operation contractors (if any). During the period of construction and operation, all activities and results thereof should be inspected and reported by an independent environmental consultant or by an environment monitoring firm. All progress and events should be reported to the institutions that provide financial support during all phases of the project, regularly.

4.5 ENVIRONMENTAL AND SOCIAL CATEGORIZATION AND ITS RATIONALE

The project investor plans to apply to international finance institutions ("IFIs") for the financing of the Project. Therefore, the project owner requested this ESIA to meet the IFIs' requirements in accordance with International Finance Corporation (IFC).

Although IFC standards are used in the report, equator principles are also taken into consideration to determine project categorization and used in some relevant parts of the project report.

Pursuant to Equator Principle 1, the project(s) is categorized as per the magnitude of potential impacts. As part of their review of a project's expected social and environmental impacts, EPFIs uses a system of social and environmental categorization, based on the IFC's environmental and social screening criteria, to reflect the magnitude of impacts understood because of assessment.

In that regard, the Project is a Category A project in accordance with Equator and IFC's Environmental and Social Sustainability Policy.

Key environmental and social items considered applicable to this appraisal include:

- The company's capacity;
    - Identify, assess and manage Environmental and Health&Safety risks and impacts associated with its construction and operation of the Project,
    - Identify and manage Occupational Health and Safety ("OHS") risks and impacts associated with;
    - The primary supply chain of operations;
    - Labor and working conditions;
    - Management of wastewater, air emissions, wastes and hazardous materials; and
    - Land acquisition.

Actions have been defined in the ESAP to address these issues and ensure compliance with IFC's Performance Standards ("PSs") and the applicable World Bank Group ("WBG") EHS Guidelines.

4.5.1 Baseline Studies and Research

Forming an integral part of the ESIA, the baseline surveys provide a benchmark of the existing conditions by which the potential impacts of the proposed project can be assessed for the construction and operational phase. This ESIA has been informed by a review of relevant desktop information as well as a series of physical site surveys which have been summarized in the relevant environmental and social impact assessment Sections of this report. The environmental baseline surveys carried out as part of the ESIA included is given in Table 10.

Table 10: Environmental and Social Baseline Surveys

Site Surveys	Period
Terrestrial Ecology Surveys	**17th July 2021**
Irrigation Reservoir(lake)	**15th July 2021**
Soil Survey	**15th July 2021**
Groundwater and surface water sampling	**9-16th July 2021**
Sediment and lake sampling	**13th July 2021**
Zooplankton and phytoplankton sampling	**13th July 2021**
Noise Monitoring Survey	**10th to 14th July 2021**
Air Quality Monitoring Survey	**10th to 16th July 2021**
Socio Economic Data Collection	**28th July 2021**
Stakeholder Consultations	**This has been completed with different stakeholders** **on July 2021 through official letters, calls and public consultation meetings conducted.**
Livelihood Restoration Surveys	**15th October 2021**

4.6 PROJECT STAKEHOLDER ANALYSIS AND CONSULTATIONS

Consultation with stakeholders is an essential part of the environmental & social assessment process. The main objective of the consultation is to establish a dialogue with those stakeholders who may be affected by aspects of the Project or who may have an interest in the outcome of the ESIA process.

4.6.1 Uzbekistan Requirements

The EIA procedure is regulated by Law on Environmental Expertise and the Regulation on State Environmental Expertise (SEE), approved by Decree No.491 of the Cabinet of Ministers on 31 December 2001 and amended in 2005 and 2009. There are two non-mandatory mechanisms for public participation in the EIA assessment procedure which include the public environmental review (PER) and public hearings. The law allows for independent expert groups to organise PER but the findings are non-mandatory. However, there are no provisions for public hearings. The EIA assessment procedure Manual provides some procedural guidance by recommending organisation of public hearings in the course of the draft EIA preparation. Review of past development Projects in Uzbekistan shows that public consultations in Uzbekistan do not generally involve public consultations and is limited to local, regional and national authorities as applicable. Such recommendations (which do recommend public hearings during EIA) are described in the Resolution of the Cabinet of Ministries of the Republic of Uzbekistan No. 949.

4.6.2 Lender Requirements

All of the IFC Performance Standards include requirements for an amount of stakeholder consultation/engagement (either in the EIA, or as part of the future ESMS) and therefore the project will require a level of engagement. In particular, IFC Performance Standard 1 on "Social and Environmental Assessment and Management Systems" describes the stakeholder engagement requirements in more depth. It states the following:

"Stakeholder engagement is the basis for building strong, constructive, and responsive relationships that are essential for the successful management of a project's environmental and social impacts. Stakeholder engagement is an on-going process that may involve, in varying degrees, the following elements:

- Stakeholder analysis and planning;
- Disclosure and dissemination of information;
- Consultation and participation;
- Grievance mechanism; and
- On-going reporting to Affected Communities. The nature, frequency, and level of effort of stakeholder engagement may vary considerably and will be commensurate with the project's risks and adverse impacts, and the project's phase of development."

5. AIR EMISSIONS AND AMBIENT AIR QUALITY

5.1 STANDARDS AND REGULATORY REQUIREMENTS

5.1.1 National Standards

The relevant legislation related with air emissions and ambient air quality in Uzbekistan are given below:

- Law "*On Ambient Air Protection*", No. 353-I dated December 27,1996 (as amended on April 21,2021);
- Resolution of Cabinet Ministers "On approval of the Regulations on the Order of design and approval of draft environmental standards", No 14 dated January 21, 2014.

Law "*On Ambient Air Protection*" covers the right of citizens to clean air and their obligations to take care of the atmosphere, state management in the field of air protection (responsibilities of SCEEP and the Ministry of Health), standards on air quality, maximum permissible emissions of pollutants from stationary sources, industrial air consumption, standards for emissions from mobile sources (vehicles and other equipment), quality of fuels, production and use of chemicals, protection of the ozone layer, spatial planning for enterprise construction and of waste disposal facilities, responsibilities of enterprises (in terms of monitoring and techniques to reduce emissions) and levies for emissions to the air and damage caused. According to the Law, new activities in industrial areas or areas with dense traffic require a SEE/EIA and a health assessment.

The Ministry of Health of RUz develops air quality standards (sanitary norms) to protect human health and oversees the compliance with hygienic norms and standards associated with air quality. The standards related to air emissions and air quality are given below:

- SanPiN No. 0293-11 "List of hygiene standards regarding Maximum Permissible Concentration (MPCs) values of air-polluting substances in populated areas in the RUz",
- SanPiN No. 0350-17 "Protection of Atmospheric Air in Populated Places of the RUz".

The national air quality standards are defined as maximum allowable concentrations (MPC) These MPC values are set for 485 pollutants (SanPiN No. 0293-11). The values are set for short-term maxima (20 minutes), for daily means, for monthly means and for annual means.

As well as the regulatory document in the analysis of the concentrations of pollutants created by emissions in the surface layer of the atmosphere, is the Resolution of Cabinet Ministers No 14 dated January 21, 2014, which defines the quotas for pollutant emissions according to their class and the territory of the project. The regulation defines territorial location quotas in maximum allowable concentration (MPC) shares depending on the hazard class of the emitted substance (see Table 11). The quotas of pollutants determined for various ecological and economic regions are the main criteria for determining the maximum allowable emissions (MPE) (see Table 12). In the Project case, it turns out that the Project is being implemented in the Surkhandarya region, with strict quotas for the emission of pollutants.

Table 11: Quotas for pollutants emitted into the atmospheric air by organizations of various ecological and economic regions of the RUz

Territorial location	Quotas in MPC fractions depending on the hazard class of the released substance [4]			
	1 (extremely hazardous substances)	2 (highly hazardous substances)	3 (moderately hazardous substances)	4 (slightly hazardous substances)
Regions:				
Bukhara, Jizzakh, Kashkadarya, Navoi, Samarkand, Surkhandarya, Syrdarya	**0,20**	**0,25**	**0,33**	**0,50**

The applicable National Ambient Air Quality Standards (MPCs, with hazard categories and calculated MPEs) related to the project are provided in Table 12.

Table 12: National Ambient Air Quality Standards (MPCs with Hazard Class, Quotas and MPEs)

Pollutant Name	Averaging Period	Maximum Permissible Concentration (MPC)[1](mg/m³)	Hazard Class[2]	Quotas in MPC	Maximum Permissible Emissions (MPE) (mg/m³)
Carbon monoxide(CO)	One Time Maximum (20-30 min.)	5.0	4	0.5	2.5
	Daily	4.0			2.00
	Monthly	3.5			1.75
	Annually	3.0			1.5
Nitrogen oxide(NO)	One Time Maximum (20-30 min.)	0.6	3	0.33	0.198
	Daily	0.25			0.0825
	Monthly	0.12			0.0396
	Annually	0.12			0.0396
Nitrogen dioxide(NO_2)	One Time Maximum (20-30 min.)	0.085	2	0.25	0.0213
	Daily	0.06			0.0150
	Monthly	0.05			0.0125
	Annually	0.05			0.0125
Sulfur dioxide (SO_2)	One Time Maximum (20-30 min.)	0.5	3	0.33	0.165
	Daily	0.2			0.066
	Monthly	0.1			0.033
	Annually	0.1			0.033

[1] SanPiN RUz No. 0293-11 "The list of maximum permissible concentration (MPC) of pollutants in the ambient air of populated areas on the territory of the Republic of Uzbekistan"., Table 1.

[2] Resolution of Cabinet Ministers "On approval of the Regulations on the Order of design and approval of draft environmental standards", No 14 dated 21.01.2014, Appendix 3.

Pollutant Name	Averaging Period	Maximum Permissible Concentration (MPC)[1](mg/m³)	Hazard Class[2]	Quotas in MPC	Maximum Permissible Emissions (MPE) (mg/m³)
Dust	One Time Maximum (20-30 min.)	0.15-0.5	3	0.33	0.0495-0.165
	Daily	0.1-0.35			0.033-0.1155
	Monthly	0.08-0.020			0.0264-0.0066
	Annually	0.05-0.015			0.0165-0.00495

Article 6.2 of the SanPin No.0350-17 requires the establishment of a sanitary protection zone (buffer zone) around any new thermal power plants. This is defined as an exclusion zone around an emission point (e.g. stack) for the protection of sensitive receptors. For the proposed Project, this zone will have a radius of 500 m (see Figure 13).

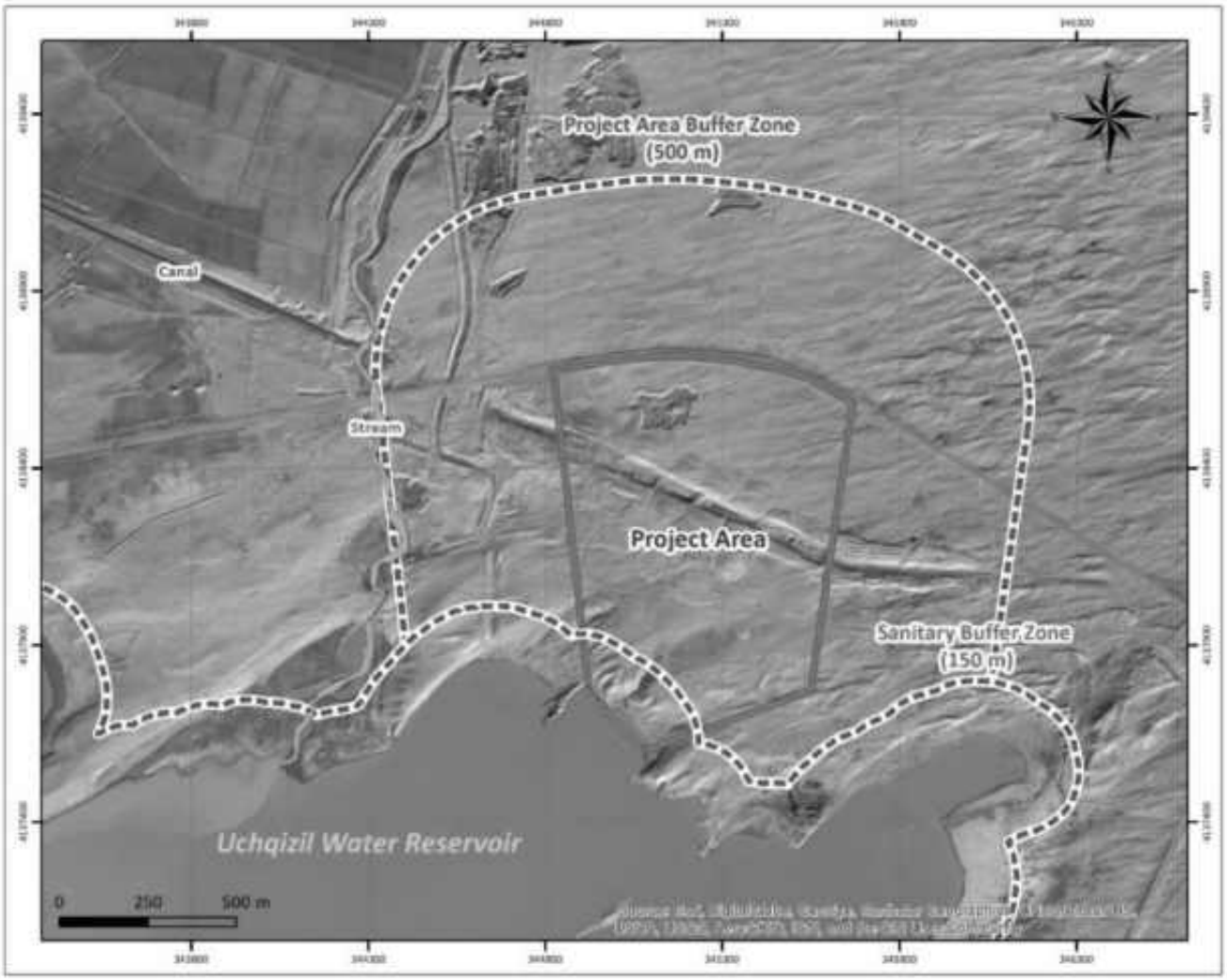


Figure 13: Project Area Buffer Zones

5.1.2 Lender Requirements

The IFI's applicable ambient air quality and air emissions standards are given below:

- IFC General EHS Guidelines: Environmental Air Emissions and Ambient Air Quality, April 30, 2007;
- IFC EHS Guidelines for Thermal Power Plants May 31, 2017;
- Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on Ambient Air Quality and Cleaner Air for Europe and National Regulation;
- EU BAT Air Emission Limits (AELs), July 31, 2017.

The international guideline standards with national standards applicable for ambient air quality to the Project are summarized in Table 13.

Table 13: Ambient Air Quality Standards

Pollutant Name	Averaging Period	National Ambient Air Quality Standards MPC (mg/m³)	IFC/WB EHS Guideline Fundamental principles (mg/m³ (2007))	EU Environmental Standard (mg/m³)
Carbon monoxide(CO)	One Time Maximum (20-30 min.)	5.0	-	-
	Daily	4.0	-	-
	Monthly	3.5	-	-
	Annually	3.0	-	-
Nitrogen oxide(NO)	One Time Maximum (20-30 min.)	0.6	-	-
	Daily	0.25	-	-
	Monthly	0.12	-	-
	Annually	0.12	-	-
Nitrogen dioxide(NO_2)	One Time Maximum (20-30 min.)	0.085		
	1 hour	-	0.2	0.2
	Daily	0.06		
	Monthly	0.05		
	Annually	0.05	0.04	0.04
Sulfur dioxide (SO_2)	10 minute	-	0.5 (limit value)	-
	One Time Maximum (20-30 min.)	0.5		
	1 hour	-	-	0.35
	Daily	0.2	0.125(Interim target-1) 0.05 (Interim target-2) 0.02 (limit value)	0.125
	Monthly	0.1	-	-
	Annually	0.1	-	0.02

Pollutant Name	Averaging Period	National Ambient Air Quality Standards MPC (mg/m³)	IFC/WB EHS Guideline Fundamental principles (mg/m³ (2007))	EU Environmental Standard (mg/m³)
Dust	**One Time Maximum (20-30 min.)**	**0.15-0.5**		
	Daily	**0.1-0.35**	**0.15 (Interim target-1)** **0.1 (Interim target-2)** **0.75 (Interim target-3)** **0.05 (limit value)**	**0.05**
	Monthly	**0.08-0.020**	**-**	**-**
	Annually	**0.05-0.015**	**0.07 (Interim target-1)** **0.05 (Interim target-2)** **0.03 (Interim target-3)** **0.02 (limit value)**	**0.04**

The pollutants given in Table 14 are related to the construction phase of the Project. IFC EHS Guidelines, Environmental Air Emissions, and Ambient Air Quality approach are "*Emissions do not result in pollutant concentrations that reach or exceed relevant ambient quality guidelines and standards by applying national legislated standards, or in their absence, the current WHO Air Quality Guidelines (Table 1.1.1.) or other internationally recognized sources*". Since Uzbekistan has its own national standard, air quality monitoring during the construction phase will be carried out according to them.

These Guidelines advise that, with respect to emission limits, "*When host country regulations differ from the levels presented in the Guidelines, projects are expected to achieve whichever is more stringent*". The MPC concentration standard for NO_2 (0.085 mg/m³) in Uzbekistan is the most stringent one based on Russian standards among the applicable standards (IFC / WB EHS and environmental standards of the EU). Additionally, regional quota is 25% (0.0213 mg/m³) for the Surkhandarya region.

However, Russia and other Commonwealth of Independent States countries have reconsidered this standard and harmonized this standard with the European Union and World Health Organization standards (i.e., 0.2 mg/m³ or 200 µg.m³). Similar work in Uzbekistan is still ongoing.

Moreover, Uzbekistan legislation does not set stack emission limits. Therefore, IFC will intend to limit the emissions as per the "IFC EHS Guideline: Thermal Power Plants". BAT AEL values are similar to the requirements set out by IFC EHS Guidelines for a Thermal Power Plant in a degraded air-shed. The guideline standards applicable for the Project during the operation phase are summarized in Table 14.

Table 14: Nitrogen Oxides (NOx) and Carbon Monoxide (CO) Air Emission Limits for Combustion Turbine

	BAT-AEL (Table 10.24) (g/Nm³)			IFC Thermal Power Guidelines (Table 6B) (g/Nm³)[3]		
Pollutant	**Combustion Plant/Natural Gas**	**Yearly average (g/Nm³)**	**Daily average over the sampling Period (g/Nm³)**	**Combustion Plant/Natural Gas**	**Non-degraded air-shed[4] [5](g/Nm³)**	**Degraded air shed (g/Nm³)**
NOx	**New CCGT (>50 MWth) firing on natural gas**	**0.01–0.03[5]**	**0.015–0.04**	**0.051 (25 ppm)**	**0.051 (25 ppm)**	**0.051 (25 ppm)**
CO	**New CCGT of ≥ 50 MWth**	**< 0.005–0.03[6]**	**-**	**-**	**-**	**-**

[3] *The Environmental Assessment (EA) may need to justify more stringent or less stringent guideline values due to environmental, community health, technical and economic considerations, whilst not exceeding nationally legislated limits. In all cases, the EA will be demonstrate that ambient impacts from emissions comply with air quality limit guidelines as set out in Section 1.1 of the General EHS Guidelines.*

[4] *Under definitions provided by IFC EHS guidelines for thermal power plant, an air-shed will be considered as degraded if relevant ambient air quality standards (as defined in the General EHS Guidelines) are exceeded; DA/NDA to be determined for each pollutant.*

[5] *The BAT Conclusions and the LCP BREF provide a range of values from reference plants in the EU, which have implemented certain BATs. They do not provide a single (hard) limit – it is up to the competent authority to determine which value will need to apply to a given plant and anything will go as long as it is properly justified. Both limits must be fulfilled.*

[6] *For plants with a net electrical efficiency (EE) greater than 55 %, a correction factor may be applied to the higher end of the range, corresponding to [higher end] × EE/55, where EE is the net electrical energy efficiency of the plant determined at ISO baseload conditions.*

5.2 OBSERVATION AND BASELINE CONDITIONS

Field measurements of meteorological parameters were carried out and atmospheric air Measurement were measured at 3 (three) observation points (A-01, A-02, A-03). Table 15 shows the coordinates and location of sampling points for atmospheric air while Figure 14 shows the locations where measurements Measurement were conducted.

Baseline air quality measurement stations are selected at the nearest settlements, which are nearest possible receptors to define baseline characteristics of each possible receptor.

Table 15: Atmospheric Air Measurement Station Coordinates

Monitoring Stations	Station Location	Coordinates (deg/min/sec)
A-01	**Garden, next to the village, 300 m from the cell tower.**	**N = 37°20'58,29"** **E = 67°11'36,42"**
A-02	**SSG Kattakum**	**N = 37°22'53,43"** **E = 67°13'38,52"**
A-03	**Former sanatorium, 15-20 m from the lake.**	**N = 37°20'42,20"** **E = 67°13'22,06"**

Figure 14: Map showing the Location of Atmospheric Air Measurement Stations

Measurements were conducted by an accredited laboratory which is Yuksak Musaffo Tabiat" Llc Company in accordance with the established state standards as specified by the corresponding regulatory, methodological and instructive documents.

The factors analyzed to determine the state of atmospheric air included measurements of meteorological parameters: which are air temperature, wind speed, wind direction and atmospheric pressure at observation points. Atmospheric air measurements and meteorological measurements were carried out simultaneously.

Meteorological observations were carried out using meteorological equipment in accordance with GOST 17.2.3.01-86 "Nature protection. Atmosphere. Air quality control rules for settlements" and GOST 31296.2-2006 "Noise. Description, measurement and assessment of noise on the ground. Part 2. Determination of sound pressure levels". To measure the ambient temperature and wind speed, a modern digital instrument, Testo 425, which measures the data of meteorological parameters automatically, (see Figure 15) was used. Air pressure was measured using an aneroid barometer (see Figure 16) and wind direction was determined by using a compass.

Figure 15: Digital Instrument Testo 425

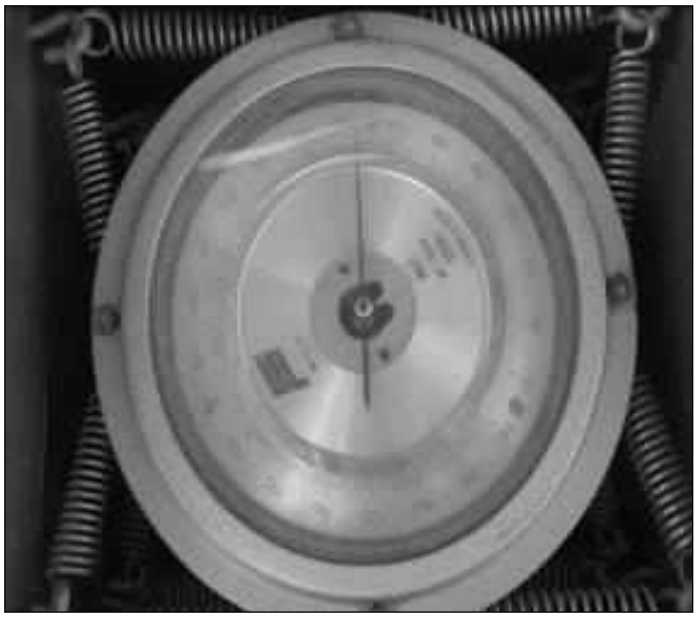


Figure 16: Measurements of Atmospheric Pressure Using Aneroid Barometer

Air quality measurements were carried out in accordance with GOST 17.2.3.01-86 "Nature protection. Atmosphere Air quality control rules for settlements". Measurement of atmospheric air for determining nitrogen dioxide, carbon monoxide, sulfur dioxide content were conducted by using an ECOLAB gas analyzer (modification A) and suspended particles (dust) measurement in the atmospheric air were carried out on a DustTrak DRX dust analyzer (see Figure 17).

Figure 17: DustTrak DRX dust analyzer

Table 16 provides a list baseline air quality measurement parameters and the methods of their analysis.

The level of atmospheric air pollution was assessed in accordance with SanPiN No: 0293-11 which was developed and approved by the Ministry of Health of the RUz

Table 16: List of measurement parameters in atmospheric air and methods of their determination

Defined Ingredient	Measurement Method
Meteorological parameters: air temperature, pressure, wind direction and speed	**GOST 17.2.3.01-86 "Nature protection. Atmosphere. Air quality control rules for settlements"**
Carbon oxide	**Working procedure for testing with the use of automatic gas analyzers EKOLAB for monitoring atmospheric air. MIP 03897485.001: 2019.**
Sulphur dioxide	**Working procedure for testing with the use of automatic gas analyzers EKOLAB for monitoring atmospheric air. MIP 03897485.001: 2019.**
Nitrogen dioxide, nitrogen oxide	**Working procedure for testing with the use of automatic gas analyzers EKOLAB for monitoring atmospheric air. MIP 03897485.001: 2019.**
Dust	**Test procedure for mass concentration of aerosol particles of various origins, as well as total dust content using a portable aerosol analyzer "Dust Trak DRX 8534".**

5.2.1 Local Meteorological Conditions

Surkhandarya is the region of the southernmost administrative-territorial unit of Uzbekistan. The climate in the area of the proposed construction of the thermal power plant is sharply continental: dry with long frost-free periods (250-270 days). The high average annual air temperature and its sharp daily fluctuations, hot dry summers, insignificant amount of atmospheric precipitation and high evaporation determine the desert like character of the region's climatic conditions. Average monthly air temperatures range from 0.5-7.7 (December-January) to 25.5-28.2 (July-August). The air temperature varies considerably over the year, from 16°C in winter to 40-42°C in the summer months. Sub-zero winter temperatures were mostly observed in the period before 1977, after which they have not been recorded to date.

Since 1994, there has been a general tendency towards an increase in average annual air temperatures from 13.0 to 14.5°C. In general, the distribution of average annual temperatures corresponds to the identified periods in terms of the water content of the year. The amount of annual precipitation varies from 185.8 mm to 781 mm, with the norm of the total average annual precipitation being 441.94 mm. The greatest amount of precipitation in the year occurs in the winter-autumn months, from December to May. However, in some years this period becomes somewhat extended and may span the months of October to June. For a significant part of the year, air humidity does not exceed 40%, with a monthly average of 44-58%.

5.2.2 Local Influences on Air Quality

Dust and engine emissions created by construction activities (i.e. earthworks, demolition and operation of machinery) can influence the local ambient air quality.

The release of vehicle exhaust emissions into the atmosphere due to the highway around the project area may have an impact on the local ambient air quality.

5.2.3 Existing Ambient Air Quality Data

Baseline data on atmospheric air pollution in the territory of the Project was obtained from the results of air quality measurement from the 3 (three) observation station for 7 days period in July 2021.

Simultaneously: meteorological measurements were also carries out to determine air temperature, atmospheric pressure, wind speed direction. The measurements are presented in Table 17.

Table 17: Meteorological measurement results

No	Number of monitoring point	Date	Meteorological parameters			
			Temperature, (°C)	Pressure,(mmHg)	Wind speed, (m/s)(min-max)	Wind direction
Monitoring point A-01						
1.	**Morning**	**10.07.2021**	**36.7**	**726**	**1.90 – 4.46**	**SE**
2.	**Day**		**40.8**	**726**	**1.01 – 3.00**	**SE**
3.	**Evening**		**35.7**	**725**	**2.30 – 3.40**	**NE**
4.	**Morning**	**11.07.2021**	**27.0**	**727**	**1.60 – 2.10**	**NE**
5.	**Day**		**39.2**	**727**	**3.60 – 5.20**	**SE**
6.	**Evening**		**42.0**	**725**	**3.70 – 4.90**	**SE**
7.	**Morning**	**12.07.2021**	**31.0**	**726**	**1.50 – 3.80**	**E**
8.	**Day**		**37.3**	**726**	**4.20 – 5.70**	**E**
9.	**Evening**		**39.0**	**723**	**1.35 – 5.80**	**SE**
10.	**Morning**	**13.07.2021**	**28.2**	**725**	**1.70 – 2.80**	**NE**
11.	**Day**		**38.4**	**725**	**4.50 – 5.71**	**SE**
12.	**Evening**		**38.6**	**723**	**1.00 – 1.15**	**NE**
13.	**Morning**	**14.04.2021**	**27.6**	**725**	**1.90 – 2.70**	**NE**
14.	**Day**		**40.0**	**724**	**2.10 – 6.90**	**NE**

No	Number of monitoring point	Date	Meteorological parameters			
			Temperature, (°C)	Pressure,(mmHg)	Wind speed, (m/s)(min-max)	Wind direction
15.	Evening		38.1	723	1.20 – 4.16	E
16.	Morning	15.04.2021	29.0	725	0.60 – 2.10	NE
17.	Day		39.1	725	0.16 – 2.67	NE
18.	Evening		35.8	724	1.30 – 3.50	SE
19.	Morning	16.04.2021	27.0	728	2.60 – 5.50	E
20.	Day		36.1	725	2.33 – 9.11	E
21.	Evening		35.8	724	1.30 – 6.81	SE
Monitoring point A-02						
1.	Morning	10.07.2021	36.0	728	0.52 – 2.81	SE
2.	Day		41.7	726	2.01 – 3.81	SE
3.	Evening		37.2	723	0.70 – 1.70	NE
4.	Morning	11.07.2021	29.5	727	1.50 – 2.20	NE
5.	Day		43.0	727	1.50 – 2.50	NE
6.	Evening		38.4	724	1.80 – 3.20	SE
7.	Morning	12.07.2021	32.0	726	0.25 – 2.15	E
8.	Day		38.0	725	1.30 – 4.30	No dominant wind direction
9.	Evening		38.0	722	1.60 – 2.60	E
10.	Morning	13.07.2021	29.1	724	1.60 – 2.90	N
11.	Day		39.0	724	1.80 – 4.20	E
12.	Evening		37.1	722	0.01 – 0.51	-
13.	Morning	14.04.2021	29.0	725	1.90 – 2.60	SE
14.	Day		42.0	724	0.14 – 1.13	E
15.	Evening		36.9	722	0.23 – 4.25	E

No	Number of monitoring point	Date	Meteorological parameters			
			Temperature, (°C)	Pressure,(mmHg)	Wind speed, (m/s)(min-max)	Wind direction
16.	Morning	15.04.2021	31.0	725	070 – 2.08	NE
17.	Day		41.0	725	0.12 – 2.17	NE
18.	Evening		36.8	724	0.12 – 2.53	SE
19.	Morning	16.04.2021	28.0	727	2.40 – 3.60	NE
20.	Day		35.5	725	0.88 – 2.55	SE
21.	Evening		35.0	724	0.12 – 7.00	SE
Monitoring point A-03						
1.	Morning	10.07.2021	33.0	726	2.71 – 4.26	SE
2.	Day		41.0	726	0.70 – 4.10	SE
3.	Evening		37.4	725	0.90 – 1.20	NE
4.	Morning	11.07.2021	21.4	722	1.90 – 3.35	SE
5.	Day		38.8	722	1.30 – 2.90	NE
6.	Evening		36.8	724	1.20 – 1.60	SE
7.	Morning	12.07.2021	29.0	726	0.10 – 0.60	NE
8.	Day		39.0	726	1.06 – 5.12	NE
9.	Evening		40.0	723	1.35 – 2.40	SE
10.	Morning	13.07.2021	27.0	724	1.80 – 4.20	E
11.	Day		35.2	725	0.10 – 2.88	E
12.	Evening		40.0	723	1.90 – 3.20	SE
13.	Morning	14.04.2021	26.0	724	0.70 – 0.90	SE
14.	Day		41.1	724	0.24 – 1.75	NE
15.	Evening		40.6	722	0.51 – 2.81	E
16.	Morning	15.04.2021	30.8	725	0.03 – 0.90	-
17.	Day		39.0	725	0.83 – 2.01	NE
18.	Evening		36.0	724	1.90 – 4.0	SE

No	Number of monitoring point	Date	Meteorological parameters			
			Temperature, (°C)	Pressure,(mmHg)	Wind speed, (m/s)(min-max)	Wind direction
19.	**Morning**	**16.04.2021**	**26.0**	**727**	**2.90 – 4.50**	**NE**
20.	**Day**		**36.0**	**725**	**2.70 – 8.10**	**E**
21.	**Evening**		**36.1**	**724**	**1.90 – 6.00**	**SE**
-	**Calm air**	**Windy weather with a speed of 1 knot or less**				

The results of observations of the main meteorological parameters during the field work showed that the winds of the southeastern and northeastern directions prevailed on the territory of the surveyed area at this time. The wind speed in the study area varies from 0.01 m/s (calm) to 6.90 m/s. In field studies, the minimum value of atmospheric pressure was 722 mm Hg, and the maximum atmospheric pressure is 728 mmHg the distribution of air temperature values at observation points ranged from 21.4oC to 43.0°C.

The meteorological measurement results are in line with the long term data obtained in the Surkhandarya region for the summer period.

Together with this sulfur dioxide, nitrogen dioxide, nitrogen oxide, carbon monoxide and dust measurements were carried out.

The assessment of baseline atmospheric air pollution was carried out by comparing the measurement results with the corresponding maximum permissible concentrations of the estimated parameters (sulfur dioxide, nitrogen dioxide, nitrogen oxide, carbon monoxide, air dust content (dust)) in accordance with SanPiN No: 0293-11 (see Table 18).

Table 18: Air Quality Measurement Results

No			Pollutants				
			Carbon monoxide (mg/m^3)	Nitrogen dioxide,(mg/m^3)	Nitrogen oxide,(mg/m^3)	Sulphur dioxide,(mg/m^3)	Dust,(mg/m^3)
MPC limit value (one-time) (mg/m^3)			**5.0 (mg/m^3)**	**0.085 (mg/m^3)**	**0.6 (mg/m^3)**	**0.5 (mg/m^3)**	**0.5 (mg/m^3)**
Sampling point A-01							
1.	**10.07.2021**	**Morning**	**0.53**	**0.00**	**0.00**	**0.00**	**0.310**
2.		**Day**	**0.00**	**0.00**	**0.00**	**0.00**	**0.067**
3.		**Evening**	**0.00**	**0.00**	**0.00**	**0.185**	**0.069**
4.	**11.07.2021**	**Morning**	**0.00**	**0.00**	**0.00**	**0.00**	**0.201**

No			Pollutants				
			Carbon monoxide (mg/m^3)	Nitrogen dioxide,(mg/m^3)	Nitrogen oxide,(mg/m^3)	Sulphur dioxide,(mg/m^3)	Dust,(mg/m^3)
MPC limit value (one-time) (mg/m^3)			5.0 (mg/m^3)	0.085 (mg/m^3)	0.6 (mg/m^3)	0.5 (mg/m^3)	0.5 (mg/m^3)
5.		Day	0.00	0.00	0.00	0.00	0.076
6.		Evening	0.00	0.00	0.00	0.479	0.017
7.	12.07.2021	Morning	0.00	0.00	0.00	0.00	0.151
8.		Day	0.00	0.00	0.00	0.079	0.079
9.		Evening	0.00	0.00	0.00	0.406	0.085
10.	13.07.2021	Morning	0.00	0.00	0.00	0.00	0.110
11.		Day	0.00	0.00	0.00	0.00	0.049
12.		Evening	0.00	0.00	0.00	0.389	0.079
13.	14.07.2021	Morning	0.00	0.00	0.00	0.003	0.067
14.		Day	0.00	0.00	0.00	0.00	0.00
15.		Evening	0.00	0.00	0.00	0.384	0.022
16.	15.07.2021	Morning	0.00	0.00	0.00	0.317	0.048
17.		Day	0.00	0.00	0.00	0.040	0.056
18.		Evening	0.00	0.00	0.00	0.867	0.026
19.	16.07.2021	Morning	0.00	0.00	0.00	0.327	0.085
20.		Day	0.00	0.00	0.00	0.00	0.234
21.		Evening	0.00	0.00	0.00	0.00	0.037
Sampling point A-02							
1.	10.07.2021	Morning	1.36	0.00	0.00	0.00	0.519
2.		Day	0.00	0.00	0.00	0.401	0.306
3.		Evening	0.00	0.00	0.00	0.318	0.240
4.	11.07.2021	Morning	0.00	0.00	0.00	0.00	0.276
5.		Day	0.00	0.00	0.00	0.00	0.072

No			Pollutants				
			Carbon monoxide (mg/m^3)	Nitrogen dioxide,(mg/m^3)	Nitrogen oxide,(mg/m^3)	Sulphur dioxide,(mg/m^3)	Dust,(mg/m^3)
MPC limit value (one-time) (mg/m^3)			5.0 (mg/m^3)	0.085 (mg/m^3)	0.6 (mg/m^3)	0.5 (mg/m^3)	0.5 (mg/m^3)
6.		Evening	0.00	0.00	0.00	0.113	0.110
7.	12.07.2021	Morning	0.00	0.00	0.00	0.00	0.123
8.		Day	0.00	0.00	0.00	0.00	0.039
9.		Evening	0.00	0.00	0.00	0.257	0.122
10.	13.07.2021	Morning	0.00	0.388	0.204	0.00	0.108
11.		Day	0.00	0.00	0.00	0.180	0.069
12.		Evening	0.00	0.00	0.00	0.129	0.714
13.	14.07.2021	Morning	0.00	0.00	0.00	0.00	0.068
14.		Day	0.00	0.00	0.00	0.00	0.045
15.		Evening	0.00	0.00	0.00	0.077	0.139
16.	15.07.2021	Morning	0.00	0.00	0.00	0.00	0.044
17.		Day	0.00	0.00	0.00	0.207	0.031
18.		Evening	0.00	0.00	0.00	0.898	0.019
19.	16.07.2021	Morning	0.00	0.00	0.00	0.00	0.201
20.		Day	0.00	0.00	0.00	0.00	0.391
21.		Evening	0.00	0.00	0.00	0.00	0.121
Sampling point A-03							
1.	10.07.2021	Morning	0.00	0.00	0.00	0.00	0.530
2.		Day	0.00	0.00	0.00	0.00	0.610
3.		Evening	0.00	0.00	0.00	0.27	0.082
4.	11.07.2021	Morning	0.00	0.00	0.00	0.00	0.103
5.		Day	0.00	0.00	0.00	0.00	0.050
6.		Evening	0.00	0.00	0.00	0.216	0.055

No			Pollutants				
			Carbon monoxide (mg/m^3)	Nitrogen dioxide,(mg/m^3)	Nitrogen oxide,(mg/m^3)	Sulphur dioxide,(mg/m^3)	Dust,(mg/m^3)
MPC limit value (one-time) (mg/m^3)			5.0 (mg/m^3)	0.085 (mg/m^3)	0.6 (mg/m^3)	0.5 (mg/m^3)	0.5 (mg/m^3)
7.	12.07.2021	Morning	0.00	0.00	0.00	0.00	0.142
8.		Day	0.00	0.00	0.00	0.00	0.081
9.		Evening	0.00	0.00	0.00	0.00	0.054
10.	13.07.2021	Morning	0.00	0.00	0.00	0.00	0.083
11.		Day	0.00	0.00	0.00	0.092	0.066
12.		Evening	0.00	0.00	0.00	1.290	0.036
13.	14.07.2021	Morning	0.00	0.00	0.00	0.512	0.098
14.		Day	0.00	0.00	0.00	0.234	0.020
15.		Evening	0.00	0.00	0.00	0.710	0.015
16.	15.07.2021	Morning	0.00	0.00	0.00	0.337	0.076
17.		Day	0.00	0.00	0.00	0.308	0.015
18.		Evening	0.00	0.00	0.00	0.443	0.019
19.	16.07.2021	Morning	0.00	0.00	0.00	0.885	0.151
20.		Day	0.00	0.00	0.00	0.00	0.508
21.		Evening	0.00	0.00	0.00	0.00	0.015

Over the limits of MPC Standards

The results of the field studies of the state of atmospheric air carried out in July 2021 on the territory of the Project shows that:

- The carbon monoxide concentration in the atmospheric air was below the level of the established standard maximum permissible concentration at all observation points
- The nitrogen oxide and nitrogen dioxide measurement results are generally below the MPC except for a one-time excess of MPC by 4.6 times at Monitoring Point 2 on July 13 in the morning.
- Sulfur dioxide measurement result shows that there is an excess of MPC was recorded at all observation points. Monitoring Point 1 and Moitoring Point 2 SO2 measured as 0.867 mg/m^3 (1.7 times of MPC) and 0.898 mg/m^3 (1.8 times of MPC), respectively. At the

Monitoring Point 3 on July 13-14 (night) and 16 July (morning) excess of MPC was recorded from 0.710 mg/m^3 (1.4 times of MPC) - 1,290 mg/m^3 (2.6 MAC) at the time.

- Dust concentrations are observed (see Table 18), generally significantly lower than the established MPC standards, with the exceptions of outlier one-time excesses of 1.4 times on the evening of July 13th at Monitoring Point 2 and 1.2 times in the afternoon of July 10th at Monitoring Point 3.

5.3 SENSITIVE RECEPTORS

Within the scope of the air quality assessment studies, receptors are classified as;

- High Sensitivity (Residential Areas): Permanent residents in residential areas, would be particularly vulnerable to changes in ambient air quality,
- Medium Sensitivity (Commercial Premises): Receptors at commercial areas (including local agricultural lands) will be relatively vulnerable to changes in ambient air quality, and
- Low sensitivity (Industrial Facilities): The Project is a local pollution source hence of low vulnerability to changes in ambient air quality.

5.4 POTENTIAL IMPACTS, MITIGATION, MANAGEMENT & RESIDUAL IMPACT

5.4.1 Construction Phase

During construction phase, local ambient air quality may potentially be affected by increased dust, particularly during the site preparation stage (site clearance and earthworks etc.) and by the exhaust gas of construction vehicles, equipment and temporary power generators. The typical air emissions resulting from these activities include nitrogen oxides (NO_X), sulphur dioxides (SO_2), carbon monoxide (CO), carbon dioxide (CO_2), volatile organic compounds (VOC), particulates and benzene, toluene, ethylbenzene and xylene (BTEX).

- Sources of air emissions during construction phase are;
- Excavations and earthworks (dust),
- Vehicle movements on unpaved, or compacted roads and surfaces (dust);
- Particulate matter dispersion from uncovered truckloads;
- Vehicle and construction equipment emissions (e.g. NO_X, SO_X and CO, CO_2, VOCs, particulates and BTEX) and particulates from vehicles, generators and other mechanical equipment;
- Stored VOCs and other volatile hazardous materials (VOCs) and;
- Odour from temporary wastewater facilities, or containment

5.4.1.1 Dust

The main sources of dust and particulate matter emissions during construction phase will be:

- Excavations and earthworks, such as cutting, filling and levelling;
- Vehicle movements on unpaved, or compacted surfaces; and
- Particulate matter dispersion from uncovered truckloads.

Dust Emissions from Site Preparation

Excavations and earthworks cause dust which typically comprises large diameter particles, settle rapidly and close to the source.

According to the screening guidance of the UK's Institute of Air Quality Management (IAQM) for construction dust, detailed assessment relating to dust generation is required where there is a 'human receptor' within 350m of the boundary of the site [6]. In the case of this Project and with respect to the screening criteria above, although there is no any settlement within the sanitary buffer zone (500m around the project area), there is a waste processing facility 250 m away from Project's north border. In addition to this, the closest residential receptors to the project site is about 990 m away from the west border of project site (see Figure 18). There are no expected impacts relating to dust emissions on the settlements. However, the existing facility (waste processing facility) can be affected. In addition to this, the magnitude of dust impacts from construction works will depend on the wind speed and wind direction at the project site. As shown in Figure 19, dominant wind direction is from the southeast for the year 2018, 2019 and 2020 and as a result, the potential of emissions impact to the facility can be considered as negligible.

Figure 18: The Closest Settlement (Kattakum Village) to the Project Area

In addition to vehicle movements on unpaved surfaces, dust generation from truck movements and particulate dispersion from truckloads would only occur where mitigation measures are not effectively implemented at the site, or by contractors bringing materials to the site.

Uncontained and/or un-sheeted trucks may be subject to losses of material where the containment is not effective (e.g. spills), or where wind or other air turbulence may disturb the contents and result in dispersion of materials. Such impacts have the potential to degrade local air quality in the immediate area of such movements.

In accordance with the UK's IAQM Guidance on the Assessment of Dust from Demolition and Construction, detailed assessment of vehicle movements should only be required where 'human' receptors are located within 50m of the route used by construction vehicles on public roads, up to 500m from the project site entrance [6]

In the instance of this Project, there are residential and commercial receptors within 50m of the route to be used by construction vehicles and as a result there is potential for impacts the receptors within 50m of the routes to be used by construction vehicles include residential and commercial receptors and there is potential for impacts relating to dust generation or particulate emissions as a result of increase vehicle movement on these routes.

5.4.1.2 Gaseous Emissions

The operation of Project related vehicles and fuel consuming construction equipment will be the only sources of gaseous emissions during construction phase. List of construction machinery, which will be used during land preparation and construction phases of the project, are given in Table 19. The quantity of gaseous emissions from this equipment will depend on the number of vehicles/equipment deployed on site, hours of operation and efficiency. The exhaust emissions due to construction machinery are negligible. In addition to this, details of the overall GHG emissions during construction phase are provided in Section 14.

Table 19: List of Vehicles and Construction Equipment During Construction Phase

Vehicles & Equipment Name	Quantity	Fuel
750t Crawling Crane	**1**	**Diesel**
150t Crawling Crane	**1**	**Diesel**
Hydraulic Lifting Device and Lifting Frame	**1**	**Electrical**
250t Crawling Crane	**1**	**Diesel**
50t Crawling Crane	**1**	**Diesel**
50t Truck Crane	**1**	**Diesel**
Gantry Crane	**2**	**Electrical**
Truck	**3**	**Diesel**
Forklift	**2**	**Diesel**
Electric Welding Machine	**301**	**Electrical**
Diesel Generator	**1**	**Diesel**

Vehicles & Equipment Name	Quantity	Fuel
Tower Crane	**2**	**Electrical**
Vehicle Crane	**2**	**Diesel**
Wheel Loader	**1**	**Diesel**
Backhoe Excavator	**7**	**Diesel**
Crawler Bulldozer	**1**	**Diesel**
Road Roller	**2**	**Diesel**
Dump Truck	**10**	**Diesel**
Platform Lorry	**1**	**Diesel**
Batch Plant	**2**	**Electrical**
Concrete Pump Truck	**3**	**Electrical**
Concrete Delivery Truck	**6**	**Electrical**
Piling Machine	**4**	**Diesel**

5.4.1.3 Emission of Volatile Organic Compounds (VOCs)

Small quantity of fuels, paints, solvents and other volatile substances are likely to be required during the construction phase, which will be stored in secure areas within the construction area. If not adequately contained, such substances have the potential to result in the dispersion of volatile emissions to the immediate air shed. Given that the storage of such volatile substances will be in small quantities, any potential impacts will be temporary and limited to the immediate surrounding area, likely to be within the Project site or in close proximity to the construction boundaries.

5.4.1.4 Odours

On site sanitation and toilet facilities (including septic tanks) will be provided for construction staff. There is the potential for release of odour to the immediate surrounding areas from inappropriate containment and coverage associated with wastewater holding/septic tanks. Any such impacts are likely to be temporary and limited to the Project site or in close proximity to the construction site boundaries.

5.4.1.5 Assessment of Impacts and Mitigation Measures

By using impact assessment significance criteria approach, key potential impacts and countermeasures on air quality for the construction phase are presented in Table 20. In addition to mitigation measures, following studies are recommended;

- Provide the information such as construction site utilization plan, excavation schedule, amount of material to be excavated and used for backfilling, machinery list and types, amount of fuel to be used, etc.
- Develop a Traffic Management Plan to establish speed limits.
- Conduct air quality monitoring in line with the plan.
- Prepare an Authority Approval Manual and obtain permits for batching plant(s).
- Conduct periodic site audits and report including findings.

Table 20: Impacts Significance of the Air Quality during – Construction Phase

Potential Impacts	Receptor	Severity	Probability	Significance of Impact (without Impact Mitigation Measures)	Mitigation and Management Measures	Significance of Residual Impact
Dust emissions within 500m of the Project boundary – Generated as a result of site preparatory works and movement of vehicles on unpaved surfaces	Residential Areas	Critical	Likely	Moderate (M)	Any land grading, excavations and moving of uncovered waste/materials will not be carried out during strong wind movements Where sand and other dusty materials are transported to the site, trucks will not be overloaded and will be appropriately covered/sheeted to avoid loses.	Moderate (M)
	Commercial Premises	Critical	Certain	High (H)	Vehicle speed on all site roads and along the access road into the site will be restricted to 20 km/h. Speed limits will be established in the Traffic Management Plan will be adhered to. Wetting down of any unpaved site roads in order to reduce dust generation. Full PPE kit will be provided to the workers including dust masks. No burning of wastes will be allowed onsite.	Moderate (M)
	Industrial Facilities	Critical	Certain	High (H)	Dusty material stockpiles (i.e. any fine powders and sand) dust generating activities will be to be located away from the site boundaries and be contained to avoid dust dispersion during storage or use. Cement and other fine powders will be sealed after use or put in bunded containers. Concrete batching plant(s) will be located away from sensitive receptors.	Moderate (M)
Gaseous emissions – From vehicle exhaust	Residential Areas & Commercial Premises	Marginal	Very Likely	Moderate (M)	Unnecessary usage of vehicles, plant and equipment will be minimized - No unnecessary idling. Exhaust fumes and particulates emitted from trucks and vehicles will be minimized by ensuring the use of good condition vehicles (e.g. compliant to vehicle emission requirements). Lorries and truck engines will be turned off while waiting on site to minimize gaseous emissions. Internal roads inside the project site will be compacted as it reduces vehicular power consumption.Construction roads in the site will be designated and made clear to the drivers with signage for directions and speed limits placed all along the roads.	Minor (L)
Emissions of VOCs and other hazardous volatiles	Residential Areas & Commercial Premises	Marginal	Very Likely	Moderate (M)	Hazardous materials stored in sealed containers and used on site with potential gas emissions will be located in well-ventilated, but secure low-risk areas, away from major transport routes and away from the site boundary (where possible). Fires and material burning will not be allowed on the Project site. Chemical storage areas will be purpose built and well maintained. A data log of all chemicals with MSDSs will be provided at the storage facility within easy access.	Minor (L)

Potential Impacts	Receptor	Severity	Probability	Significance of Impact (without Impact Mitigation Measures)	Mitigation and Management Measures	Significance of Residual Impact
Odour from Onsite	Residential Areas	Marginal	Likely	Moderate (M)	Adequate and sufficient sanitary facilities for site workers will be provided. Effective cleaning and maintenance of toilets to be undertaken to avoid odour dispersion and cleaning records/inspection sheets displayed in the toilets. All septic tanks will be sealed and fully functioning. Septic tanks will be operated and maintained according to manufacturer recommendations. Sanitary waste will be removed from site by licensed contractors and disposed in waste treatment facilities approved by the local government.	Minor (L)

5.4.2 Operational Phase

Activities associated with the operational phase of the Project will result in the emissions of gaseous pollutants from the operation of the CCGT power blocks. These emissions will occur under combined cycle operating modes using natural gas fuel only. Impacts from the CCGT are likely to be associated with emissions from the two main stacks associated with the HRSG.

The key pollutants arising from natural gas combustion and emitted via the stacks will be oxides of nitrogen (NO and NO_2) and carbon monoxide (CO). The use of natural gas is generally accepted as being preferred over fuel oils or other solid fuels and there will be no (or negligible) emissions content of SO_2 and no particulates [9].

5.4.2.1 Air Emissions Modelling

By means of modeling studies, how the pollutants to be discharged from the stack of the planned plant into the atmosphere under the current meteorological conditions and the possible ground level concentration values of the pollutants are investigated.

AERMOD software is used within the scope of Air Quality Dispersion Modeling. This model is a typical Gaussian dispersion model and is used to calculate the distribution of various pollutants such as gas or dust in three dimensions. It is possible to model the pollutant distribution of area, point, linear or volumetric sources within the scope of the model. The model, which was developed to replace ISC in 2000, has been proposed by USEPA (US Environmental Protection Agency) since 9 November 2005.

AERMOD is used for the modeling of atmospheric dispersion for air pollutants originating from a fixed plant in areas up to 50 kilometers, in simple or complex terrain.

A detailed air quality dispersion modelling assessment has been undertaken to determine impacts associated with the proposed Project. Dispersion modelling has been carried out using the United States (US) Environmental Protection Agency (EPA) Breeze AERMOD (version 10.0.0.15 and US EPA version 21112) dispersion model, three years of meteorological data from Termez (2018, 2019 and 2020) and terrain data for the local area.

The key pollutants considered in this assessment are: oxides of nitrogen (NO2 and NO) and carbon monoxide (CO) are the key pollutants emitted from combustion of natural gas that may potentially lead to exceedances of any relevant standards. Predicted concentrations are compared with the most stringent applicable standards and guidelines incorporated into Uzbekistan law and also the European Union (EU) standards, the International Finance Corporation (IFC) guidelines and the World Health Organisation (WHO) Guidelines.

In the scope of modelling studies, worst case approach was implemented. In this case, it is assumed that, the power plant will be operated at full load throughout the year. Technical details of the modelling inputs and amount of pollutants are given below (see Table 21).

Table 21: Modelling Study Inputs

Fuel Type		-	Natural gas	Natural gas
Unit		**-**	**Unit-1**	**Unit-2**
Number of Stack		**Piece**	**1**	**1**
Inner Diameter of Stack		**m**	**8.24**	**8.24**
Stack Height		**m**	**65**	**65**
Flue Gas Volumetric Flow		**m³/h**	**5,363,604**	**5,363,604**
Flue Gas Outlet Temperature		**°C**	**120**	**120**
Flue Gas Output Speed		**m/s**	**27.94**	**27.94**
Pollutant Concentrations	**NO_2**	**mg/Nm³**	**52.60**	**52.60**
	NO	**mg/Nm³**	**8.55**	**8.55**
	CO	**mg/Nm³**	**218.07**	**218.07**
Pollutant Mass Flows Per Stack	**NO_2**	**g/s**	**78.37**	**78.37**
	NO	**g/s**	**12.74**	**12.74**
	CO	**g/s**	**324.9**	**324.9**
Total Pollutant Mass Flows to be Originated from the Plant	**NO_2**	**g/s**	**156.74**	
	NO	**g/s**	**25.48**	
	CO	**g/s**	**649.80**	

Baseline Data

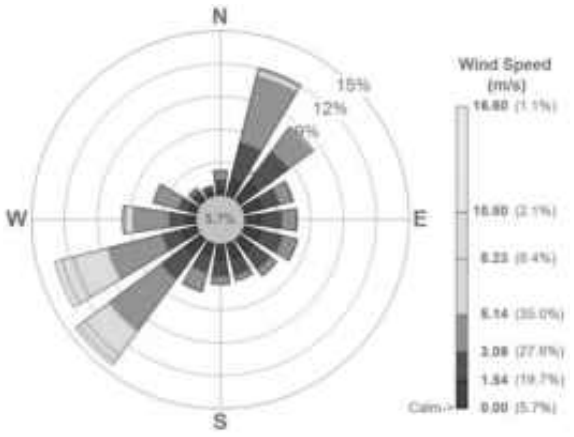
As discussed in Section 5.2.3 , ambient air quality monitoring was undertaken for the Project through active sampler for seven days at three observation points (see Table 18). The results of the baseline measurement study are,

- The carbon monoxide concentration in the atmospheric air was below the level of the established standard maximum permissible concentration at all observation points.
- The nitrogen oxide and nitrogen dioxide measurement results are generally below the MPC except for a one-time excess of MPCby 4.6 times at Monitoring Point 2 on July 13 in the morning.

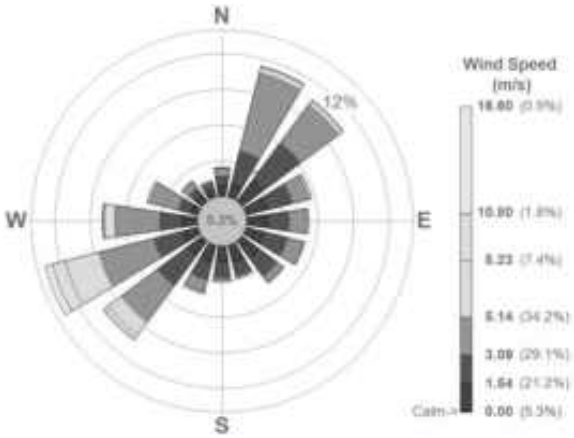
Meteorological Data

The modelling has been carried out by using three years (2018, 2019 and 2020) of hourly sequential meteorological data (temperature, pressure, cloudiness, and wind speed and direction) in order to take account of inter-annual variability and reduce the effect of any atypical conditions. Data from meteorological station at Termez has been used for the assessment. Wind rose for each of these years are presented in the figures below. For all years, dominant wind direction is blowing from the southwest.

2018



2019



2020

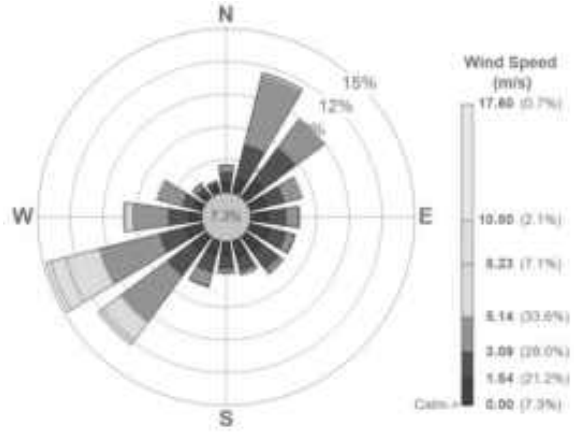


Figure 19: Wind Roses for the Years 2018, 2019 and 2020

Receptors

For the AERMOD model, a working area must be defined and allocated to the receiving environment elements. For this purpose, ground-level pollutant concentrations have been predicted at both the receptor locations above and over a coarse grid of size 12km by 12km Cartesian grid of 250m resolution. In other words, the plant impact area is defined as a square with an edge of 12,000 meters, and receiving points are placed at 250 m intervals by the Cartesian grid method. For this study, the central area of the Cartesian grid area, defined as the receiving environment, was determined as the midpoint of the facility.

In addition to this, three (3) discreet receptor points, which were used as air quality measurement point, were added to the modelling study.

As a result, total receptor point number is 2,404 and in air quality modelling study, all of receptor points are evaluated. Satellite view of cartesian grid and discreet receptors with Project area and Area of Influence (R=10km) given in Figure 20.

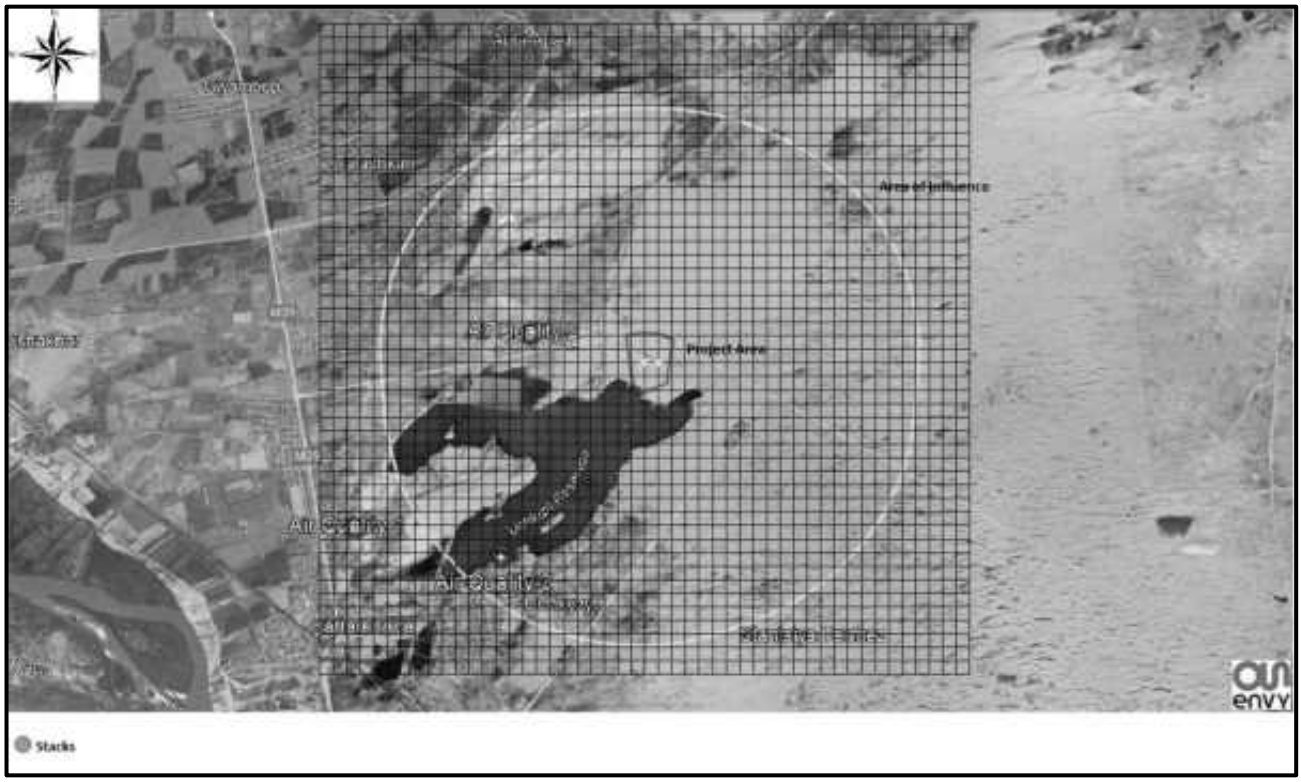


Figure 20: Air Quality Receptor Points

5.4.2.2 Modelling Results

In the scope of modelling studies, worst case approach was implemented. In this case, it is assumed that, the power plant will be operated at full load throughout the year. In addition to this, to determine the burden of air quality in the region, to compare this burden with the limit values given in the regulations and to create a cumulative impact assessment to provide solutions that can provide these limit values. Within the scope of the study, the pollutant ground level concentration obtained from the existing air quality measurements was taken as the present pollution load of the region and this result was collected with the results obtained from the modeling study and cumulative impact assessment was made. For the Project, background measurements were implemented at the site for three days. In this respect, the highest measurement result is evaluated as one-time maximum value and average of all time measurement result is evaluated as daily value.

The results of the modeling study and total pollution values on NO, NO_2, and CO parameters that will occur during the operation phase are given below, separately.

NO_2 Modelling Results

The highest ground level concentrations and coordinates determined by the modelling study for NO2 pollutant during operation phase, background measurement results, the total pollution value which equals to the total of modelling result and background measurement value and the limits specified in the national and international legislations are given in Table 22 and ground level concentration distributions are presented between Figure 21 and Figure 24.

Table 22: Highest Ground Level Concentrations of NO2 via Modelling and Limit Values

Parameter	Period	Modelling Results of the Project			Background	Total	National Ambient Air Quality Standards	IFC/WB EHS Guideline Fundamental principles	EU Environmental Standard
		Highest Ground Level Concentration (mg/m^3)	Coordinates where Highest Ground Level Concentrations Observed		Measurement Result (mg/m^3)	Pollution Value (mg/m^3)	MPC (mg/m^3)	(mg/m^3 (2007))	(mg/m^3)
			X	Y					
NO_2	One Time Max (20-30 min)*	0.051	343905.4	4137187	0.39	0.44	0.085	-	-
	Hourly	0.051	343905.4	4137187	-	0.051	-	0.2	0.2
	Daily	0.014	346405.4	4138437	0.02	0.034	0.06	-	-
	Monthly	0.006	345905.4	4138187	-	0.006	0.05	-	-
	Annual	0.002	346155.4	4138437	-	0.002	0.05	0.04	0.04

**Since the AerMod program gives hourly values as the smallest time period, hourly modeling results are given for the One Time Maximum evaluation.*

According to modelling results, for all periods highest level concentration values are under both National Ambient Ari Quality Standards, IFC/WB EHS Guideline Fundamental Principles and EU Environmental Standards.

According to the total pollution values evaluation, hourly, daily, monthly and annual total pollution values are under both National Ambient Air Quality Standards, IFC/WB EHS Guideline Fundamental Principles and EU Environmental Standards. For one-time maximum time basis, the highest modelling result is 0.051 mg/m^3, background measurement result is 0.39 mg/m^3 and the total pollution value is 0.44 mg/m^3 and it is higher than the limit value of National Ambient Air Quality Standards, (MPC 0.085 mg/m^3). The contribution of the Project to the air quality pollution is 11.6%. As stated in Section 5.2.3. "Existing Ambient Air Quality Data", the content of nitrogen dioxide in the atmospheric air of the surveyed territory did not reveal cases of exceeding the maximum permissible concentration (MPC) of this substance in the air, except for a one-time excess of its values at observation point No. 2 by 4.6 times on July 13 in the morning.

Ground Level Concentrations at Air Quality Measurement Points

During the determination of baseline conditions at and near the project site, air quality measurements were conducted at 3 air quality measurement points. Detailed information about the baseline air quality is given in Section 5.2.3. In order to determine the impact of the NO2 emissions at these air quality measurement points, modelling studies also were conducted and modelling study results, background measurement values and total pollution values at that three air quality measurement points are summarized in Table 23.

According to modelling results, for all periods highest level concentration values at all measurement points are under both National Ambient Ari Quality Standards, IFC/WB EHS Guideline Fundamental Principles and EU Environmental Standards.

According to the total pollution values evaluation, hourly, daily, monthly and annual total pollution values for all measurement points also are under both National Ambient Air Quality Standards, IFC/WB EHS Guideline Fundamental Principles and EU Environmental Standards.

For one-time maximum time basis, at AQ-1 and AQ-3 measurement points total pollution values are under both National Ambient Air Quality Standards, IFC/WB EHS Guideline Fundamental Principles and EU Environmental Standards. In addition to this, for one-time maximum time basis, at AQ-2 measurement point, the highest modelling result is 0.043 mg/m^3, background measurement result is 0.39 mg/m^3 and the total pollution value is 0.43 mg/m^3 and it is higher than the limit value of National Ambient Air Quality Standards, MPC which is 0.085 mg/m^3. The contribution of the Project is 10%. As stated in Section 5.2.3. "Existing Ambient Air Quality Data", the content of nitrogen dioxide in the atmospheric air of the surveyed territory did not reveal cases of exceeding the maximum permissible concentration (MPC) of this substance in the air, except for a one-time excess of its values at observation point No. 2 by 4.6 times on July 13 in the morning.

Table 23: Modelling Results, Background Measurements and Total Pollution Values at Measurements Points

Point	Period	Modelling Results of the Project			Background	Total	National Ambient Air Quality Standards	IFC/WB EHS Guideline Fundamental principles	EU Environmental Standard
		Highest Ground Level Concentration (mg/m^3)	Coordinates X	Y	Measurement Result (mg/m^3)	Pollution Value (mg/m^3)	MPC (mg/m^3)	(mg/m^3 (2007))	(mg/m^3)
AQ-1	One Time Max (20-30 min)*	0.029	339777.7	4135189	0	0.029	0.085	-	-
	Hourly	0.029			-	0.029	-	0.2	0.2
	Daily	0.003			0	0.003	0.06	-	-
	Monthly	0.0009			-	0.0009	0.05	-	-
	Annual	0.0004			-	0.0004	0.05	0.04	0.04
AQ-2	One Time Max (20-30 min)*	0.043	343059	4138735	0.39	0.43	0.085	-	-
	Hourly	0.043			-	0.043	-	0.2	0.2
	Daily	0.004			0.02	0.024	0.06	-	-
	Monthly	0.0011			-	0.0011	0.05	-	-
	Annual	0.0006			-	0.0006	0.05	0.04	0.04
AQ-3	One Time Max (20-30 min)*	0.042	342508.7	4134598	0	0.042	0.085	-	-
	Hourly	0.042			-	0.042	-	0.2	0.2
	Daily	0.005			0	0.005	0.06	-	-
	Monthly	0.0012			-	0.0012	0.05	-	-
	Annual	0.0006			-	0.0006	0.05	0.04	0.04

**Since the AerMod program gives hourly values as the smallest time period, hourly modeling results are given for the One Time Maximum evaluation.*

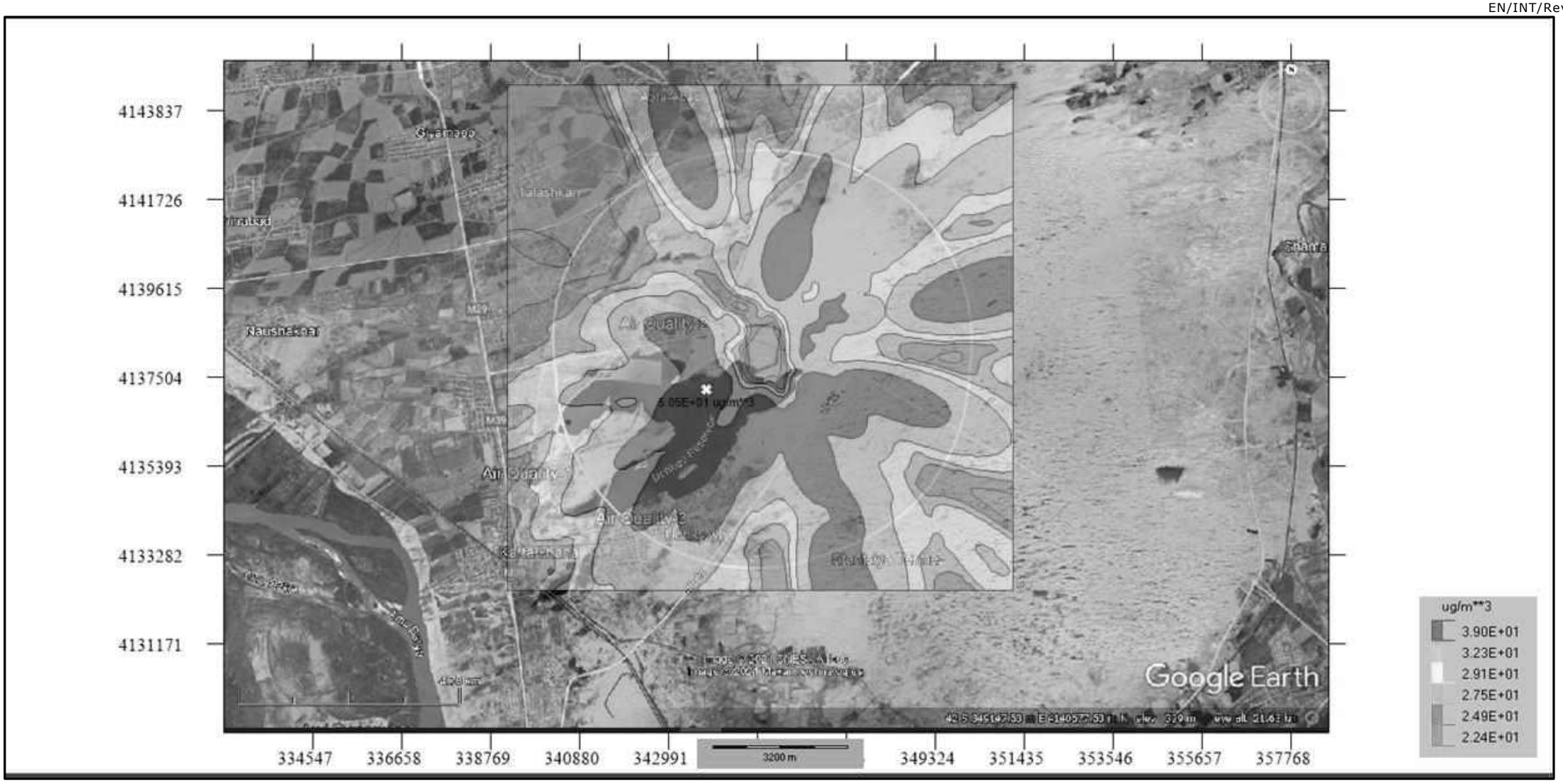


Figure 21: Maximum Hourly NO2 Distribution

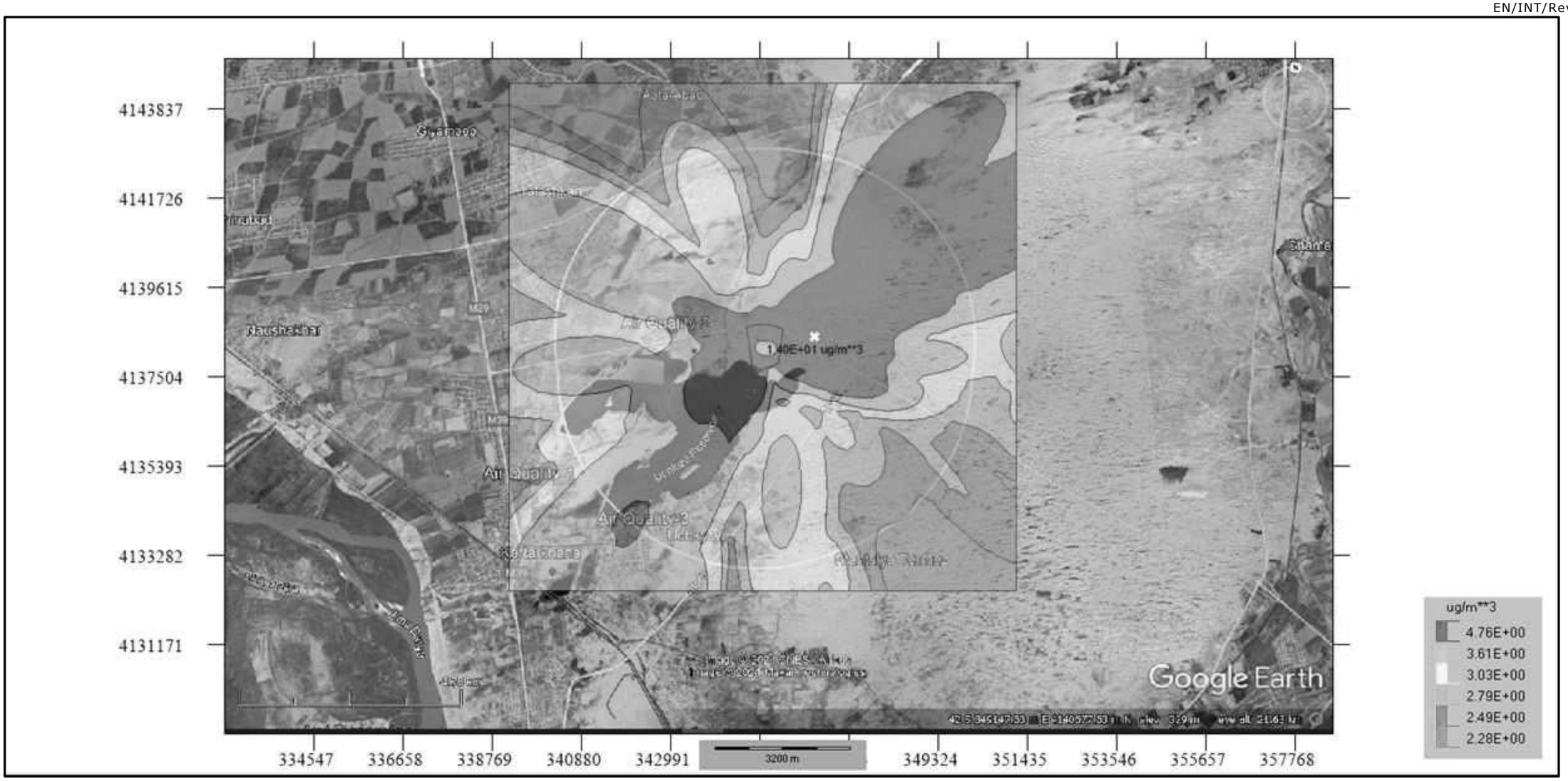


Figure 22: Maximum Daily NO_2 Distribution

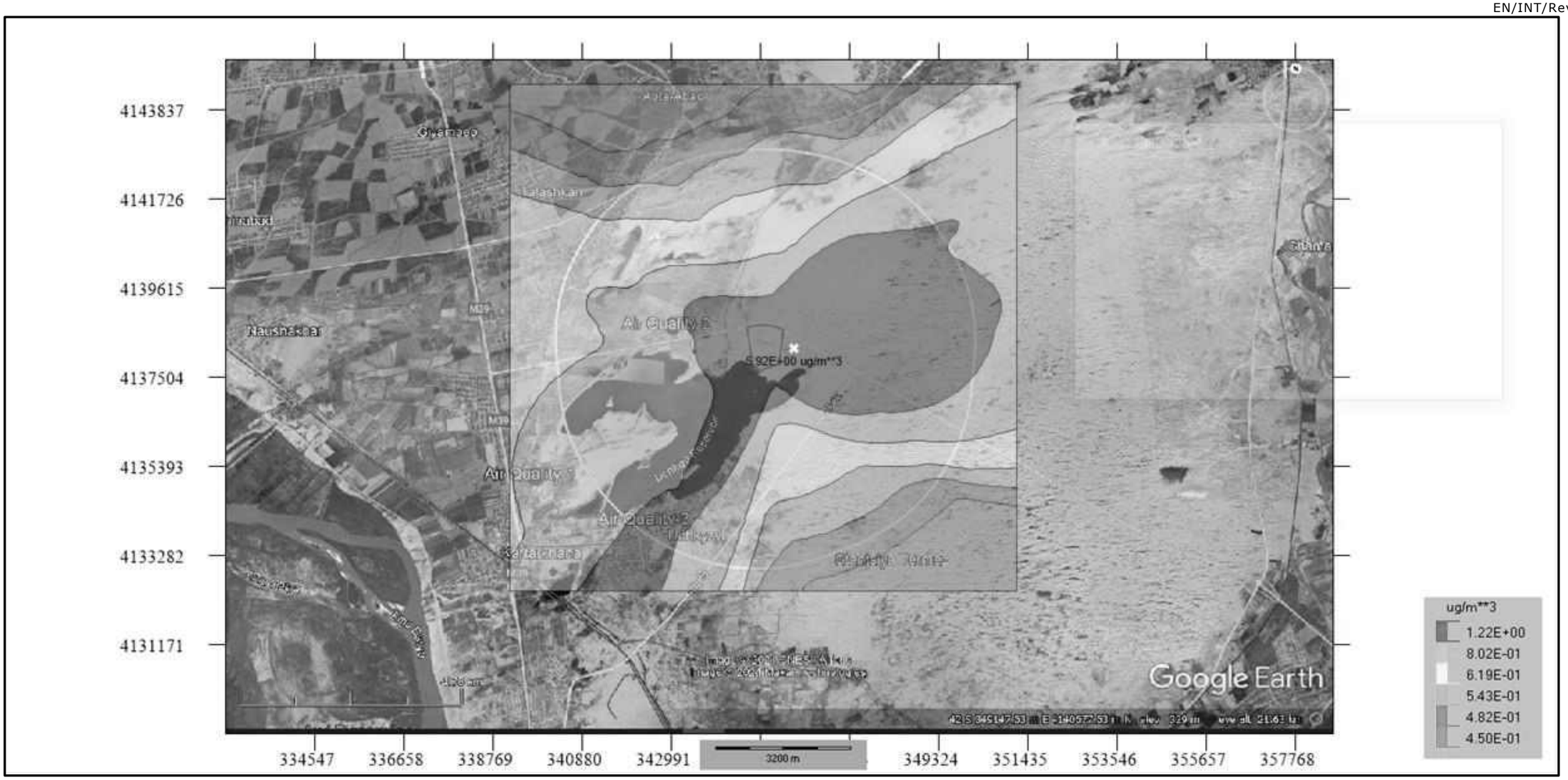


Figure 23: Maximum Monthly NO_2 Distribution

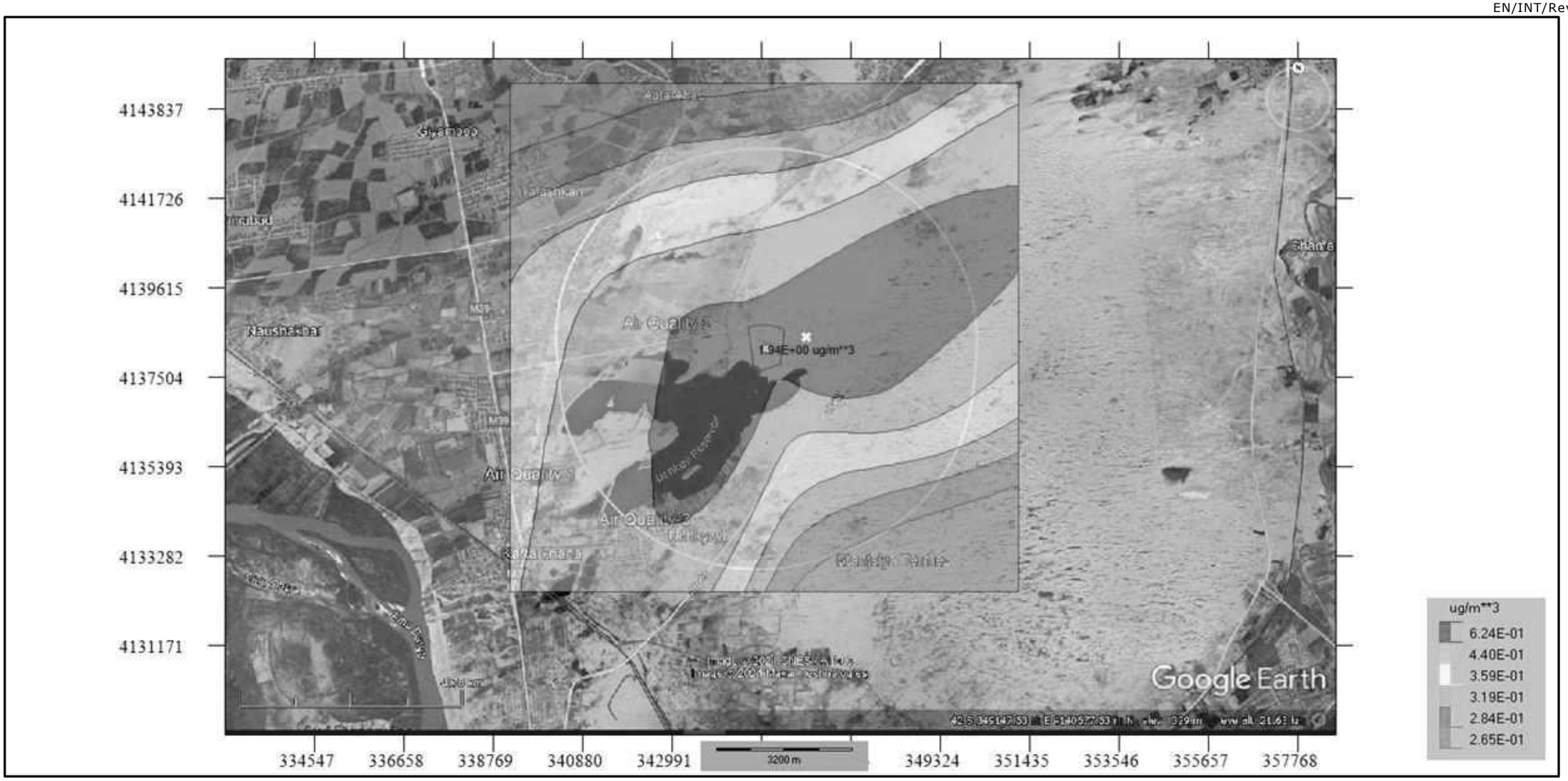


Figure 24: Maximum Annual NO2 Distribution

NO Modelling Results

The highest ground level concentrations and coordinates determined by the modelling study for NO pollutant during operation phase, background measurement results, the total pollution value which equals to the total of modelling result and background measurement value and the limits specified in the national and international legislations are given in Table 24 and ground level concentration distributions are presented between Figure 25 and Figure 28.

Table 24: Highest Ground Level Concentrations of NO via Modelling and Limit Values

Parameter	Period	Modelling Results of the Project			Background	Total	National Ambient Air Quality Standards MPC (mg/m³)	IFC/WB EHS Guideline Fundamental principles (mg/m³ (2007))	EU Environmental Standard (mg/m³)
		Highest Ground Level Concentration (mg/m³)	Coordinates where Highest Ground Level Concentrations Observed		Measurement Result (mg/m³)	Pollution Value (mg/m³)			
			X	Y					
NO	One Time Max (20-30 min)*	0.008	343905.4	4137187	0.20	0.208	0.6	-	-
	Daily	0.0022	346405.4	4138437	0.009	0.011	0.25	-	-
	Monthly	0.0009	345905.4	4138187	-	0.0009	0.12	-	-
	Annual	0.0003	346155.4	4138437	-	0.0003	0.12	-	-

**Since the AerMod program gives hourly values as the smallest time period, hourly modeling results are given for the One Time Maximum evaluation.*

According to modelling results, for all periods highest level concentration values are under both National Ambient Ari Quality Standards, IFC/WB EHS Guideline Fundamental Principles and EU Environmental Standards.

According to the total pollution values evaluation, one-time maximum value, daily, monthly and annual total pollution values are under both National Ambient Air Quality Standards, IFC/WB EHS Guideline Fundamental Principles and EU Environmental Standards.

Ground Level Concentrations at Air Quality Measurement Points

During the determination of baseline conditions at and near the project site, air quality measurements were conducted at 3 air quality measurement points. Detailed information about the baseline air quality is given in Section 5.2.3. In order to determine the impact of the NO emissions at these air quality measurement points, modelling studies also were conducted and modelling study results, background measurement values and total pollution values at that three air quality measurement points are summarized in Table 25.

According to modelling results, for all periods highest level concentration values at all measurement points are under both National Ambient Air Quality Standards, IFC/WB EHS Guideline Fundamental Principles and EU Environmental Standards.

According to the total pollution values evaluation, one-time maximum value, daily, monthly and annual total pollution values for all measurement points also are under both National Ambient Air Quality Standards, IFC/WB EHS Guideline Fundamental Principles and EU Environmental Standards.

Table 25: Modelling Results, Background Measurements and Total Pollution Values at Measurements Points

Point	Period	Modelling Results of the Project			Background Measurement Result	Total Pollution Value	National Ambient Air Quality Standards MPC	IFC/WB EHS Guideline Fundamental principles	EU Environmental Standard
		Highest Ground Level Concentration (mg/m^3)	Coordinates X	Y	(mg/m^3)	(mg/m^3)	(mg/m^3)	(mg/m^3 (2007))	(mg/m^3)
AQ-1	One Time Max (20-30 min)*	0.005	339777.7	4135189	0	0.005	0.6	-	-
	Daily	0.0005			0	0.0005	0.25	-	-
	Monthly	0.0009			-	0.0009	0.12	-	-
	Annual	0.00007			-	0.00007	0.12	-	-
AQ-2	One Time Max (20-30 min)*	0.007	343059	4138735	0.204	0.211	0.6	-	-
	Daily	0.0006			0.01	0.024	0.25	-	-
	Monthly	0.0002			-	0.0011	0.12	-	-
	Annual	0.0001			-	0.0006	0.12	-	-
AQ-3	One Time Max (20-30 min)*	0.007	342508.7	4134598	0	0.007	0.6	-	-
	Daily	0.0008			0	0.0008	0.25	-	-
	Monthly	0.0002			-	0.0002	0.12	-	-
	Annual	0.0001			-	0.0001	0.12	-	-

**Since the AerMod program gives hourly values as the smallest time period, hourly modeling results are given for the One Time Maximum evaluation.*

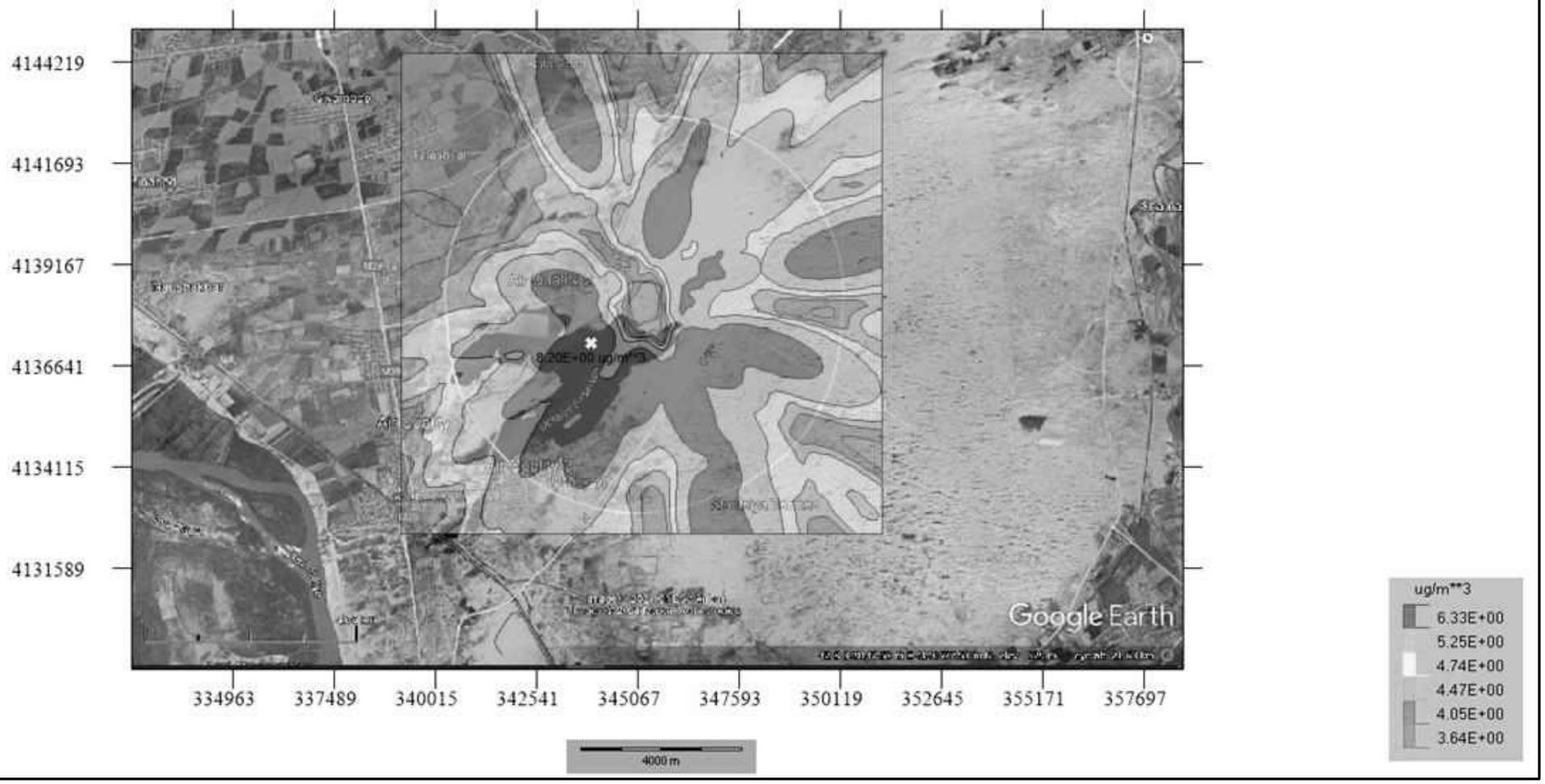


Figure 25: Maximum Hourly NO Distribution

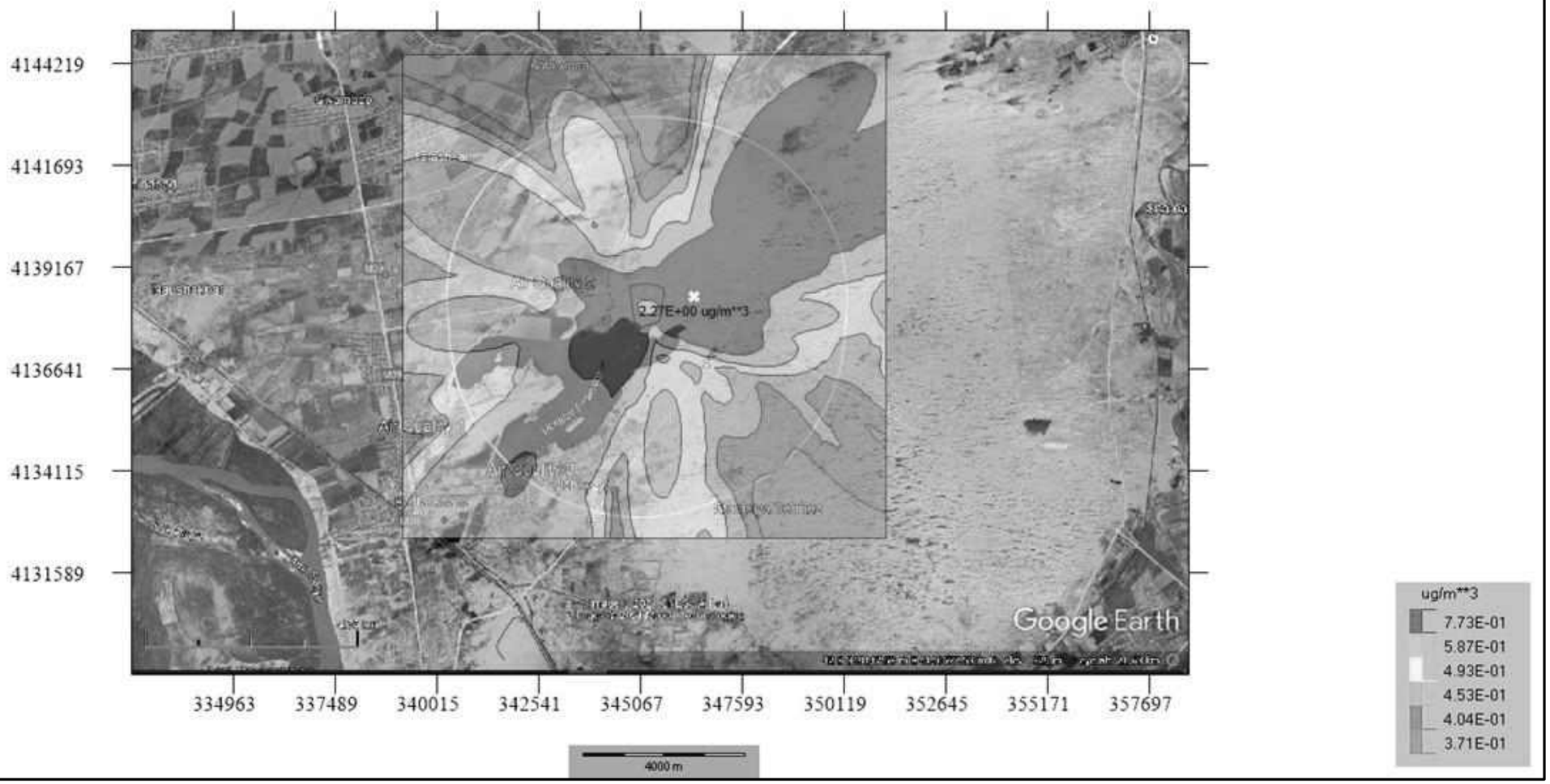


Figure 26: Maximum Daily NO Distribution

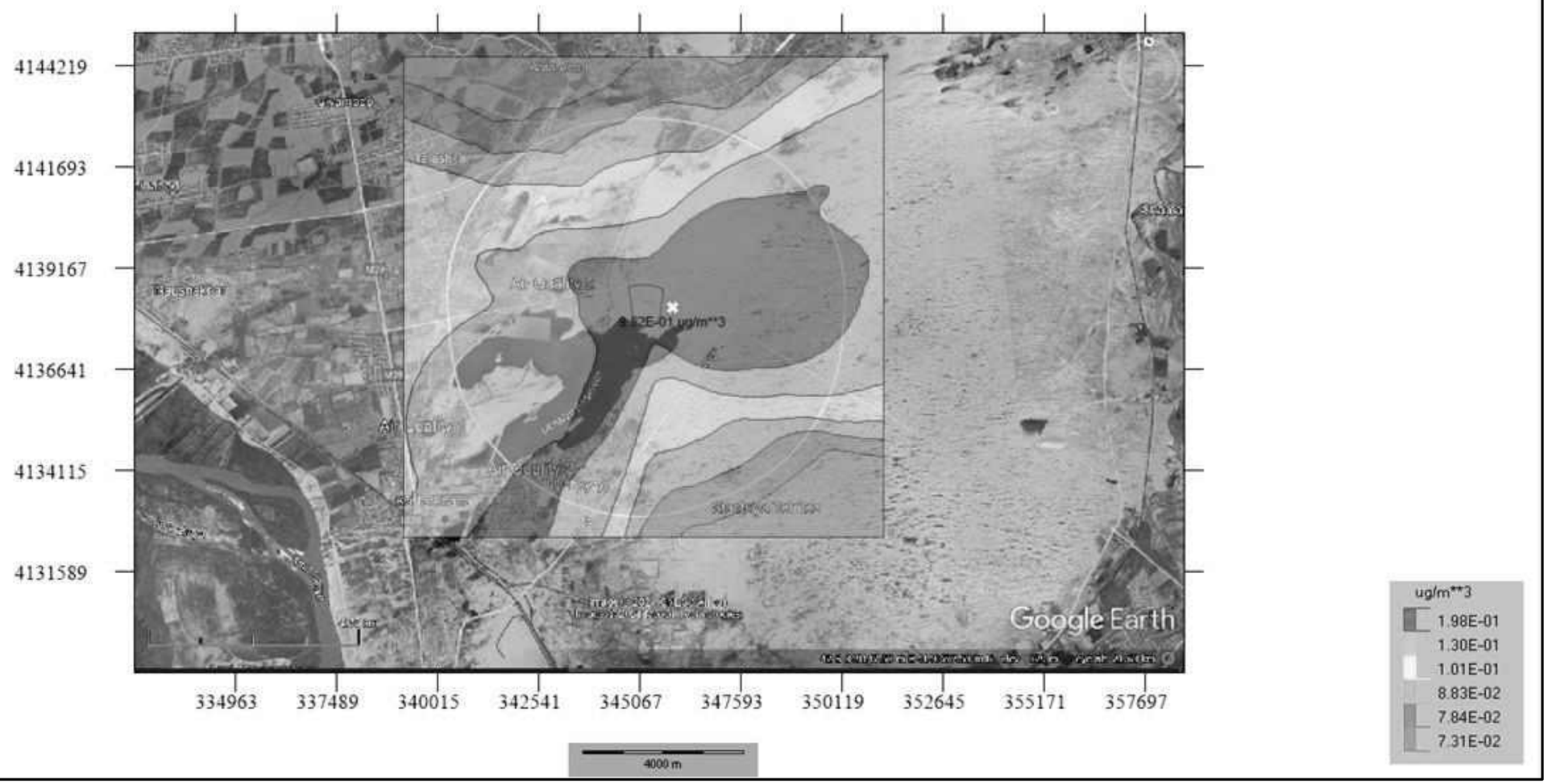


Figure 27: Maximum Monthly NO Distribution

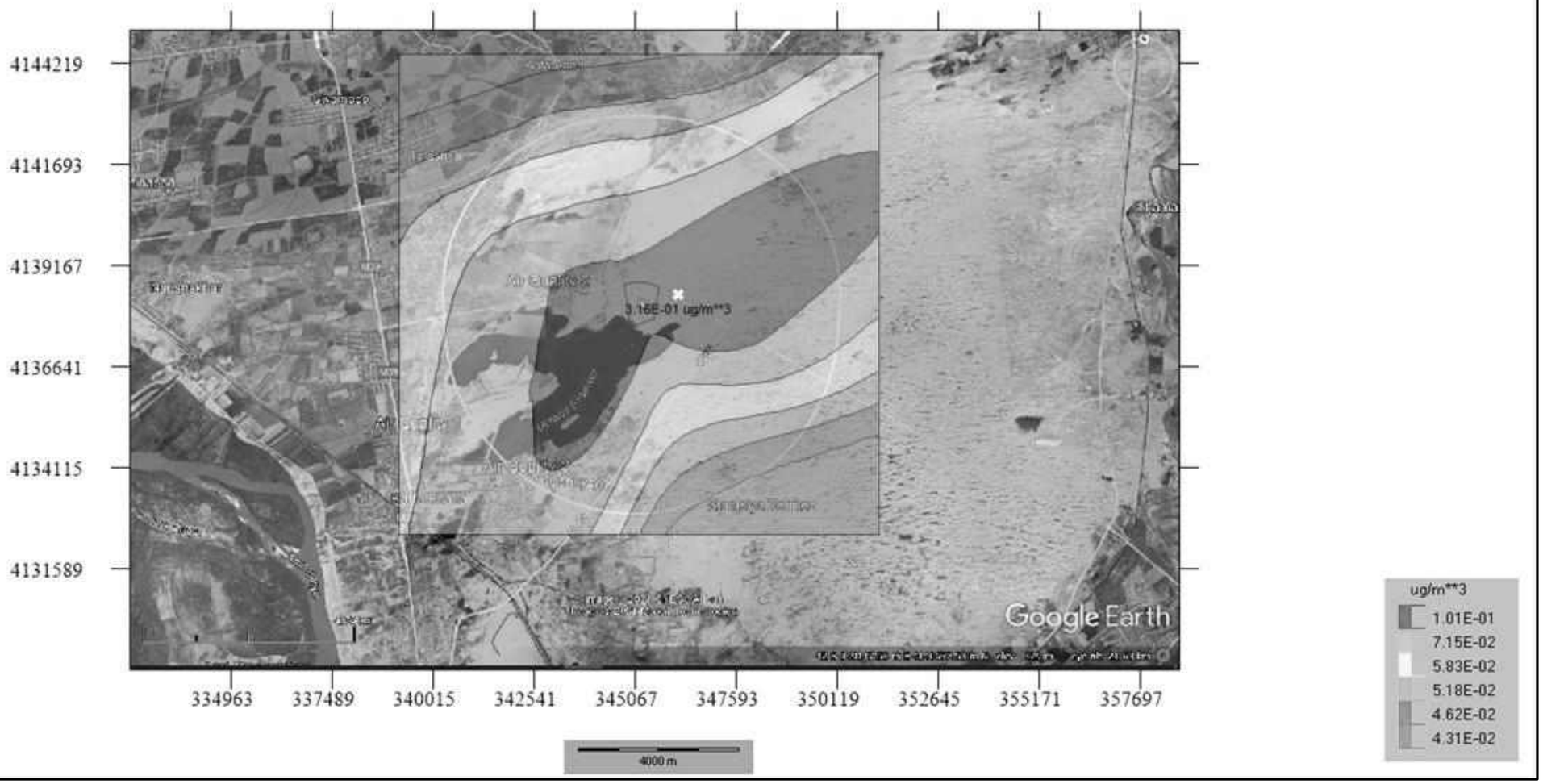


Figure 28: Maximum Annual NO Distribution

CO Modelling Results

The highest ground level concentrations and coordinates determined by the modelling study for CO pollutant during operation phase, background measurement results, the total pollution value which equals to the total of modelling result and background measurement value and the limits specified in the national and international legislations are given in Table 26 and ground level concentration distributions are presented between Figure 29 and Figure 32.

Table 26: Highest Ground Level Concentrations of CO via Modelling and Limit Values

Parameter	Period	Modelling Results of the Project			Background	Total	National Ambient Air Quality Standards MPC (mg/m³)	IFC/WB EHS Guideline Fundamental principles (mg/m³ (2007))	EU Environmental Standard (mg/m³)
		Highest Ground Level Concentration (mg/m³)	Coordinates where Highest Ground Level Concentrations Observed		Measurement Result (mg/m³)	Pollution Value (mg/m³)			
			X	Y					
CO	One Time Max (20-30 min)*	0.21	343905.4	4137187	1.36	1.57	5.0	-	-
	Daily	0.06	346405.4	4138437	0.05	0.11	4.0	-	-
	Monthly	0.02	345905.4	4138187	-	0.02	3.5	-	-
	Annual	0.008	346155.4	4138437	-	0.008	3.0	-	-

**Since the AerMod program gives hourly values as the smallest time period, hourly modeling results are given for the One Time Maximum evaluation.*

According to modelling results, for all periods highest level concentration values are under both National Ambient Ari Quality Standards, IFC/WB EHS Guideline Fundamental Principles and EU Environmental Standards.

According to the total pollution values evaluation, one-time maximum value, daily, monthly and annual total pollution values are under both National Ambient Air Quality Standards, IFC/WB EHS Guideline Fundamental Principles and EU Environmental Standards.

Ground Level Concentrations at Air Quality Measurement Points

During the determination of baseline conditions at and near the project site, air quality measurements were conducted at 3 air quality measurement points. Detailed information about the baseline air quality is given in Section 5.2.3. In order to determine the impact of the CO emissions at these air quality measurement points, modelling studies also were conducted and modelling study results, background measurement values and total pollution values at that three air quality measurement points are summarized in Table 27.

According to modelling results, for all periods highest level concentration values at all measurement points are under both National Ambient Ari Quality Standards, IFC/WB EHS Guideline Fundamental Principles and EU Environmental Standards.

According to the total pollution values evaluation, one-time maximum value, daily, monthly and annual total pollution values for all measurement points also are under both National Ambient Air Quality Standards, IFC/WB EHS Guideline Fundamental Principles and EU Environmental Standards.

Table 27: Modelling Results, Background Measurements and Total Pollution Values at Measurements Points

Point	Period	Modelling Results of the Project			Background Measurement Result (mg/m^3)	Total Pollution Value (mg/m^3)	National Ambient Air Quality Standards MPC (mg/m^3)	IFC/WB EHS Guideline Fundamental principles (mg/m^3 (2007))	EU Environmental Standard (mg/m^3)
		Highest Ground Level Concentration (mg/m^3)	Coordinates X	Y					
AQ-1	One Time Max (20-30 min)*	0.12	339777.7	4135189	0.53	0.65	5.0	-	-
	Daily	0.012			0.03	0.042	4.0	-	-
	Monthly	0.004			-	0.004	3.5	-	-
	Annual	0.002			-	0.002	3.0	-	-
AQ-2	One Time Max (20-30 min)*	0.18	343059	4138735	1.36	1.54	5.0	-	-
	Daily	0.016			0.06	0.076	4.0	-	-
	Monthly	0.005			-	0.005	3.5	-	-
	Annual	0.003			-	0.003	3.0	-	-
AQ-3	One Time Max (20-30 min)*	0.18	342508.7	4134598	0	0.18	5.0	-	-
	Daily	0.020			0	0.020	4.0	-	-
	Monthly	0.005			-	0.005	3.5	-	-
	Annual	0.003			-	0.003	3.0	-	-

*Since the AerMod program gives hourly values as the smallest time period, hourly modeling results are given for the One Time Maximum evaluation.

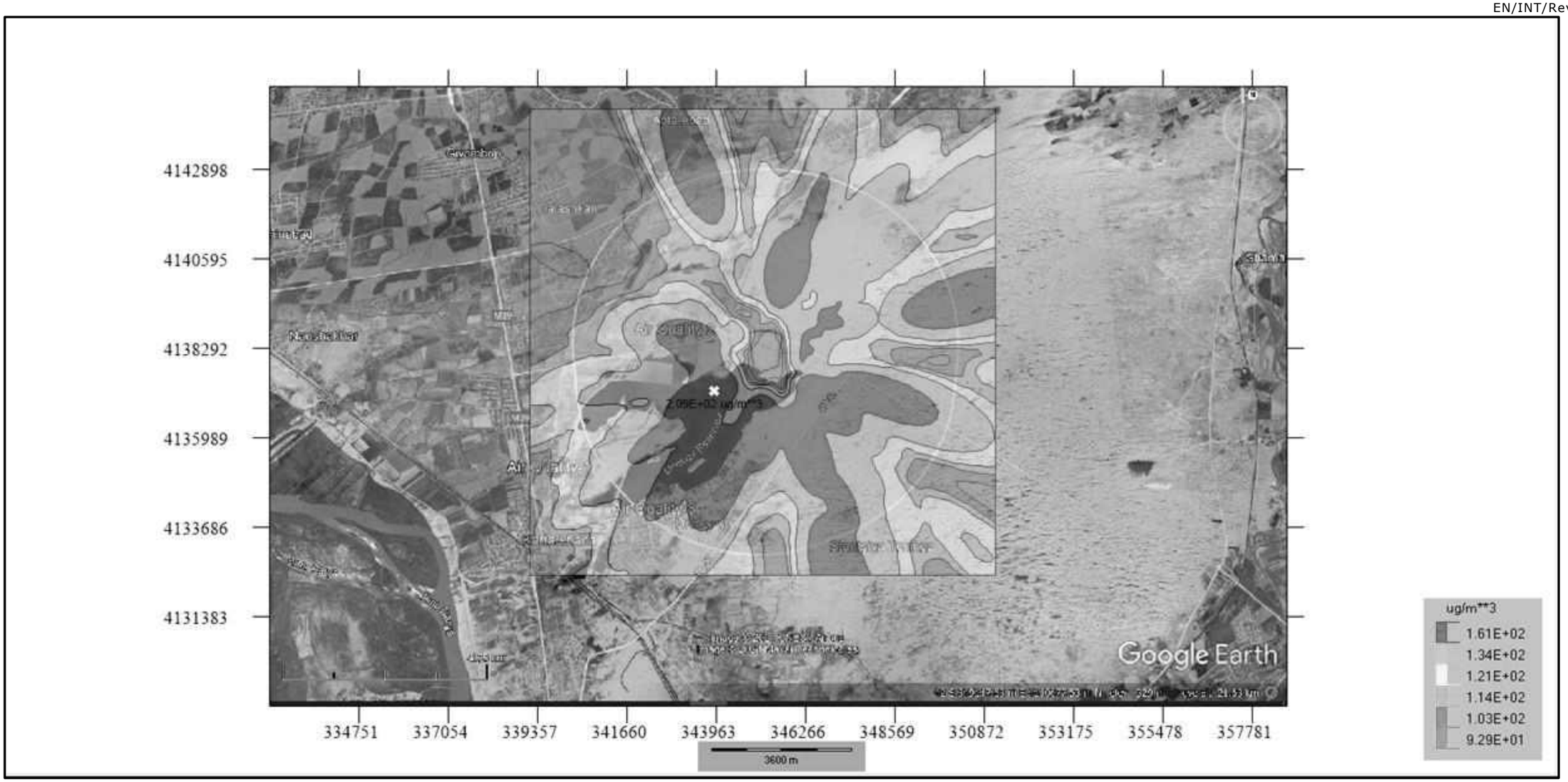


Figure 29: Maximum Hourly CO Distribution

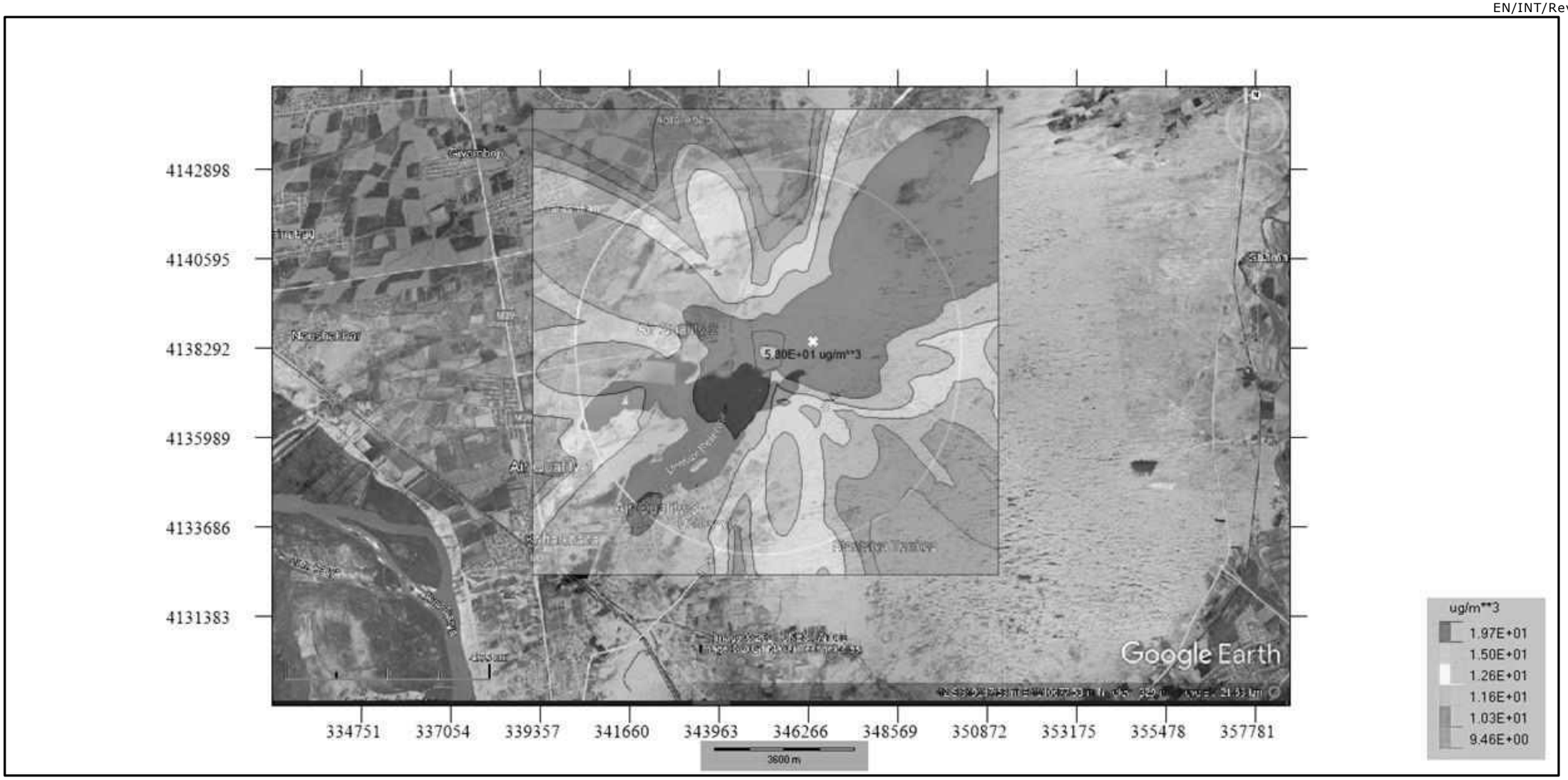


Figure 30: Maximum Daily CO Distribution

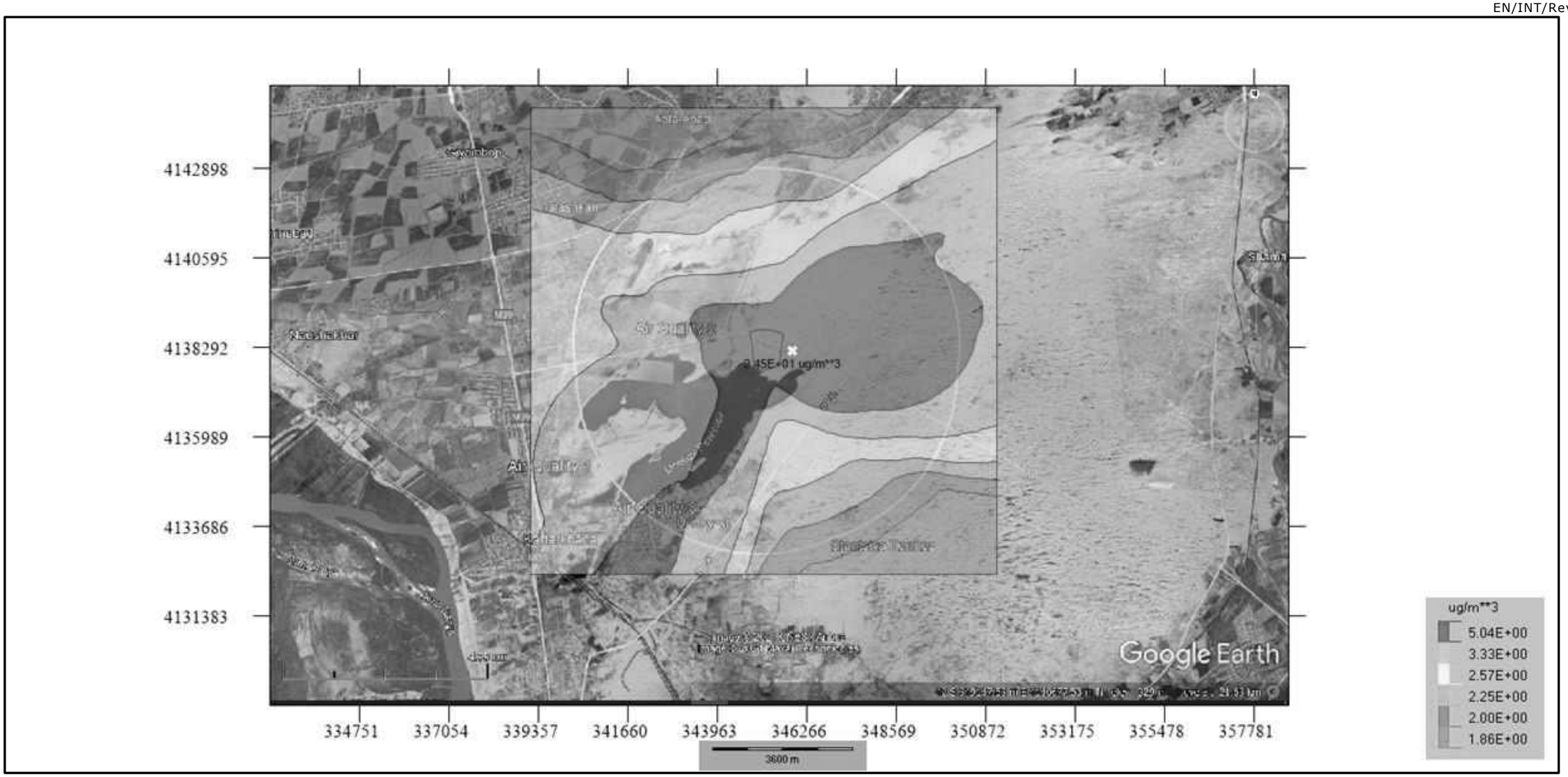


Figure 31: Maximum Monthly CO Distribution

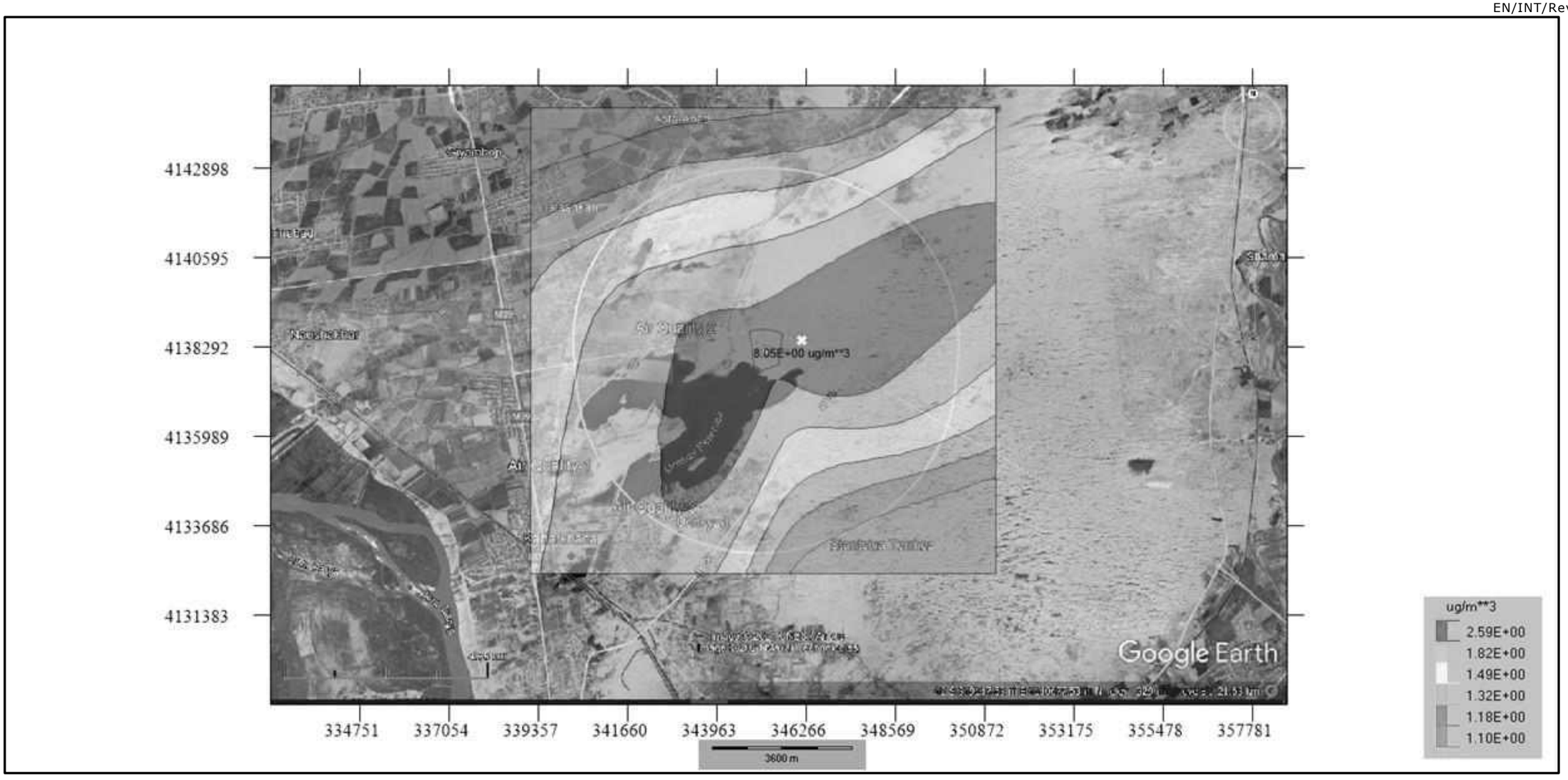


Figure 32: Maximum Annual CO Distribution

5.4.2.3 Operational Vehicle Emissions

The facility is likely to result in the small additional number of vehicles and delivery/removal vehicles along the local roads. Emissions from these vehicles will likely result in a negligible impact and as such detailed assessment has not been conducted.

5.4.2.4 Assessment of Impacts and Mitigation Measures

Activities associated with the operational phase of the Project will result in the emissions of gaseous pollutants from the operation of the power blocks. The key pollutants arising from natural gas combustion and emitted via the stacks will be oxides of nitrogen (NO and NO_2) and carbon monoxide (CO). The use of natural gas is generally accepted as being preferred over fuel oils or other solid fuels and there will be no (or negligible) emissions content of sulfur dioxide (SO_2) and no particulates. By using impact assessment significance criteria approach, key potential impacts and countermeasures on air quality for the operation phase are presented in Table 28.

Table 28: Impacts Significance of the Air Quality during – Operation Phase

Potential Impacts	Receptor	Severity	Probability	Significance of Impact (without Impact Mitigation Measures)	Mitigation and Management Measures	Significance of Residual Impact
Stack Emissions	**Residential Areas**	**Critical**	**Certain**	**High (H)**	**During commissioning, the stack emissions will be tested for NO, NO_2, CO to ensure that the control systems are operating correctly and that emission values comply with applicable standards and guidelines.** **During operation there will be continuous emission monitoring system (CEMS) of stack emissions of NO, NO_2 and CO to ensure compliant conditions are maintained through appropriate process controls.** **Regular scheduled maintenance activities will be undertaken to ensure that equipment is operating in its most effective manner, to reduce emissions.** **In operation phase, long term (at least three months and if possible in winter) ambient air quality measurement should be conducted.**	**Moderate (M)**
	Commercial Premises	**Marginal**	**Very Likely**	**Moderate (M)**		**Minor (L)**
	Industrial Facilities	**Marginal**	**Very Likely**	**Moderate (M)**		**Minor (L)**
Gaseous emissions – From vehicle exhaust	**Residential Areas & Commercial Premises**	**Marginal**	**Very Likely**	**Moderate (M)**	**Unnecessary usage of vehicles, plant and equipment will be minimized - No unnecessary idling.** **Exhaust fumes and particulates emitted from trucks and vehicles will be minimized by ensuring the use of good condition vehicles (e.g. compliant to vehicle emission requirements).** **Vehicle engines will be turned off while waiting on site to minimize gaseous emissions.** **Appropriate quality of fuel used – Fuel to International standards to be sourced through a licensed company.** **Emissions from vehicles should be free from significant black smoke - remedial measures shall be taken if this is observed.** **Ensure emissions comply with Maximum allowable limits for air pollutants emitted by mobile vehicles established by law.** **Implement a regular maintenance program of vehicles, and keep documentary evidence.**	**Minor (L)**

5.5 CUMULATIVE IMPACTS

The purpose of a cumulative impact assessment is to determine how the potential impacts of a proposed development might combine cumulatively, with the potential impacts of other projects or human activities as well as natural stressors such as droughts or extreme climatic events. Summary of Cumulative Impacts of Air Emissions & Ambient Air is presented in Table 29.

Table 29: Summary of Cumulative Impacts of Air Emissions & Ambient Air

Environmental & Social Aspects	Construction	Operation
Air Emissions & Ambient Air		
Cumulative Impacts	**There is no any known Project which will be in construction phase at the same time period with the Stonecity Project.** **No cumulative impact will occur if the construction periods do not overlap.** **If the construction periods coincide, cumulative impact on air quality with respect to dust generation and gaseous emissions from construction activities at the Project is anticipated. However, with the implementation of management and mitigation measures, the cumulative impacts are expected to be Minor.**	**In the scope of modelling studies, worst case approach was implemented. In this case, it is assumed that, the power plant will be operated at full load throughout the year. In addition to this, to determine the burden of air quality in the region, to compare this burden with the limit values given in the regulations and to create a cumulative impact assessment to provide solutions that can provide these limit values. Within the scope of the study, the pollutant ground level concentration obtained from the existing air quality measurements was taken as the present pollution load of the region and this result was collected with the results obtained from the modeling study and cumulative impact assessment was made.** **For the NO2 modelling study, according to modelling results, for all periods highest level concentration values are under both National Ambient Ari Quality Standards, IFC/WB EHS Guideline Fundamental Principles and EU Environmental Standards. According to the total pollution values evaluation,**

hourly, daily, monthly and annual total pollution values are under both National Ambient Air Quality Standards, IFC/WB EHS Guideline Fundamental Principles and EU Environmental Standards. For one time maximum time basis, the highest modelling result is 0.051 mg/m^3, background measurement result is 0.39 mg/m^3 and the total pollution value is 0.44 mg/m^3 and it is higher than the limit value of National Ambient Air Quality Standards, MPC which is 0.085 mg/m^3. The contribution of the Project is 11.6%. As stated in Section 5.3.3. "Existing Ambient Air Quality Data", the content of nitrogen dioxide in the atmospheric air of the surveyed territory did not reveal cases of exceeding the maximum permissible concentration (MPC) of this substance in the air, except for a one-time excess of its values at observation point No. 2 by 4.6 times on July 13 in the morning.

For the NO and CO modelling studies, according to modelling results, for all periods highest level concentration values are under both National Ambient Ari Quality Standards, IFC/WB EHS Guideline Fundamental Principles and EU Environmental Standards and the total pollution values evaluation, one time maximum value, daily, monthly and annual total pollution values are under both National Ambient Air Quality Standards, IFC/WB EHS Guideline Fundamental Principles and EU Environmental Standards.

5.6 MONITORING

Air quality monitoring should be undertaken by the EPC Contractor/s and the Project owner during both the construction, commissioning and operational phases of the Project respectively (see Table 30).

Table 30: Monitoring Requirements of Air Quality

Source	Parameters	Duration	Location
Construction Phase			
Dust Generation & Dispersion	**Dust**	**Visual observation for dust emissions to be undertaken on a daily basis.** **To be monitored quantitatively if generation is considered to be excessive or complaints are received.**	**Access Road to the Project site,** **Construction site and laydown areas,** **Dispersion to external receptors from point of generation.**
Emissions from Engines	**Emissions from Vehicles**	**Visual assessment of emissions to be undertaken on a daily basis while vehicles & equipment are in use and annual inspection of vehicles. This will include an inspection during the initial acceptance criteria of such vehicles to site.**	**All vehicles and engines**
Sanitary Facilities & Hazardous Material Storage	**Odour & VOCs**	**Daily olfactory observations – as part of maintenance and inspection checks Daily inspection of hazardous materials storage areas for any leaks or emission of VOCs**	**All sanitary facilities available within the laydown areas, subcontractor camps and work fields.**
Commissioning & Operation			
Emissions from Stacks	**NOX (NO and NO_2) and CO**	**Continuous Emissions Monitoring System (CEMS). Manual testing if the CEMS is not calibrated at the start of commissioning stage.**	**Stacks**
Emissions from Vehicles	**Vehicles Emissions**	**Regular maintenance & servicing of project vehicles and planned annual inspection.**	**All road and non-road vehicles and engines**

6. NOISE LEVEL

6.1 STANDARDS AND REGULATORY REQUIREMENTS

6.1.1 National Standards

Noise, vibration, and electromagnetic fields are regulated through sanitary norms and standards in Uzbekistan which are given below:

- SanPiN No. 0267-09 "Sanitary norms and rules to ensure acceptable noise levels inside residential and public buildings and in residential areas";
- SanPiN No. 0325-16 "Sanitary norms and rules to ensure acceptable noise levels in the workplace";
- SanPiN No. 0326-16 "Sanitary Standards for general and local vibration at workplace".

Noise standards established by SanPiN No. 0267-09 set the rules for ensuring residential/public areas in Uzbekistan. This standard indicates a table of noise levels for a variety of internal and external applications. The most significant permissible noise levels for the Project are summarized in Table 31.

Regarding this standard, assessment of the sound level at the determining point is performed for the day and night period of the selected day and takes into account the maximum intensity of the sound level during the half-hour period.

Additionally, noise standards established by SanPiN No. 0325-16 set the rules for ensuring the health of workers in the workplace in Uzbekistan. This standard indicates a table of noise levels for various types of work. The most significant permissible noise level at workplaces for the Project is summarized in

Table 32.

Table 31: National Noise Levels for Residential / Commercial Areas

Purpose of premises or territories	**Sound pressure Level dB(A) of inconstant noise** **(SanPİN No. 0267-09 : Sanitary norms and rules to ensure acceptable noise levels inside residential and public buildings and in residential areas. (Table 1))**	
Territories adjacent to residential buildings, clinics, outpatient clinic, dispensaries, rest homes, boarding houses, nursing homes, childcare facilities, schools and other educational institutions, libraries.	**Daytime** **(07:00 to 23:00)** **55**	**Night-time** **(23:00 to 07:00)** **45**

Living room of apartments, holiday homes,	**40**	**30**

Table 32: National Noise Levels for Workplace

Type of work, Workplace	**Sound pressure Level dB(A) of inconstant noise (SanPiN No. 0325-16: Sanitary standards for permissible noise levels in the workplace (Table 2))**	
	Daytime (07:00 to 23:00)	**Night-time (23:00 to 07:00)**
Performance of all types of work at permanent workplaces in industrial premises and at enterprises operated since March 12, 1985.	**80**	

6.1.2 Lender Requirements

The IFI's applicable noise standards for the Project are given below:

- IFC General EHS Guidelines: Environmental, Noise Management, April 30, 2007;
- IFC General EHS Guidelines: Occupational Health and Safety, Noise, April 30, 2007;

The Project is required to comply with the strictest of the noise limit values defined in guideline noise levels set out in the IFC/WBG General EHS Guidelines and national standards, as presented in Table 33 and Table 34.

IFC/WBG General EHS Guidelines recommend that noise levels presented in Table 33 should not result in a maximum increase in background levels of 3 dB at the nearest receptor location off-site and that noise levels at the boundary of an industrial property should not exceed 70 dB(A).

According to noise limits for various working environments in IFC/WBG General EHS Guidelines, no employee should be exposed to a noise level greater than 85 dB(A) for a duration of more than 8 hours per day without hearing protection (see Table 34). Although hearing protection is preferred for any period of noise exposure in excess of 85 dB(A), an equivalent level of protection can be obtained, but less easily managed, by limiting the duration of noise exposure. For every 3 dB(A) increase in sound levels, the 'allowed' exposure period or duration should be reduced by 50 percent.

Table 33: Summary of the IFC/WBG General EHS Guidelines, Noise Level Guidelines with National Standards

Type	National Noise Level Standard (SanPİN No. 0267-09) (30 min LAeq (dB(A))		IFC/WBG General EHS Guidelines (2007), Table 1.7.1. (One-hour LAeq (dB(A))	
	Daytime (07:00 to 23:00)	Night-time (23:00 to 07:00)	Daytime (07:00 to 22:00)	Night-time (22:00 – 07:00)
Residential, institutional, educational	**55**	**45**	**55**	**45**
Industry, commercial	**80**	**80**	**70**	**70**

Table 34: IFC/WBG General EHS Guidelines, Occupational Health and Safety, Noise Limits for Various Working Environments with National Standards

Type	Sound pressure Level dB(A) of inconstant noise (SanPiN No. 0325-16: Sanitary standards for permissible noise levels in the workplace (Table 2))	IFC/WBG General EHS Guidelines (2007), Table 2.3.1. One-hour LAeq (dB(A))	
		Equivalent level LAeq,8h	Maximum LAmax,fast
Performance of all types of work at permanent workplaces in industrial premises and at enterprises operated since March 12, 1985.	**80 dB(A)**		
Heavy Industry (no demand for oral communication)		**85**	**110**
Light industry (decreasing demand for oral communication)		**50-65**	**110**

The national standards (SanPiN No. 0267-09 and SanPiN No. 0325-16) are fundamentally aligned with IFC/WBG General EHS Guidelines standards (see Table 33 and Table 34).

Moreover, the Project commits that the following room average sound pressure levels will not be exceeded inside the Plant in rooms which are provided for or which require the constant presence of staff:

- Main control room and offices 50 dB(A),
- Local control rooms 70 dB(A),
- Areas of computers 75 dB(A),
- Workshop and stores 85 dB(A).

The contribution of noise caused by the inventory in these rooms, e.g., workshop machines, as well as that caused by the staff is not taken into consideration.

Under consideration of an unabsorbing inner lining, the following room averaged sound pressure levels will be expected during normal operation: (excluding offices and recreation rooms):

- Turbine building 90 dB(A),
- Circulating water pump area 95 dB(A),
- Building for water treatment plant 90 dB(A).

Additionally, IFC/WBG General EHS Guidelines indicate that "Limits for vibration and action values, (i.e. the level of exposure at which remediation should be initiated) are provided by the American Conference of Governmental Industrial Hygienists. Exposure levels should be checked on the basis of daily exposure time and data provided by equipment manufacturers."

6.2 OBSERVATION AND BASELINE CONDITIONS

The noise level in the environment was measured at four observation points to determine the baseline noise conditions in the project area between 10-14, July 2021. Table 35 shows the coordinates of the points of measurements of the noise level. The locations of the noise measurements points are presented in Figure 33.

Noise level measurement locations were selected to determine baseline noise levels at the possible nearest receptors near the Project Area.

Table 35: Coordinates of points of measurement of noise levels and measurements of meteorological parameters

No.	Number of monitoring point	Coordinates, deg/min/sec	Measurement Period	Measured Parameters and their frequencies
1.	**Point 1**	**N= 37°23'1.08"** **E= 67°14'49.65"**	**10-13 July 2021**	**Meteorological parameters (48 measurements)** **Noise (35 measurements) weekdays and weekends**

No.	Number of monitoring point	Coordinates, deg/min/sec	Measurement Period	Measured Parameters and their frequencies
				Daytime and at night time of day **Hourly, 1 time for 15 minutes.**
2.	**Point 2**	**N= 37°22'48.9"** **E= 67°13'48.4"**	**10-13 July 2021**	**Meteorological parameters (48 measurements)** **Noise (36 measurements) weekdays and weekends** **Daytime and at night time of day** **Hourly, 1 time for 15 minutes.**
3.	**Point 3**	**N= 37°21'31.8"** **E= 67°14'47.7"**	**11-14 July 2021**	**Meteorological parameters (48 measurements)** **Noise (27 measurements) weekdays and weekends** **Daytime and at night time of day** **Hourly, 1 time for 15 minutes.**
4	**Point 4**	**N= 37°21'45.3"** **E= 67° 12'55.8"**		**Meteorological parameters (48 measurements)** **Noise (27 measurements) weekdays and weekends** **Daytime and at night time of day** **Hourly, 1 time for 15 minutes.**

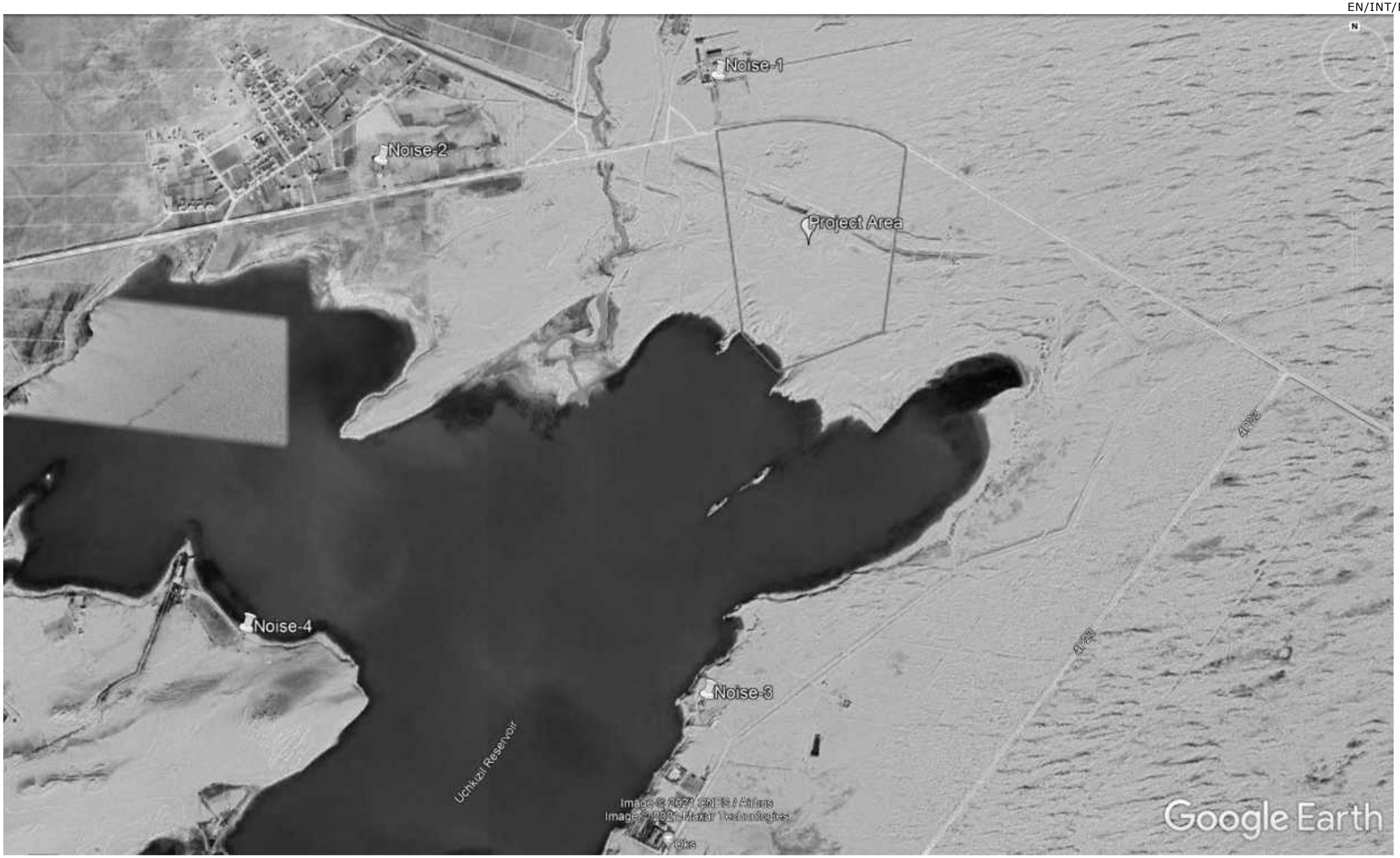


Figure 33: Location of Sampling Points for Noise

Measurement of the noise level was carried out in accordance with GOST 31296.1-2005 "Noise. Description, measurement and assessment of noise on the ground. Part 1. Basic quantities and assessment procedures ", as well as GOST 31296.2-2006" Noise. Description, measurement and assessment of noise on the ground. Part 2. Determination of sound pressure levels". In accordance with this standard, noise measurements can be carried out when the wind speed is less than 5 m/s for the measurement period. Therefore, during measurements, noise levels could not be measured for certain hours when the wind speed in more than 5 m/s.

Measurement of weighted equivalent continuous noise level, maximum sound pressure level over time, measurements of minimum and maximum weighted sound pressure level with fast time weighting and measurement of sound pressure level in octave bands with geometric mean frequencies (31.5; 63; 125; 250; 500 ; 1000; 2000; 4000; 8000 Hz) at the observation points was carried out using a special device - a sound level meter of the 1st and 3rd accuracy classes (sound level meter ShUM-1M30 and sound level meter VShV-003-M-2). Figure 34 shows noise level measurements and measurements of meteorological parameters at observation points during the period of monitoring the baseline noise levels.

Measurements of the noise level at the observation points

Sound level meter SHUM-1M30

Sound level meter VShV-003-M-2

Measurement of noise at point No. 1 (day)

Measurement of noise at Point Number 1 (night)

Measurement of noise at Point Number 2 (day)

Measurement of noise at Point Number 2 (night

Measurement of noise at Point Number 3 (day)

Measurement of noise at Point Number 3 (night)

Measurement of noise at Point Number 4 (day).

Measurement of noise at Point Number 4 (night)

Figure 34: Noise measurements Photographs

To measure noise, various principles of operation of sound analyzers were used as follows:

- Measurement of an electrical signal coming from a condenser microphone and proportional to the sound pressure of acoustic noise;
- Conversion of sound vibrations into electric voltage by a microphone;

The list of methods used during measurement of noise and meteorological parameters are given in Table 36 Measurements of the noise level and meteorological parameters and description and assessment of the characteristics of noise levels at measurement points were selected in accordance with the accredited Sampling Acts.

Table 36: List of noise level measurement methods

Defined parameters	Measurement technique
Meteorological parameters: air temperature, pressure, wind direction and speed	**GOST 17.2.3.01-86 "Nature protection. Atmosphere. Air quality control rules for settlements".** **GOST 31296.2-2006 "Noise. Description, measurement and assessment of noise on the ground. Part 2. Determination of sound pressure levels".**

Simultaneously with the measurements of the noise level at the observation points: meteorological parameters were also measured which are air temperature, atmospheric pressure, wind speed and direction.

Laboratory assessment of the performed measurements to determine:

- Weighted equivalent continuous noise level;
- Minimum and maximum weighted sound pressure level with fast time weighing;
- The maximum sound pressure level over the measurement time;
- Sound pressure in octave bands with geometric mean frequencies.

In total, 130 measurements of the noise level and 192 measurements of meteorological parameters were carried out during the period of field research.

Based on the results of noise measurements and observations of the main meteorological parameters in the area of the project, carried out in July 2021, the following can be noted:

The results of observations of the main meteorological parameters during fieldwork at point 1 showed:

Measured values of temperatures by dates:

- July 10-11 - 25.3 °C - 45.4 °C;
- July 12-13 - 25.0 °C - 43.3 °C;

Measured values of atmospheric pressure by dates:

- July 10-11 - 722 - 727 mm Hg;
- July 12-13 - 722 - 724 mm Hg;

The winds from southeast and northeast directions prevailed.

Observation Point Number 1 is located in an open area (steppe), 1500 m from the road. A constant source of noise of natural origin (wind, insects), sometimes dogs barking can be heard from a distant village.

The A-weighted equivalent continuous noise level was in the range of 31.6 - 57.0 dB, the maximum sound pressure level was at 42.9 - 64.1 dB during the observations.

The results of observations of the main meteorological parameters during the fieldwork at point 2 showed:

Measured values of temperatures by dates:

- July 10-11 - 25.4 °C - 45.2 °C;
- July 12-13 - 25.2 °C - 42.0 °C;

Measured values of atmospheric pressure by dates:

- July 10-11 - 723 - 726 mm Hg;
- July 12-13 - 722 - 726 mm Hg;

The winds from southeast and northeast directions prevailed.

Observation Point Number 2 is located near the village, along a small road and near the storage of agricultural products. The main source of noise is trucks, but their traffic on the road is rare, the flow of cars is extremely insignificant.

The A-weighted equivalent continuous noise level was in the range of 30.1 - 56.4 dB, the maximum sound pressure level was 35.8 - 72.0 dB during the observations.

The results of observations of the main meteorological parameters during the fieldwork at point 3 showed:

Measured values of temperatures by dates:

- July 11-12 - 21.0 °C - 37.5 °C;
- July 13-14 - 22.0 °C - 38.1 °C;

Measured values of atmospheric pressure by dates:

- July 11-12 - 724 - 727 mm Hg;
- July 13-14 - 722 - 724 mm Hg;

The winds from southeast and east directions prevailed.

Observation Point Number 3 is located on the bank of the lake; the terrain has a highly rugged relief with a height difference of up to five meters. The main sources of natural noise are animals (wind, birds) and sometimes people swimming in the lake.

A weighted equivalent continuous noise level was in the range of 31.7 - 49.5 dB, the maximum sound pressure level was at the level of 37.5 - 59.8 dB during the observations.

The results of observations of the main meteorological parameters during field work at point 4 showed:

Measured values of temperatures by dates:

- July 11-12 - 26.1 °C - 43.1 °C;
- July 13-14 - 23.7 °C - 42.0 °C;

Measured values of atmospheric pressure by dates:

- July 11-12 - 724 - 726 mm Hg;
- July 13-14 - 723 - 724 mm Hg;

The winds from the northeast and east directions prevailed.

Observation Point Number 4 is located in the area near the lake (former sanatorium), with separate abandoned buildings. The main sources of noise are wind and birds.

A-weighted equivalent continuous noise level was in the range of 31.2 - 50.6 dB, the maximum sound pressure level was at 38.0 - 57.9 dB during the observations.

Detailed noise monitoring results are presented in the Appendix H and calculated day-time and night-time noise levels at measurement points are given in Table 37. The average of the noise levels recorded between 7 am and 11 pm as the daytime noise level, and the average of the noise levels recorded between 11 pm and 7 am as the night noise level were calculated.

Table 37: Noise Measurement Levels Summary

Receptor	Distance to the Project Area (m)	Background Noise Measurements (dBA) Daytime (07:00 to 23:00)	Night-time (23:00 to 07:00)
Waste Processing Facility Measurement Point-1	**250**	**44.41**	**37.45**
Settlement Measurement Point-2	**990**	**41.61**	**36.90**
Settlement Measurement Point-3	**1,690**	**40.14**	**38.52**
Settlement Measurement Point-4	**2,980**	**41.74**	**41.05**

6.2.1 Sensitive Receptors

In the scope of the Projects, sensitive receptors were determined in sopping process and background noise measurements were implemented at that points. Background noise measurement points are shown in Figure 33. The table below show these receptors in representative clusters and have been identified based on the nearest receptors to the Project site in each cluster group.

Table 38: Potential Noise Receptors of the Project

Receptor	Receptor Type	Distance From Project Border (m)	Sensitivity	Justification
Point - 1	**Waste Processing Facility**	**250**	**Low**	**This is an industrial area.**
Point - 2	**Residential**	**990**	**Medium**	**Residents living in these residential areas will be particularly vulnerable to increase in ambient noise levels.**
Point - 3	**Residential**	**1,690**	**Low**	**Residents living in these residential areas can be particularly vulnerable to increase in ambient noise levels. It is far away from Project site.**
Point - 4	**Residential**	**2,980**	**Low**	**Residents living in these residential areas can be particularly vulnerable to increase in ambient noise levels. It is far away from Project site.**

6.3 POTENTIAL IMPACTS, MITIGATION, MANAGEMENT & RESIDUAL IMPACT

6.3.1 Construction Phase

The construction phase of the Project is planned to be conducted only during the day-time. However, if it is required to work during evening and night times, the necessary permits should be received from the authority. The permit will identify the type of construction activities that are allowed to be performed during night-time.

There will be no blasting during construction activities; therefore, vibration effect will not be of concern on the environment and human health. Nevertheless, there will be vibration due to heavy machinery. Vibrations resulted from the machines or buildings including machinery emerge from the dynamic force from the moving parts of the machines. Different parts of the machines generally make different frequency and vibration. Vibrations cause mechanical weathering in time. Generally, most important factor of a machine malfunction is vibration. Therefore, necessary maintenance shall be performed for the construction machines and equipment.

The main noise sources during construction phase are the heavy machineries. Heavy machinery planned to use during construction phase provided by Project owner and noise data for the anticipated plant/equipment to be used at the site has been obtained from 'British Standards: Code of practice for noise and vibration on construction and open sites [60] and are listed in Table 39. Construction activities in relation to noise and vibration are likely to include:

- Site Preparation
- Civil Works

- Construction and mechanical Installation;
- Internal Road Paving/Compacting; and
- Works at associated facilities; and
- Movement of vehicles (on and off-site)

Table 39: Construction Machine & Equipment Types, Quantities and Expected Sound Levels

Vehicles & Equipment Name	Quantity	Sound Power Level (dB)
Site Preparation and Earth and Civil Works		
Wheel Loader	**1**	**76**
Backhoe Excavator	**7**	**78**
Crawler Bulldozer	**1**	**88**
Road Roller	**2**	**79**
Dump Truck	**10**	**79**
Diesel Generator	**1**	**74**
Truck	**3**	**66**
Forklift	**2**	**77**
Building and Foundation Works		
Platform Lorry	**1**	**80**
Concrete Pump Truck	**3**	**79**
Concrete Delivery Truck	**6**	**80**
Piling Machine	**4**	**89**
Diesel Generator	**1**	**74**
Truck	**1**	**66**
Forklift	**2**	**77**
Mechanical and Installation Works		
750t, 250t and 150t Crawling Crane	**3**	**75**
Hydraulic Lifting Device and Lifting Frame	**1**	**67**
50t Crawling Crane	**1**	**71**
50t Truck Crane	**1**	**67**
Gantry Crane	**2**	**75**

Vehicles & Equipment Name	Quantity	Sound Power Level (dB)
Electric Welding Machine	**301**	**73**
Tower and Vehicle Crane	**2**	**76**
Vehicle Crane	**2**	**71**
Diesel Generator	**1**	**74**
Truck	**1**	**66**
Forklift	**2**	**77**

The accumulation of noise from the above activities can introduce potential impacts for nearby receptors at different construction phases as discussed below. It is assumed that all construction machines will work at the same time and same location (worst case)

Total Sound Power Level (L_W) can be calculated via following formula:

$$Lw = 10 * log \sum_{i=1}^{n} 10^{\mathrm{Lwi}/10}$$

L_{Wi} = Sound Power Level of Each Construction Machine (dB)

L_W = Total Sound Power Level (dB)

Site Preparation and Earth and Civil Works

The sound power level of each noise source was calculated by distributing it to 4-octave bands (see Table 40). Total sound power level, 500 Hz, 1000 Hz, 2000 Hz and 4000 Hz octave band sound power level calculations are used in the following formula. In the calculations, it is assumed that the total sound power levels are equally distributed on 4-octave bands.

Lw (i) = 10 * log (10 (Lw / 10) / 4)

Lw = Sound power level of the source (dB)

Table 40: Distribution of Noise Sources Sound Power Levels in Octave Bands in Site Preparation and Earth and Civil Works

Noise Sources	Total	Sound Power Level (dB)			
		500 Hz	1000 Hz	2000 Hz	4000 Hz
Wheel Loader	**76**	**70**	**70**	**70**	**70**
Backhoe Excavator	**78**	**72**	**72**	**72**	**72**
Crawler Bulldozer	**88**	**82**	**82**	**82**	**82**
Road Roller	**79**	**73**	**73**	**73**	**73**
Dump Truck	**79**	**73**	**73**	**73**	**73**
Diesel Generator	**74**	**68**	**68**	**68**	**68**
Truck	**66**	**60**	**60**	**60**	**60**
Forklift	**77**	**71**	**71**	**71**	**71**

Sound pressure levels of each sources based on 4-octave bands are given in Table 41.

Table 41: Sound Pressure Levels of Noise Sources in Site Preparation and Earth and Civil Works

Noise Source		Sound Pressure Level (dB)			
	Distance (m)	500 Hz	1000 Hz	2000 Hz	4000 Hz
Wheel Loader	**50**	**25.01**	**25.01**	**25.01**	**25.01**
	100	**18.99**	**18.99**	**18.99**	**18.99**
	250	**11.03**	**11.03**	**11.03**	**11.03**
	500	**5.01**	**5.01**	**5.01**	**5.01**
	1000	**-1.01**	**-1.01**	**-1.01**	**-1.01**
	2000	**-7.03**	**-7.03**	**-7.03**	**-7.03**
	4000	**-13.05**	**-13.05**	**-13.05**	**-13.05**

Noise Source		Sound Pressure Level (dB)			
	Distance (m)	500 Hz	1000 Hz	2000 Hz	4000 Hz
Backhoe Excavator	**50**	**27.01**	**27.01**	**27.01**	**27.01**
	100	**20.99**	**20.99**	**20.99**	**20.99**
	250	**13.03**	**13.03**	**13.03**	**13.03**
	500	**7.01**	**7.01**	**7.01**	**7.01**
	1000	**0.99**	**0.99**	**0.99**	**0.99**
	2000	**-5.03**	**-5.03**	**-5.03**	**-5.03**
	4000	**-11.05**	**-11.05**	**-11.05**	**-11.05**
Crawler Bulldozer	**50**	**37.01**	**37.01**	**37.01**	**37.01**
	100	**30.99**	**30.99**	**30.99**	**30.99**
	250	**23.03**	**23.03**	**23.03**	**23.03**
	500	**17.01**	**17.01**	**17.01**	**17.01**
	1000	**10.99**	**10.99**	**10.99**	**10.99**
	2000	**4.97**	**4.97**	**4.97**	**4.97**
	4000	**-1.05**	**-1.05**	**-1.05**	**-1.05**
Road Roller	**50**	**28.01**	**28.01**	**28.01**	**28.01**
	100	**21.99**	**21.99**	**21.99**	**21.99**
	250	**14.03**	**14.03**	**14.03**	**14.03**
	500	**8.01**	**8.01**	**8.01**	**8.01**
	1000	**1.99**	**1.99**	**1.99**	**1.99**
	2000	**-4.03**	**-4.03**	**-4.03**	**-4.03**
	4000	**-10.05**	**-10.05**	**-10.05**	**-10.05**
Dump Truck	**50**	**28.01**	**28.01**	**28.01**	**28.01**
	100	**21.99**	**21.99**	**21.99**	**21.99**
	250	**14.03**	**14.03**	**14.03**	**14.03**
	500	**8.01**	**8.01**	**8.01**	**8.01**
	1000	**1.99**	**1.99**	**1.99**	**1.99**
	2000	**-4.03**	**-4.03**	**-4.03**	**-4.03**
	4000	**-10.05**	**-10.05**	**-10.05**	**-10.05**

Noise Source		Sound Pressure Level (dB)			
	Distance (m)	500 Hz	1000 Hz	2000 Hz	4000 Hz
Diesel Generator	**50**	**23.01**	**23.01**	**23.01**	**23.01**
	100	**16.99**	**16.99**	**16.99**	**16.99**
	250	**9.03**	**9.03**	**9.03**	**9.03**
	500	**3.01**	**3.01**	**3.01**	**3.01**
	1000	**-3.01**	**-3.01**	**-3.01**	**-3.01**
	2000	**-9.03**	**-9.03**	**-9.03**	**-9.03**
	4000	**-15.05**	**-15.05**	**-15.05**	**-15.05**
Truck	**50**	**15.01**	**15.01**	**15.01**	**15.01**
	100	**8.99**	**8.99**	**8.99**	**8.99**
	250	**1.03**	**1.03**	**1.03**	**1.03**
	500	**-4.99**	**-4.99**	**-4.99**	**-4.99**
	1000	**-11.01**	**-11.01**	**-11.01**	**-11.01**
	2000	**-17.03**	**-17.03**	**-17.03**	**-17.03**
	4000	**-23.05**	**-23.05**	**-23.05**	**-23.05**
Forklift	**50**	**26.01**	**26.01**	**26.01**	**26.01**
	100	**19.99**	**19.99**	**19.99**	**19.99**
	250	**12.03**	**12.03**	**12.03**	**12.03**
	500	**6.01**	**6.01**	**6.01**	**6.01**
	1000	**-0.01**	**-0.01**	**-0.01**	**-0.01**
	2000	**-6.03**	**-6.03**	**-6.03**	**-6.03**
	4000	**-12.05**	**-12.05**	**-12.05**	**-12.05**

As a result of the calculation with the correction factors, the sound levels of the 4-octave bands of each noise source were calculated (see Table 42).

Table 42: Sound Pressure Levels of Corrected Noise Sources in Site Preparation and Earth and Civil Works

Noise Source		Sound Power Level (dB)			
	Distance (m)	500 Hz	1000 Hz	2000 Hz	4000 Hz
Wheel Loader	**50**	**21.81**	**25.01**	**26.21**	**26.01**
	100	**15.79**	**18.99**	**20.19**	**19.99**
	250	**7.83**	**11.03**	**12.23**	**12.03**
	500	**1.81**	**5.01**	**6.21**	**6.01**
	1000	**-4.21**	**-1.01**	**0.19**	**-0.01**
	2000	**-10.23**	**-7.03**	**-5.83**	**-6.03**
	4000	**-16.25**	**-13.05**	**-11.85**	**-12.05**
Backhoe Excavator	**50**	**23.81**	**27.01**	**28.21**	**28.01**
	100	**17.79**	**20.99**	**22.19**	**21.99**
	250	**9.83**	**13.03**	**14.23**	**14.03**
	500	**3.81**	**7.01**	**8.21**	**8.01**
	1000	**-2.21**	**0.99**	**2.19**	**1.99**
	2000	**-8.23**	**-5.03**	**-3.83**	**-4.03**
	4000	**-14.25**	**-11.05**	**-9.85**	**-10.05**
Crawler Bulldozer	**50**	**33.81**	**37.01**	**38.21**	**38.01**
	100	**27.79**	**30.99**	**32.19**	**31.99**
	250	**19.83**	**23.03**	**24.23**	**24.03**
	500	**13.81**	**17.01**	**18.21**	**18.01**
	1000	**7.79**	**10.99**	**12.19**	**11.99**
	2000	**1.77**	**4.97**	**6.17**	**5.97**
	4000	**-4.25**	**-1.05**	**0.15**	**-0.05**

Noise Source		Sound Power Level (dB)			
	Distance (m)	500 Hz	1000 Hz	2000 Hz	4000 Hz
Road Roller	**50**	**24.81**	**28.01**	**29.21**	**29.01**
	100	**18.79**	**21.99**	**23.19**	**22.99**
	250	**10.83**	**14.03**	**15.23**	**15.03**
	500	**4.81**	**8.01**	**9.21**	**9.01**
	1000	**-1.21**	**1.99**	**3.19**	**2.99**
	2000	**-7.23**	**-4.03**	**-2.83**	**-3.03**
	4000	**-13.25**	**-10.05**	**-8.85**	**-9.05**
Dump Truck	**50**	**24.81**	**28.01**	**29.21**	**29.01**
	100	**18.79**	**21.99**	**23.19**	**22.99**
	250	**10.83**	**14.03**	**15.23**	**15.03**
	500	**4.81**	**8.01**	**9.21**	**9.01**
	1000	**-1.21**	**1.99**	**3.19**	**2.99**
	2000	**-7.23**	**-4.03**	**-2.83**	**-3.03**
	4000	**-13.25**	**-10.05**	**-8.85**	**-9.05**
Diesel Generator	**50**	**19.81**	**23.01**	**24.21**	**24.01**
	100	**13.79**	**16.99**	**18.19**	**17.99**
	250	**5.83**	**9.03**	**10.23**	**10.03**
	500	**-0.19**	**3.01**	**4.21**	**4.01**
	1000	**-6.21**	**-3.01**	**-1.81**	**-2.01**
	2000	**-12.23**	**-9.03**	**-7.83**	**-8.03**
	4000	**-18.25**	**-15.05**	**-13.85**	**-14.05**

Noise Source		Sound Power Level (dB)			
	Distance (m)	500 Hz	1000 Hz	2000 Hz	4000 Hz
Truck	**50**	**11.81**	**15.01**	**16.21**	**16.01**
	100	**5.79**	**8.99**	**10.19**	**9.99**
	250	**-2.17**	**1.03**	**2.23**	**2.03**
	500	**-8.19**	**-4.99**	**-3.79**	**-3.99**
	1000	**-14.21**	**-11.01**	**-9.81**	**-10.01**
	2000	**-20.23**	**-17.03**	**-15.83**	**-16.03**
	4000	**-26.25**	**-23.05**	**-21.85**	**-22.05**
Forklift	**50**	**22.81**	**26.01**	**27.21**	**27.01**
	100	**16.79**	**19.99**	**21.19**	**20.99**
	250	**8.83**	**12.03**	**13.23**	**13.03**
	500	**2.81**	**6.01**	**7.21**	**7.01**
	1000	**-3.21**	**-0.01**	**1.19**	**0.99**
	2000	**-9.23**	**-6.03**	**-4.83**	**-5.03**
	4000	**-15.25**	**-12.05**	**-10.85**	**-11.05**

Atmospheric absorption values at specific distances for each frequency were calculated using the following formula and calculated values are given in Table 43.

Waste (Atmospheric Swallow) = 7.4 * 10-8 (f2 * r / H) dB

f = frequency of noise source / center frequency of frequency band (Hz)

r = Distance from source (m)

H = Relative humidity of air (%) (According to the data recorded in Termez Meteorological Station for the years 2018, 2019 and 2020, 47% is taken.)

Table 43: Atmospheric Absorption Values Calculated Based on Distance

Frequency (Hz)	Distance (m)	Atmospheric Swallow
500	50	0.020
500	100	0.039
500	250	0.098
500	500	0.197
500	1000	0.394
500	2000	0.787
500	4000	1.574
1000	50	0.079
1000	100	0.157
1000	250	0.394
1000	500	0.787
1000	1000	1.574
1000	2000	3.149
1000	4000	6.298
2000	50	0.315
2000	100	0.630
2000	250	1.574
2000	500	3.149
2000	1000	6.298
2000	2000	12.596
2000	4000	25.191
4000	50	1.260
4000	100	2.519
4000	250	6.298
4000	500	12.596
4000	1000	25.191

Frequency (Hz)	Distance (m)	Atmospheric Swallow
4000	**2000**	**50.383**
4000	**4000**	**100.766**

After deducting the atmospheric absorption values, the net sound levels of the 4-octave bands of each noise source were calculated using the formula LP = LPort - Aatm (see Table 44).

Table 44: Clear Sound Levels of Noise Source Based on Distance in Site Preparation and Earth and Civil Works

Noise Source	Distance (m)	Sound Level (dBA)				Total Sound Level (dBA)
		500 Hz	1000 Hz	2000 Hz	4000 Hz	
Wheel Loader	**50**	**21.79**	**24.93**	**25.90**	**24.75**	**30.605**
	100	**15.75**	**18.83**	**19.56**	**17.47**	**24.153**
	250	**7.73**	**10.64**	**10.66**	**5.73**	**15.170**
	500	**1.61**	**4.22**	**3.06**	**0.00**	**8.523**
	1000	**0.00**	**0.00**	**0.00**	**0.00**	**6.021**
	2000	**0.00**	**0.00**	**0.00**	**0.00**	**6.021**
	4000	**0.00**	**0.00**	**0.00**	**0.00**	**6.021**
Backhoe Excavator	**50**	**23.79**	**26.93**	**27.90**	**26.75**	**32.605**
	100	**17.75**	**20.83**	**21.56**	**19.47**	**26.153**
	250	**9.73**	**12.64**	**12.66**	**7.73**	**17.170**
	500	**3.61**	**6.22**	**5.06**	**0.00**	**10.292**
	1000	**0.00**	**0.00**	**0.00**	**0.00**	**6.021**
	2000	**0.00**	**0.00**	**0.00**	**0.00**	**6.021**
	4000	**0.00**	**0.00**	**0.00**	**0.00**	**6.021**

Noise Source	Distance (m)	Sound Level (dBA)				Total Sound Level (dBA)
		500 Hz	1000 Hz	2000 Hz	4000 Hz	
Crawler Bulldozer	**50**	**33.79**	**36.93**	**37.90**	**36.75**	**42.605**
	100	**27.75**	**30.83**	**31.56**	**29.47**	**36.153**
	250	**19.73**	**22.64**	**22.66**	**17.73**	**27.170**
	500	**13.61**	**16.22**	**15.06**	**5.41**	**20.019**
	1000	**7.40**	**9.42**	**5.89**	**0.00**	**12.813**
	2000	**0.98**	**1.82**	**0.00**	**0.00**	**6.789**
	4000	**0.00**	**0.00**	**0.00**	**0.00**	**6.021**
Road Roller	**50**	**24.79**	**27.93**	**28.90**	**27.75**	**33.605**
	100	**18.75**	**21.83**	**22.56**	**20.47**	**27.153**
	250	**10.73**	**13.64**	**13.66**	**8.73**	**18.170**
	500	**4.61**	**7.22**	**6.06**	**-3.59**	**11.019**
	1000	**-1.60**	**0.42**	**-3.11**	**-22.20**	**3.591**
	2000	**-8.02**	**-7.18**	**-15.43**	**0.00**	**1.392**
	4000	**-14.83**	**-16.35**	**-34.04**	**0.00**	**0.239**
Dump Truck	**50**	**24.79**	**27.93**	**28.90**	**27.75**	**33.605**
	100	**18.75**	**21.83**	**22.56**	**20.47**	**27.153**
	250	**10.73**	**13.64**	**13.66**	**8.73**	**18.170**
	500	**4.61**	**7.22**	**6.06**	**-3.59**	**11.019**
	1000	**-1.60**	**0.42**	**-3.11**	**-22.20**	**3.591**
	2000	**-8.02**	**-7.18**	**-15.43**	**0.00**	**1.392**
	4000	**-14.83**	**-16.35**	**0.00**	**0.00**	**3.130**

Noise Source	Distance (m)	Sound Level (dBA)				Total Sound Level (dBA)
		500 Hz	1000 Hz	2000 Hz	4000 Hz	
Diesel Generator	**50**	**19.79**	**22.93**	**24.21**	**22.75**	**28.714**
	100	**13.75**	**16.83**	**18.19**	**15.47**	**22.383**
	250	**5.73**	**8.64**	**10.23**	**3.73**	**13.794**
	500	**-0.39**	**2.22**	**4.21**	**-8.59**	**7.290**
	1000	**-6.60**	**-4.58**	**-1.81**	**-27.20**	**0.890**
	2000	**-13.02**	**-12.18**	**-7.83**	**0.00**	**1.056**
	4000	**-19.83**	**-21.35**	**-13.85**	**0.00**	**0.249**
Truck	**50**	**11.79**	**14.93**	**15.90**	**14.75**	**20.605**
	100	**5.75**	**8.83**	**9.56**	**7.47**	**14.153**
	250	**-2.27**	**0.64**	**0.66**	**-4.27**	**5.170**
	500	**-8.39**	**-5.78**	**-6.94**	**-16.59**	**-1.981**
	1000	**-14.60**	**-12.58**	**-16.11**	**-35.20**	**-9.409**
	2000	**-21.02**	**-20.18**	**-28.43**	**0.00**	**0.081**
	4000	**-27.83**	**-29.35**	**-47.04**	**0.00**	**0.012**
Forklift	**50**	**22.79**	**25.93**	**26.90**	**25.75**	**31.605**
	100	**16.75**	**19.83**	**20.56**	**18.47**	**25.153**
	250	**8.73**	**11.64**	**11.66**	**6.73**	**16.170**
	500	**2.61**	**5.22**	**4.06**	**-5.59**	**9.019**
	1000	**-3.60**	**-1.58**	**-5.11**	**-24.20**	**1.591**
	2000	**-10.02**	**-9.18**	**-17.43**	**0.00**	**0.929**
	4000	**-16.83**	**-18.35**	**-36.04**	**0.00**	**0.152**

The total sound level during the construction phase is calculated using the following formula.

LT = Total sound level (dBA)

$LT = 10\log\sum 10Li / 10$

Equivalent noise levels, assuming that all machines in the field preparation works simultaneously, are given below (see Table 45).

Table 45: Clear Sound Levels of Noise Sources Depending on Distance in Site Preparation and Earth and Civil Works

Distance (m)	L(day,evening,night) (dBA)
50	**48.12**
100	**41.67**
250	**32.71**
500	**25.64**
1000	**19.31**
2000	**17.83**
4000	**17.12**

Building and Foundation Works

The sound power level of each noise source was calculated by distributing it to 4-octave bands (see Table 46). Total sound power level, 500 Hz, 1000 Hz, 2000 Hz and 4000 Hz octave band sound power level calculations are used in the following formula. In the calculations, it is assumed that the total sound power levels are equally distributed on 4-octave bands.

Lw (i) = 10 * log (10 (Lw / 10) / 4)

Lw = Sound power level of the source (dB)

Table 46: Distribution of Noise Sources Sound Power Levels in Octave Bands in Building and Foundation Works

Noise Sources	Total	Sound Power Level (dB)			
		500 Hz	1000 Hz	2000 Hz	4000 Hz
Platform Lorry	**80**	**74**	**74**	**74**	**74**
Concrete Pump Truck	**79**	**73**	**73**	**73**	**73**
Concrete Delivery Truck	**80**	**74**	**74**	**74**	**74**
Piling Machine	**89**	**83**	**83**	**83**	**83**
Diesel Generator	**74**	**68**	**68**	**68**	**68**
Truck	**66**	**60**	**60**	**60**	**60**
Forklift	**77**	**71**	**71**	**71**	**71**

Sound pressure levels of each sources based on 4-octave bands are given in Table 47.

Table 47: Sound Pressure Levels of Noise Sources in Building and Foundation Works

Noise Source	Distance (m)	Sound Pressure Level (dB)			
		500 Hz	1000 Hz	2000 Hz	4000 Hz
Platform Lorry	50	29.01	29.01	29.01	29.01
	100	22.99	22.99	22.99	22.99
	250	15.03	15.03	15.03	15.03
	500	9.01	9.01	9.01	9.01
	1000	2.99	2.99	2.99	2.99
	2000	-3.03	-3.03	-3.03	-3.03
	4000	-9.05	-9.05	-9.05	-9.05
Concrete Pump Truck	50	28.01	28.01	28.01	28.01
	100	21.99	21.99	21.99	21.99
	250	14.03	14.03	14.03	14.03
	500	8.01	8.01	8.01	8.01
	1000	1.99	1.99	1.99	1.99
	2000	-4.03	-4.03	-4.03	-4.03
	4000	-10.05	-10.05	-10.05	-10.05
Concrete Delivery Truck	50	29.01	29.01	29.01	29.01
	100	22.99	22.99	22.99	22.99
	250	15.03	15.03	15.03	15.03
	500	9.01	9.01	9.01	9.01
	1000	2.99	2.99	2.99	2.99
	2000	-3.03	-3.03	-3.03	-3.03
	4000	-9.05	-9.05	-9.05	-9.05

Noise Source	Distance (m)	Sound Pressure Level (dB)			
		500 Hz	1000 Hz	2000 Hz	4000 Hz
Piling Machine	50	38.01	38.01	38.01	38.01
	100	31.99	31.99	31.99	31.99
	250	24.03	24.03	24.03	24.03
	500	18.01	18.01	18.01	18.01
	1000	11.99	11.99	11.99	11.99
	2000	5.97	5.97	5.97	5.97
	4000	-0.05	-0.05	-0.05	-0.05
Diesel Generator	50	23.01	23.01	23.01	23.01
	100	16.99	16.99	16.99	16.99
	250	9.03	9.03	9.03	9.03
	500	3.01	3.01	3.01	3.01
	1000	-3.01	-3.01	-3.01	-3.01
	2000	-9.03	-9.03	-9.03	-9.03
	4000	-15.05	-15.05	-15.05	-15.05
Truck	50	15.01	15.01	15.01	15.01
	100	8.99	8.99	8.99	8.99
	250	1.03	1.03	1.03	1.03
	500	-4.99	-4.99	-4.99	-4.99
	1000	-11.01	-11.01	-11.01	-11.01
	2000	-17.03	-17.03	-17.03	-17.03
	4000	-23.05	-23.05	-23.05	-23.05

Noise Source	Distance (m)	Sound Pressure Level (dB)			
		500 Hz	1000 Hz	2000 Hz	4000 Hz
	50	26.01	26.01	26.01	26.01
	100	19.99	19.99	19.99	19.99
	250	12.03	12.03	12.03	12.03
Forklift	500	6.01	6.01	6.01	6.01
	1000	-0.01	-0.01	-0.01	-0.01
	2000	-6.03	-6.03	-6.03	-6.03
	4000	-12.05	-12.05	-12.05	-12.05

As a result of the calculation with the correction factors, the sound levels of the 4-octave bands of each noise source were calculated (see Table 48).

Table 48: Sound Pressure Levels of Corrected Noise Sources in Building and Foundation Works

Noise Source	Distance (m)	Sound Power Level (dB)			
		500 Hz	1000 Hz	2000 Hz	4000 Hz
	50	25.81	29.01	30.21	30.01
	100	19.79	22.99	24.19	23.99
	250	11.83	15.03	16.23	16.03
Platform Lorry	500	5.81	9.01	10.21	10.01
	1000	-0.21	2.99	4.19	3.99
	2000	-6.23	-3.03	-1.83	-2.03
	4000	-12.25	-9.05	-7.85	-8.05
	50	24.81	28.01	29.21	29.01
	100	18.79	21.99	23.19	22.99
	250	10.83	14.03	15.23	15.03
Concrete Pump Truck	500	4.81	8.01	9.21	9.01
	1000	-1.21	1.99	3.19	2.99
	2000	-7.23	-4.03	-2.83	-3.03
	4000	-13.25	-10.05	-8.85	-9.05

Noise Source	Distance (m)	Sound Power Level (dB)			
		500 Hz	1000 Hz	2000 Hz	4000 Hz
Concrete Delivery Truck	50	25.81	29.01	30.21	30.01
	100	19.79	22.99	24.19	23.99
	250	11.83	15.03	16.23	16.03
	500	5.81	9.01	10.21	10.01
	1000	-0.21	2.99	4.19	3.99
	2000	-6.23	-3.03	-1.83	-2.03
	4000	-12.25	-9.05	-7.85	-8.05
Piling Machine	50	34.81	38.01	39.21	39.01
	100	28.79	31.99	33.19	32.99
	250	20.83	24.03	25.23	25.03
	500	14.81	18.01	19.21	19.01
	1000	8.79	11.99	13.19	12.99
	2000	2.77	5.97	7.17	6.97
	4000	-3.25	-0.05	1.15	0.95
Diesel Generator	50	19.81	23.01	24.21	24.01
	100	13.79	16.99	18.19	17.99
	250	5.83	9.03	10.23	10.03
	500	-0.19	3.01	4.21	4.01
	1000	-6.21	-3.01	-1.81	-2.01
	2000	-12.23	-9.03	-7.83	-8.03
	4000	-18.25	-15.05	-13.85	-14.05

Noise Source	Distance (m)	Sound Power Level (dB)			
		500 Hz	1000 Hz	2000 Hz	4000 Hz
Truck	50	11.81	15.01	16.21	16.01
	100	5.79	8.99	10.19	9.99
	250	-2.17	1.03	2.23	2.03
	500	-8.19	-4.99	-3.79	-3.99
	1000	-14.21	-11.01	-9.81	-10.01
	2000	-20.23	-17.03	-15.83	-16.03
	4000	-26.25	-23.05	-21.85	-22.05
Forklift	50	22.81	26.01	27.21	27.01
	100	16.79	19.99	21.19	20.99
	250	8.83	12.03	13.23	13.03
	500	2.81	6.01	7.21	7.01
	1000	-3.21	-0.01	1.19	0.99
	2000	-9.23	-6.03	-4.83	-5.03
	4000	-15.25	-12.05	-10.85	-11.05

Atmospheric absorption values at specific distances for each frequency were calculated using the following formula and calculated values are given in Table 49.

Waste (Atmospheric Swallow) = 7.4 * 10-8 (f2 * r / H) dB

f = frequency of noise source / center frequency of frequency band (Hz)

r = Distance from source (m)

H = Relative humidity of air (%) (According to the data recorded in Termez Meteorological Station for the years 2018, 2019 and 2020, 47% is taken.)

Table 49: Atmospheric Absorption Values Calculated Based on Distance

Frequency (Hz)	Distance (m)	Atmospheric Swallow
500	**50**	**0.020**
500	**100**	**0.039**
500	**250**	**0.098**
500	**500**	**0.197**
500	**1000**	**0.394**
500	**2000**	**0.787**
500	**4000**	**1.574**
1000	**50**	**0.079**
1000	**100**	**0.157**
1000	**250**	**0.394**
1000	**500**	**0.787**
1000	**1000**	**1.574**
1000	**2000**	**3.149**
1000	**4000**	**6.298**
2000	**50**	**0.315**
2000	**100**	**0.630**
2000	**250**	**1.574**
2000	**500**	**3.149**
2000	**1000**	**6.298**
2000	**2000**	**12.596**
2000	**4000**	**25.191**
4000	**50**	**1.260**
4000	**100**	**2.519**
4000	**250**	**6.298**
4000	**500**	**12.596**
4000	**1000**	**25.191**
4000	**2000**	**50.383**
4000	**4000**	**100.766**

After deducting the atmospheric absorption values, the net sound levels of the 4-octave bands of each noise source were calculated using the formula LP = LPort - Aatm (see Table 50).

Table 50: Clear Sound Levels of Noise Source Based on Distance in Building and Foundation Works

Noise Source	Distance (m)	Sound Level (dBA)				Total Sound Level (dBA)
		500 Hz	1000 Hz	2000 Hz	4000 Hz	
	50	25.79	28.93	29.90	28.75	34.605
	100	19.75	22.83	23.56	21.47	28.153
	250	11.73	14.64	14.66	9.73	19.170
Platform Lorry	500	5.61	8.22	7.06	0.00	12.140
	1000	0.00	1.42	0.00	0.00	6.420
	2000	0.00	0.00	0.00	0.00	6.021
	4000	0.00	0.00	0.00	0.00	6.021
	50	24.79	27.93	28.90	27.75	33.605
	100	18.75	21.83	22.56	20.47	27.153
	250	10.73	13.64	13.66	8.73	18.170
Concrete Pump Truck	500	4.61	7.22	6.06	0.00	11.208
	1000	0.00	0.42	0.00	0.00	6.128
	2000	0.00	0.00	0.00	0.00	6.021
	4000	0.00	0.00	0.00	0.00	6.021
	50	25.79	28.93	29.90	28.75	34.605
	100	19.75	22.83	23.56	21.47	28.153
	250	11.73	14.64	14.66	9.73	19.170
Concrete Delivery Truck	500	5.61	8.22	7.06	0.00	12.140
	1000	0.00	1.42	0.00	0.00	6.420
	2000	0.00	0.00	0.00	0.00	6.021
	4000	0.00	0.00	0.00	0.00	6.021

Noise Source	Distance (m)	Sound Level (dBA)				Total Sound Level (dBA)
		500 Hz	1000 Hz	2000 Hz	4000 Hz	
	50	34.79	37.93	38.90	37.75	43.605
	100	28.75	31.83	32.56	30.47	37.153
	250	20.73	23.64	23.66	18.73	28.170
Piling Machine	500	14.61	17.22	16.06	6.41	21.019
	1000	8.40	10.42	6.89	-12.20	13.591
	2000	1.98	2.82	-5.43	0.00	6.793
	4000	-4.83	-6.35	-24.04	0.00	1.945
	50	19.79	22.93	23.90	22.75	28.605
	100	13.75	16.83	17.56	15.47	22.153
	250	5.73	8.64	8.66	3.73	13.170
Diesel Generator	500	-0.39	2.22	1.06	-8.59	6.019
	1000	-6.60	-4.58	-8.11	-27.20	-1.409
	2000	-13.02	-12.18	-20.43	0.00	0.490
	4000	-19.83	-21.35	0.00	0.00	3.049
	50	11.79	14.93	16.21	14.75	20.714
	100	5.75	8.83	10.19	7.47	14.383
	250	-2.27	0.64	2.23	-4.27	5.794
Truck	500	-8.39	-5.78	-3.79	-16.59	-0.710
	1000	-14.60	-12.58	-9.81	-35.20	-7.110
	2000	-21.02	-20.18	-15.83	0.00	0.185
	4000	-27.83	-29.35	-21.85	0.00	0.040
	50	22.79	25.93	26.90	25.75	31.605
	100	16.75	19.83	20.56	18.47	25.153
	250	8.73	11.64	11.66	6.73	16.170
Forklift	500	2.61	5.22	4.06	-5.59	9.019
	1000	-3.60	-1.58	-5.11	-24.20	1.591
	2000	-10.02	-9.18	-17.43	0.00	0.929
	4000	-16.83	-18.35	-36.04	0.00	0.152

The total sound level during the construction phase is calculated using the following formula.

LT = Total sound level (dBA)

LT = 10log∑10Li / 10

Equivalent noise levels, assuming that all machines in building and foundation works simultaneously, are given below (see Table 51).

Table 51: Clear Sound Levels of Noise Sources Depending on Distance in Building and Foundation Works

Distance (m)	L(day,evening,night,) (dBA)
50	**50.84**
100	**44.39**
250	**35.40**
500	**28.28**
1000	**21.37**
2000	**18.03**
4000	**17.10**

Mechanical and Installation Works

The sound power level of each noise source was calculated by distributing it to 4-octave bands (see Table 52). Total sound power level, 500 Hz, 1000 Hz, 2000 Hz and 4000 Hz octave band sound power level calculations are used in the following formula. In the calculations, it is assumed that the total sound power levels are equally distributed on 4-octave bands.

Lw (i) = 10 * log (10 (Lw / 10) / 4)

Lw = Sound power level of the source (dB)

Table 52: Distribution of Noise Sources Sound Power Levels in Octave Bands in Mechanical and Installation Works

Noise Sources	Total	Sound Power Level (dB)			
		500 Hz	1000 Hz	2000 Hz	4000 Hz
750t, 250t and 150t Crawling Crane	**75**	**69**	**69**	**69**	**69**
Hydraulic Lifting Device and Lifting Frame	**67**	**61**	**61**	**61**	**61**
50t Crawling Crane	**71**	**65**	**65**	**65**	**65**
50t Truck Crane	**67**	**61**	**61**	**61**	**61**

Noise Sources	Total	Sound Power Level (dB)			
		500 Hz	1000 Hz	2000 Hz	4000 Hz
Gantry Crane	**75**	**69**	**69**	**69**	**69**
Electric Welding Machine	**73**	**67**	**67**	**67**	**67**
Tower and Vehicle Crane	**76**	**70**	**70**	**70**	**70**
Vehicle Crane	**71**	**65**	**65**	**65**	**65**
Diesel Generator	**74**	**68**	**68**	**68**	**68**
Truck	**66**	**60**	**60**	**60**	**60**
Forklift	**77**	**71**	**71**	**71**	**71**

Sound pressure levels of each sources based on 4-octave bands are given in Table 53.

Table 53: Sound Pressure Levels of Noise Sources in Mechanical and Installation Works

Noise Source	Distance (m)	Sound Pressure Level (dB)			
		500 Hz	1000 Hz	2000 Hz	4000 Hz
750t, 250t and 150t Crawling Crane	**50**	**24.01**	**24.01**	**24.01**	**24.01**
	100	**17.99**	**17.99**	**17.99**	**17.99**
	250	**10.03**	**10.03**	**10.03**	**10.03**
	500	**4.01**	**4.01**	**4.01**	**4.01**
	1000	**-2.01**	**-2.01**	**-2.01**	**-2.01**
	2000	**-8.03**	**-8.03**	**-8.03**	**-8.03**
	4000	**-14.05**	**-14.05**	**-14.05**	**-14.05**
Hydraulic Lifting Device and Lifting Frame	**50**	**16.01**	**16.01**	**16.01**	**16.01**
	100	**9.99**	**9.99**	**9.99**	**9.99**
	250	**2.03**	**2.03**	**2.03**	**2.03**
	500	**-3.99**	**-3.99**	**-3.99**	**-3.99**
	1000	**-10.01**	**-10.01**	**-10.01**	**-10.01**
	2000	**-16.03**	**-16.03**	**-16.03**	**-16.03**
	4000	**-22.05**	**-22.05**	**-22.05**	**-22.05**

Noise Source	Distance (m)	Sound Pressure Level (dB)			
		500 Hz	1000 Hz	2000 Hz	4000 Hz
50t Crawling Crane	50	20.01	20.01	20.01	20.01
	100	13.99	13.99	13.99	13.99
	250	6.03	6.03	6.03	6.03
	500	0.01	0.01	0.01	0.01
	1000	-6.01	-6.01	-6.01	-6.01
	2000	-12.03	-12.03	-12.03	-12.03
	4000	-18.05	-18.05	-18.05	-18.05
50t Truck Crane	50	16.01	16.01	16.01	16.01
	100	9.99	9.99	9.99	9.99
	250	2.03	2.03	2.03	2.03
	500	-3.99	-3.99	-3.99	-3.99
	1000	-10.01	-10.01	-10.01	-10.01
	2000	-16.03	-16.03	-16.03	-16.03
	4000	-22.05	-22.05	-22.05	-22.05
Gantry Crane	50	24.01	24.01	24.01	24.01
	100	17.99	17.99	17.99	17.99
	250	10.03	10.03	10.03	10.03
	500	4.01	4.01	4.01	4.01
	1000	-2.01	-2.01	-2.01	-2.01
	2000	-8.03	-8.03	-8.03	-8.03
	4000	-14.05	-14.05	-14.05	-14.05

Noise Source	Distance (m)	Sound Pressure Level (dB)			
		500 Hz	1000 Hz	2000 Hz	4000 Hz
Electric Welding Machine	50	22.01	22.01	22.01	22.01
	100	15.99	15.99	15.99	15.99
	250	8.03	8.03	8.03	8.03
	500	2.01	2.01	2.01	2.01
	1000	-4.01	-4.01	-4.01	-4.01
	2000	-10.03	-10.03	-10.03	-10.03
	4000	-16.05	-16.05	-16.05	-16.05
Tower and Vehicle Crane	50	25.01	25.01	25.01	25.01
	100	18.99	18.99	18.99	18.99
	250	11.03	11.03	11.03	11.03
	500	5.01	5.01	5.01	5.01
	1000	-1.01	-1.01	-1.01	-1.01
	2000	-7.03	-7.03	-7.03	-7.03
	4000	-13.05	-13.05	-13.05	-13.05
Vehicle Crane	50	20.01	20.01	20.01	20.01
	100	13.99	13.99	13.99	13.99
	250	6.03	6.03	6.03	6.03
	500	0.01	0.01	0.01	0.01
	1000	-6.01	-6.01	-6.01	-6.01
	2000	-12.03	-12.03	-12.03	-12.03
	4000	-18.05	-18.05	-18.05	-18.05

Noise Source	Distance (m)	Sound Pressure Level (dB)			
		500 Hz	1000 Hz	2000 Hz	4000 Hz
Diesel Generator	50	23.01	23.01	23.01	23.01
	100	16.99	16.99	16.99	16.99
	250	9.03	9.03	9.03	9.03
	500	3.01	3.01	3.01	3.01
	1000	-3.01	-3.01	-3.01	-3.01
	2000	-9.03	-9.03	-9.03	-9.03
	4000	-15.05	-15.05	-15.05	-15.05
Truck	50	15.01	15.01	15.01	15.01
	100	8.99	8.99	8.99	8.99
	250	1.03	1.03	1.03	1.03
	500	-4.99	-4.99	-4.99	-4.99
	1000	-11.01	-11.01	-11.01	-11.01
	2000	-17.03	-17.03	-17.03	-17.03
	4000	-23.05	-23.05	-23.05	-23.05
Forklift	50	26.01	26.01	26.01	26.01
	100	19.99	19.99	19.99	19.99
	250	12.03	12.03	12.03	12.03
	500	6.01	6.01	6.01	6.01
	1000	-0.01	-0.01	-0.01	-0.01
	2000	-6.03	-6.03	-6.03	-6.03
	4000	-12.05	-12.05	-12.05	-12.05

As a result of the calculation with the correction factors, the sound levels of the 4-octave bands of each noise source were calculated (see Table 54).

Table 54: Sound Pressure Levels of Corrected Noise Sources in Mechanical and Installation Works

Noise Source	Distance (m)	Sound Power Level (dB)			
		500 Hz	1000 Hz	2000 Hz	4000 Hz
750t, 250t and 150t Crawling Crane	50	20.81	24.01	25.21	25.01
	100	14.79	17.99	19.19	18.99
	250	6.83	10.03	11.23	11.03
	500	0.81	4.01	5.21	5.01
	1000	-5.21	-2.01	-0.81	-1.01
	2000	-11.23	-8.03	-6.83	-7.03
	4000	-17.25	-14.05	-12.85	-13.05
Hydraulic Lifting Device and Lifting Frame	50	12.81	16.01	17.21	17.01
	100	6.79	9.99	11.19	10.99
	250	-1.17	2.03	3.23	3.03
	500	-7.19	-3.99	-2.79	-2.99
	1000	-13.21	-10.01	-8.81	-9.01
	2000	-19.23	-16.03	-14.83	-15.03
	4000	-25.25	-22.05	-20.85	-21.05
50t Crawling Crane	50	16.81	20.01	21.21	21.01
	100	10.79	13.99	15.19	14.99
	250	2.83	6.03	7.23	7.03
	500	-3.19	0.01	1.21	1.01
	1000	-9.21	-6.01	-4.81	-5.01
	2000	-15.23	-12.03	-10.83	-11.03
	4000	-21.25	-18.05	-16.85	-17.05

Noise Source	Distance (m)	Sound Power Level (dB)			
		500 Hz	1000 Hz	2000 Hz	4000 Hz
50t Truck Crane	50	12.81	16.01	17.21	17.01
	100	6.79	9.99	11.19	10.99
	250	-1.17	2.03	3.23	3.03
	500	-7.19	-3.99	-2.79	-2.99
	1000	-13.21	-10.01	-8.81	-9.01
	2000	-19.23	-16.03	-14.83	-15.03
	4000	-25.25	-22.05	-20.85	-21.05
Gantry Crane	50	20.81	24.01	25.21	25.01
	100	14.79	17.99	19.19	18.99
	250	6.83	10.03	11.23	11.03
	500	0.81	4.01	5.21	5.01
	1000	-5.21	-2.01	-0.81	-1.01
	2000	-11.23	-8.03	-6.83	-7.03
	4000	-17.25	-14.05	-12.85	-13.05
Electric Welding Machine	50	18.81	22.01	23.21	23.01
	100	12.79	15.99	17.19	16.99
	250	4.83	8.03	9.23	9.03
	500	-1.19	2.01	3.21	3.01
	1000	-7.21	-4.01	-2.81	-3.01
	2000	-13.23	-10.03	-8.83	-9.03
	4000	-19.25	-16.05	-14.85	-15.05

Noise Source	Distance (m)	Sound Power Level (dB)			
		500 Hz	1000 Hz	2000 Hz	4000 Hz
Tower and Vehicle Crane	50	21.81	25.01	26.21	26.01
	100	15.79	18.99	20.19	19.99
	250	7.83	11.03	12.23	12.03
	500	1.81	5.01	6.21	6.01
	1000	-4.21	-1.01	0.19	-0.01
	2000	-10.23	-7.03	-5.83	-6.03
	4000	-16.25	-13.05	-11.85	-12.05
Vehicle Crane	50	16.81	20.01	21.21	21.01
	100	10.79	13.99	15.19	14.99
	250	2.83	6.03	7.23	7.03
	500	-3.19	0.01	1.21	1.01
	1000	-9.21	-6.01	-4.81	-5.01
	2000	-15.23	-12.03	-10.83	-11.03
	4000	-21.25	-18.05	-16.85	-17.05
Diesel Generator	50	19.81	23.01	24.21	24.01
	100	13.79	16.99	18.19	17.99
	250	5.83	9.03	10.23	10.03
	500	-0.19	3.01	4.21	4.01
	1000	-6.21	-3.01	-1.81	-2.01
	2000	-12.23	-9.03	-7.83	-8.03
	4000	-18.25	-15.05	-13.85	-14.05

Noise Source	Distance (m)	Sound Power Level (dB)			
		500 Hz	1000 Hz	2000 Hz	4000 Hz
Truck	50	11.81	15.01	16.21	16.01
	100	5.79	8.99	10.19	9.99
	250	-2.17	1.03	2.23	2.03
	500	-8.19	-4.99	-3.79	-3.99
	1000	-14.21	-11.01	-9.81	-10.01
	2000	-20.23	-17.03	-15.83	-16.03
	4000	-26.25	-23.05	-21.85	-22.05
Forklift	50	22.81	26.01	27.21	27.01
	100	16.79	19.99	21.19	20.99
	250	8.83	12.03	13.23	13.03
	500	2.81	6.01	7.21	7.01
	1000	-3.21	-0.01	1.19	0.99
	2000	-9.23	-6.03	-4.83	-5.03
	4000	-15.25	-12.05	-10.85	-11.05

Atmospheric absorption values at specific distances for each frequency were calculated using the following formula and calculated values are given in Table 55.

Waste (Atmospheric Swallow) = 7.4 * 10-8 (f2 * r / H) dB

f = frequency of noise source / center frequency of frequency band (Hz)

r = Distance from source (m)

H = Relative humidity of air (%) (According to the data recorded in Temez Meteorological Station for the years 2018, 2019 and 2020, 47% is taken.)

Table 55: Atmospheric Absorption Values Calculated Based on Distance

Frequency (Hz)	Distance (m)	Atmospheric Swallow
500	50	0.020
500	100	0.039
500	250	0.098
500	500	0.197
500	1000	0.394
500	2000	0.787
500	4000	1.574
1000	50	0.079
1000	100	0.157
1000	250	0.394
1000	500	0.787
1000	1000	1.574
1000	2000	3.149
1000	4000	6.298
2000	50	0.315
2000	100	0.630
2000	250	1.574
2000	500	3.149
2000	1000	6.298
2000	2000	12.596
2000	4000	25.191
4000	50	1.260
4000	100	2.519
4000	250	6.298
4000	500	12.596
4000	1000	25.191

Frequency (Hz)	Distance (m)	Atmospheric Swallow
4000	**2000**	**50.383**
4000	**4000**	**100.766**

After deducting the atmospheric absorption values, the net sound levels of the 4-octave bands of each noise source were calculated using the formula LP = LPort - Aatm (see Table 56).

Table 56: Clear Sound Levels of Noise Source Based on Distance in Mechanical and Installation Works

Noise Source	Distance (m)	Sound Level (dBA)				Total Sound Level (dBA)
		500 Hz	1000 Hz	2000 Hz	4000 Hz	
750t, 250t and 150t Crawling Crane	**50**	**20.79**	**23.93**	**24.90**	**23.75**	**29.605**
	100	**14.75**	**17.83**	**18.56**	**16.47**	**23.153**
	250	**6.73**	**9.64**	**9.66**	**4.73**	**14.170**
	500	**0.61**	**3.22**	**2.06**	**0.00**	**7.679**
	1000	**0.00**	**0.00**	**0.00**	**0.00**	**6.021**
	2000	**0.00**	**0.00**	**0.00**	**0.00**	**6.021**
	4000	**0.00**	**0.00**	**0.00**	**0.00**	**6.021**
Hydraulic Lifting Device and Lifting Frame	**50**	**12.79**	**15.93**	**16.90**	**15.75**	**21.605**
	100	**6.75**	**9.83**	**10.56**	**8.47**	**15.153**
	250	**0.00**	**1.64**	**1.66**	**0.00**	**6.922**
	500	**0.00**	**0.00**	**0.00**	**0.00**	**6.021**
	1000	**0.00**	**0.00**	**0.00**	**0.00**	**6.021**
	2000	**0.00**	**0.00**	**0.00**	**0.00**	**6.021**
	4000	**0.00**	**0.00**	**0.00**	**0.00**	**6.021**

Noise Source	Distance (m)	Sound Level (dBA)				Total Sound Level (dBA)
		500 Hz	1000 Hz	2000 Hz	4000 Hz	
50t Crawling Crane	50	16.79	19.93	20.90	19.75	25.605
	100	10.75	13.83	14.56	12.47	19.153
	250	2.73	5.64	5.66	0.73	10.170
	500	0.00	0.00	0.00	0.00	6.021
	1000	0.00	0.00	0.00	0.00	6.021
	2000	0.00	0.00	0.00	0.00	6.021
	4000	0.00	0.00	0.00	0.00	6.021
50t Truck Crane	50	12.79	15.93	16.90	15.75	21.605
	100	6.75	9.83	10.56	8.47	15.153
	250	-1.27	1.64	1.66	-3.27	6.170
	500	-7.39	-4.78	-5.94	-15.59	-0.981
	1000	-13.60	-11.58	-15.11	-34.20	-8.409
	2000	-20.02	-19.18	-27.43	0.00	0.102
	4000	-26.83	-28.35	-46.04	0.00	0.015
Gantry Crane	50	20.79	23.93	24.90	23.75	29.605
	100	14.75	17.83	18.56	16.47	23.153
	250	6.73	9.64	9.66	4.73	14.170
	500	0.61	3.22	2.06	-7.59	7.019
	1000	-5.60	-3.58	-7.11	-26.20	-0.409
	2000	-12.02	-11.18	-19.43	0.00	0.609
	4000	-18.83	-20.35	0.00	0.00	3.059

Noise Source	Distance (m)	Sound Level (dBA)				Total Sound Level (dBA)
		500 Hz	1000 Hz	2000 Hz	4000 Hz	
	50	18.79	21.93	23.21	21.75	27.714
	100	12.75	15.83	17.19	14.47	21.383
	250	4.73	7.64	9.23	2.73	12.794
Electric Welding Machine	500	-1.39	1.22	3.21	-9.59	6.290
	1000	-7.60	-5.58	-2.81	-28.20	-0.110
	2000	-14.02	-13.18	-8.83	0.00	0.859
	4000	-20.83	-22.35	-14.85	0.00	0.199
	50	21.79	24.93	25.90	24.75	30.605
	100	15.75	18.83	19.56	17.47	24.153
	250	7.73	10.64	10.66	5.73	15.170
Tower and Vehicle Crane	500	1.61	4.22	3.06	-6.59	8.019
	1000	-4.60	-2.58	-6.11	-25.20	0.591
	2000	-11.02	-10.18	-18.43	0.00	0.753
	4000	-17.83	-19.35	-37.04	0.00	0.121
	50	16.79	19.93	20.90	19.75	25.605
	100	10.75	13.83	14.56	12.47	19.153
	250	2.73	5.64	5.66	0.73	10.170
Vehicle Crane	500	-3.39	-0.78	-1.94	-11.59	3.019
	1000	-9.60	-7.58	-11.11	-30.20	-4.409
	2000	-16.02	-15.18	-23.43	0.00	0.253
	4000	-22.83	-24.35	-42.04	0.00	0.039

Noise Source	Distance (m)	Sound Level (dBA)				Total Sound Level (dBA)
		500 Hz	1000 Hz	2000 Hz	4000 Hz	
	50	19.79	22.93	23.90	22.75	0.000
	100	13.75	16.83	17.56	15.47	0.000
	250	5.73	8.64	8.66	3.73	0.000
Diesel Generator	500	-0.39	2.22	1.06	-8.59	0.000
	1000	-6.60	-4.58	-8.11	-27.20	0.000
	2000	-13.02	-12.18	-20.43	0.00	0.000
	4000	-19.83	-21.35	0.00	0.00	0.000
	50	11.79	14.99	16.19	15.99	-0.02
	100	5.75	8.95	10.15	9.95	-0.04
	250	-2.27	0.93	2.13	1.93	-0.10
Truck	500	-8.39	-5.19	-3.99	-4.19	-0.20
	1000	-14.60	-11.40	-10.20	-10.40	-0.39
	2000	-21.02	-17.82	-16.62	-16.82	-0.79
	4000	-27.83	-24.63	-23.43	-23.63	-1.57
	50	22.79	25.99	27.19	26.99	-0.02
	100	16.75	19.95	21.15	20.95	-0.04
	250	8.73	11.93	13.13	12.93	-0.10
Forklift	500	2.61	5.81	7.01	6.81	-0.20
	1000	-3.60	-0.40	0.80	0.60	-0.39
	2000	-10.02	-6.82	-5.62	-5.82	-0.79
	4000	-16.83	-13.63	-12.43	-12.63	-1.57

The total sound level during the construction phase is calculated using the following formula.

LT = Total sound level (dBA)

$LT = 10\log\sum 10Li / 10$

Equivalent noise levels, assuming that all machines in mechanical and installation works simultaneously, are given below (see Table 57).

Table 57: Clear Sound Levels of Noise Sources Depending on Distance in Mechanical and Installation Works

Distance (m)	L(day,evening,night,) (dBA)
50	**55.48**
100	**49.03**
250	**40.05**
500	**32.92**
1000	**25.72**
2000	**25.60**
4000	**25.34**

Table 58: Summary of Noise Levels Caused from Activities in Construction Phase, Background Noise Measurements and National and International Limits

Receptor	Distance (m)	Background Noise Measurements (dBA)		Noise Caused By Construction Activities (dBA)			IFC's EHS Guidelines	National Noise Level Standard (SanPİN No. 0267-09) (30 min LAeq (dB(A))		IFC/WBG General EHS Guidelines (2007), Table 1.7.1. (One-hour LAeq (dB(A))	
		Daytime (07:00 to 23:00)	Night-time (23:00 to 07:00)	Site Preparation and Earth and Civil Works	Building and Foundation Works	Mechanical and Installation Works	Maximum Increase in Background Levels of 3 (dBA) (max limit during construction) Total Cumulative noise (according to nigt time)	Daytime (07:00 to 23:00)	Night-time (23:00 to 07:00)	Daytime (07:00 to 23:00)	Night-time (23:00 to 07:00)
Waste Processing Facility Measurement Point-1	**250**	**44.41**	**37.45**	**32.71**	**35.40**	**40.05**	**45.80**				
Settlement Measurement Point-2	**990**	**41.61**	**36.90**	**19.30**	**21.36**	**25.71**	**41.70**	**55**	**45**	**55**	**45**
Settlement Measurement Point-3	**1,690**	**40.14**	**38.52**	**18.84**	**19.71**	**25.63**	**40.3**				
Settlement Measurement Point-4	**2,980**	**41.74**	**41.05**	**17.56**	**17.83**	**25.49**	**41.8**				

As seen form Table 58, noise levels during construction phase of the project is under the limit values specified for the day and night time in both national and international limits.

In addition to this, it is stated in IFC's EHS Guidelines that noise levels should not exceed the levels presented in Table 58, or result in a maximum increase in background levels of 3 dB at the nearest receptor location off-site. The baseline noise level measurement results and the noise level calculations are given in Table 58 and there is no any increase in background levels of 3 dB.

Vehicular Noise

The addition of temporary construction vehicles on local roads and within the site will likely result in temporary increases in traffic which will consequently result in an increase to noise levels at off-site receptors within close proximity to the Project boundary and close to the site access road and along key routes. Impacts due to vehicular noise will vary due to the phasing of works and the timing of vehicular movements, which affect both vehicles flow and the percentage of heavy vehicles.

The flow of vehicles in the local area is not constant, but the main road to the north of the Project site has a very low but continuous flow. The construction phase will result in the presence of larger vehicles and other more specialized equipment. As a major Project in the local area requiring hundreds of construction staff, associated equipment and deliveries, there will be a noticeable increase in vehicles at the site and along key access routes. This will influence noise levels and impacts to receptors in the adjacent corridors along these roads, in addition to existing impacts from existing vehicle flows. It is noted that such impacts will be limited to the construction phase only and may be more prevalent during certain period so construction, which require more vehicle trips.

Internal site roads will generate a new noise source from the movement of construction vehicles. Such noises will be predominantly experienced by the Project construction workers and workers of in nearby facility. It is noted that much of this movement of vehicles has been captured by the predictions for construction equipment as above.

Vibration

There will be no blasting during construction activities; therefore, vibration effect will not be of concern on the environment and human health. Nevertheless, there will be vibration due to heavy machinery. Vibrations resulted from the machines or buildings including machinery emerge from the dynamic force from the moving parts of the machines. Different parts of the machines generally make different frequency and vibration. Vibrations cause mechanical weathering in time. Generally, most important factor of a machine malfunction is vibration. Therefore, necessary maintenance shall be performed for the construction machines and equipment.

Noise Impacts to Site Workers

Site workers will be exposed to varying levels of noise depending on their specific roles and activities being conducted. This may relate to exposure to noise in areas that are considered 'high' (e.g. above occupational health and safety guidelines), Without mitigation, noise impacts to the workforce could results in health impacts, for example hearing damage.

Noise Impacts at Accommodation Facilities Located On Site

Some of the EPC construction workers will live in accommodation facilities located at the Project site. This will potentially expose the workers to construction phase noise levels especially in the event that workers are required to work in shifts (day and night). Currently, the exact location of the accommodation facilities has not been determined, so if the impacts are higher than regulatory limit

values, the EPC Contractor will be required to implement appropriate mitigation and management measures.

6.3.1.1 Assessment of Impacts and Mitigation Measures

By using impact assessment significance criteria approach, key potential impacts and countermeasures on air quality for the construction phase are presented in Table 60.

Table 59: Impacts Significance of the Noise and Vibration during – Construction Phase

Potential Impacts	Receptor	Severity	Probability	Significance of Impact (without Impact Mitigation Measures)	Mitigation and Management Measures	Significance of Residual Impact
Construction Site Noise – Noise generated from general construction activities	**Waste Processing Facility**	**Critical**	**Certain**	**High (H)**	**Consideration of noise fences for non-mobile equipment such as generators or at boundaries for key receptors that may have higher assessed impacts.** **The EPC Contractor will, at all times, carry out all work in such a manner as to keep any disturbance from noise to a minimum (by phasing noisy works).** **Acoustic covers on machine engines will be remain closed at all times as applicable.** **Where practical, electrically powered machines will be preferred to mechanically powered alternatives.** **All mechanically powered plant, diesel engine vehicles and compression equipment will be fitted with noise control equipment (exhaust silencers, mufflers) as available from the manufacturer.** **Where possible, the highest noise emitting activities will be undertaken in a central site area, or within an enclosed structure.** **Where practical, additional noise barriers/attenuation should be employed to ensure that the maximum noise level at 1m distance outside of the plant fence when all equipment is running do not exceed 70dB(A) and maximum noise level at 1m from open air installations do not exceed 85dB(A).** **Items of plant on site operating intermittently will be shut down in the intervening periods between use.** **Night time construction works will be avoided as much as practicable to prevent noise impact at the sub contactor camp. Where unavoidable, night work permits (if applicable) will be obtained from the relevant authorities.** **The impacted receptors will have access to a grievance mechanism in accordance with the Project SEP in order to make any complaints regarding noise during the construction phase.**	**Moderate (M)**
	Residential Areas	**Critical**	**Likely**	**Moderate (M)**		**Minor (L)**

Potential Impacts	Receptor	Severity	Probability	Significance of Impact (without Impact Mitigation Measures)	Mitigation and Management Measures	Significance of Residual Impact
Vehicular Noise- Noise from movement of Vehicles	**Waste Processing Facility & Residential Areas**	**Marginal**	**Very Likely**	**Moderate (M)**	**Delivery vehicles will be prohibited from waiting outside the site with their engines running (consideration of driver waiting room with heating/AC).** **Ensure any applicable permits are in place for deliveries to the site and for any works performed outside normal working hours.** **Review vendor specifications and accept site plant & vehicles, in particular heavy vehicles, based on noise generation (as far as practical).** **The movement of heavy vehicles during the night will be avoided wherever practical.** **Where available in country, audible reversing alarms with broadband noise (white noise) should be preferred over tone alarms (beeping), to limit external disturbance to communities.** **Where construction vehicles will be operating in close proximity to the accommodation camps, the need for trucks to reverse will be minimized as far as practicable. This is so as to reduce the frequency at which disturbing but necessary reverse warnings sirens will be used.** **Speed limits established in the Traffic Management Plan will be adhered to.**	**Minor (L)**
Construction vibration impacts (including vehicle vibration)	**Waste Processing Facility & Residential Areas**	**Marginal**	**Very Likely**	**Moderate (M)**	**The Contractors will, at all times, carry out all works in such a manner to keep any disturbance from vibration to a minimum.** **Wherever practical, all vibratory generating equipment and activities shall be sited away from the Project boundary.** **Vibrating equipment/machinery will be switched off when not in use.**	**Minor (L)**

Potential Impacts	Receptor	Severity	Probability	Significance of Impact (without Impact Mitigation Measures)	Mitigation and Management Measures	Significance of Residual Impact
Impacts to Construction Workers & Accommodation Areas Located at the Project site	**Site Workers**	**Critical**	**Certain**	**High (H)**	**Where noise levels exceed 80dB(A) noise protection devices will be provided to personnel on-site and the area marked as a high-noise zone where ear protection is mandatory. Note: 80dB(A) is aligned with Uzbekistan noise standards.** **Operators of vibrating hand-held machinery (if any) will be provided with appropriate PPE (e.g. protective gloves and ear muffs/plugs) and be given suitable breaks from using such equipment to reduce the impacts of vibration.** **Workers potentially exposed to high noise and vibration shall be provided with appropriate PPE with respect to the occupational H&S risk assessment conducted for that activity.** **Workers potentially exposed to high noise and vibration shall be trained to identify situation when PPE is required to be worn and how to effectively utilise the PPE.** **These mitigation measures shall be incorporated to the applicable occupational H&S plan being developed by the EPC Contractor and implemented on-site.** **The Occupational H&S Plan shall include measures to reduce the risk of potential sleep disturbance to workers (who may work both day and night shifts). Where practical the benchmark for noise in the sleeping areas shall be taken against the WHO Guidelines for Community Noise (2011) of 30dB (LAeq,8h).** **Worker accommodation facilities should be located further away from the construction areas and facilities such as canteens and laundry rooms positioned in a way that creates a buffer zone between the sleeping areas and construction areas.** **Where applicable, the worker accommodation facilities at the Project site should be constructed with walls and windows that reduce noise (such as double-glazed windows, noise cancelling shutters or blinds, etc.).** **If necessary, solid walls (rather than wire fences) may be required to fence the accommodation area.** **Where noisy activities are located in close proximity to the EPC accommodation facilities, stockpiling of materials could be considered between the source of noise and the camp so as to provide acoustic screening.**	**Moderate (M)**

6.3.2 Operational Phase

In scope of the project, 2 Gas Turbines + 2 Heat Recovery Steam Generators + 1 Steam turbines will be operated. Under consideration of an unabsorbing inner lining, the following room averaged sound pressure levels will be expected during normal operation: (excluding offices and recreation rooms):

- Turbine building 90 dB(A),
- Circulating water pump area 95 dB(A),
- Building for water treatment plant 90 dB(A).

Additionally, IFC/WBG General EHS Guidelines indicate that "Limits for vibration and action values, (i.e. the level of exposure at which remediation should be initiated) are provided by the American Conference of Governmental Industrial Hygienists. Exposure levels should be checked on the basis of daily exposure time and data provided by equipment manufacturers."

Moreover, the Project commits that the following room average sound pressure levels will not be exceeded inside the Plant in rooms which are provided for or which require the constant presence of staff:

- Main control room and offices 50 dB(A),
- Local control rooms 70 dB(A),
- Areas of computers 75 dB(A),
- Workshop and stores 85 dB(A).

The contribution of noise caused by the inventory in these rooms, e.g., workshop machines, as well as that caused by the staff is not taken into consideration.

The sound power level of each noise source was calculated by distributing it to 4-octave bands (see Table 60). Total sound power level, 500 Hz, 1000 Hz, 2000 Hz and 4000 Hz octave band sound power level calculations are used in the following formula. In the calculations, it is assumed that the total sound power levels are equally distributed on 4-octave bands.

Lw (i) = 10 * log (10 (Lw / 10) / 4)

Lw = Sound power level of the source (dB)

Table 60: Distribution of Noise Sources Sound Power Levels in Octave Bands in Operation Phase

Noise Sources	Total	Sound Power Level (dB)			
		500 Hz	1000 Hz	2000 Hz	4000 Hz
Turbine Building	**90**	**84**	**84**	**84**	**84**
Circulating Water Pomp Area	**95**	**89**	**89**	**89**	**89**
Building for Treatment Plants	**90**	**84**	**84**	**84**	**84**

Sound pressure levels of each sources based on 4-octave bands are given in Table 61.

Table 61: Sound Pressure Levels of Noise Sources in Operation Phase

Noise Source	Distance (m)	Sound Pressure Level (dB)			
		500 Hz	1000 Hz	2000 Hz	4000 Hz
Turbine Building	**50**	**39.01**	**39.01**	**39.01**	**39.01**
	100	**32.99**	**32.99**	**32.99**	**32.99**
	250	**25.03**	**25.03**	**25.03**	**25.03**
	500	**19.01**	**19.01**	**19.01**	**19.01**
	1000	**12.99**	**12.99**	**12.99**	**12.99**
	2000	**6.97**	**6.97**	**6.97**	**6.97**
	4000	**0.95**	**0.95**	**0.95**	**0.95**
Circulating Water Pomp Area	**50**	**44.01**	**44.01**	**44.01**	**44.01**
	100	**37.99**	**37.99**	**37.99**	**37.99**
	250	**30.03**	**30.03**	**30.03**	**30.03**
	500	**24.01**	**24.01**	**24.01**	**24.01**
	1000	**17.99**	**17.99**	**17.99**	**17.99**
	2000	**11.97**	**11.97**	**11.97**	**11.97**
	4000	**5.95**	**5.95**	**5.95**	**5.95**
Building for Treatment Plants	**50**	**39.01**	**39.01**	**39.01**	**39.01**
	100	**32.99**	**32.99**	**32.99**	**32.99**
	250	**25.03**	**25.03**	**25.03**	**25.03**
	500	**19.01**	**19.01**	**19.01**	**19.01**
	1000	**12.99**	**12.99**	**12.99**	**12.99**
	2000	**6.97**	**6.97**	**6.97**	**6.97**
	4000	**0.95**	**0.95**	**0.95**	**0.95**

As a result of the calculation with the correction factors, the sound levels of the 4-octave bands of each noise source were calculated (see Table 62).

Table 62: Sound Pressure Levels of Corrected Noise Sources in Operation Phase

Noise Source	Distance (m)	Sound Power Level (dB)			
		500 Hz	1000 Hz	2000 Hz	4000 Hz
Turbine Building	**50**	**35.81**	**39.01**	**40.21**	**40.01**
	100	**29.79**	**32.99**	**34.19**	**33.99**
	250	**21.83**	**25.03**	**26.23**	**26.03**
	500	**15.81**	**19.01**	**20.21**	**20.01**
	1000	**9.79**	**12.99**	**14.19**	**13.99**
	2000	**3.77**	**6.97**	**8.17**	**7.97**
	4000	**-2.25**	**0.95**	**2.15**	**1.95**
Circulating Water Pomp Area	**50**	**40.81**	**44.01**	**45.21**	**45.01**
	100	**34.79**	**37.99**	**39.19**	**38.99**
	250	**26.83**	**30.03**	**31.23**	**31.03**
	500	**20.81**	**24.01**	**25.21**	**25.01**
	1000	**14.79**	**17.99**	**19.19**	**18.99**
	2000	**8.77**	**11.97**	**13.17**	**12.97**
	4000	**2.75**	**5.95**	**7.15**	**6.95**
Building for Treatment Plants	**50**	**35.81**	**39.01**	**40.21**	**40.01**
	100	**29.79**	**32.99**	**34.19**	**33.99**
	250	**21.83**	**25.03**	**26.23**	**26.03**
	500	**15.81**	**19.01**	**20.21**	**20.01**
	1000	**9.79**	**12.99**	**14.19**	**13.99**
	2000	**3.77**	**6.97**	**8.17**	**7.97**
	4000	**-2.25**	**0.95**	**2.15**	**1.95**

Atmospheric absorption values at specific distances for each frequency were calculated using the following formula and calculated values are given in Table 63.

Waste (Atmospheric Swallow) = 7.4 * 10-8 (f2 * r / H) dB

f = frequency of noise source / center frequency of frequency band (Hz)

r = Distance from source (m)

H = Relative humidity of air (%) (According to the data recorded in Termez Meteorological Station for the years 2018, 2019 and 2020, 47% is taken.)

Table 63: Atmospheric Absorption Values Calculated Based on Distance

Frequency (Hz)	Distance (m)	Atmospheric Swallow
500	**50**	**0.020**
500	**100**	**0.039**
500	**250**	**0.098**
500	**500**	**0.197**
500	**1000**	**0.394**
500	**2000**	**0.787**
500	**4000**	**1.574**
1000	**50**	**0.079**
1000	**100**	**0.157**
1000	**250**	**0.394**
1000	**500**	**0.787**
1000	**1000**	**1.574**
1000	**2000**	**3.149**
1000	**4000**	**6.298**
2000	**50**	**0.315**
2000	**100**	**0.630**
2000	**250**	**1.574**
2000	**500**	**3.149**
2000	**1000**	**6.298**
2000	**2000**	**12.596**
2000	**4000**	**25.191**
4000	**50**	**1.260**

Frequency (Hz)	Distance (m)	Atmospheric Swallow
4000	100	2.519
4000	250	6.298
4000	500	12.596
4000	1000	25.191
4000	2000	50.383
4000	4000	100.766

After deducting the atmospheric absorption values, the net sound levels of the 4-octave bands of each noise source were calculated using the formula LP = LPort - Aatm (see Table 64).

Table 64: Clear Sound Levels of Noise Source Based on Distance in Operation Phase

Noise Source	Distance (m)	Sound Level (dBA)				Total Sound Level (dBA)
		500 Hz	1000 Hz	2000 Hz	4000 Hz	
Turbine Building	50	35.79	38.93	39.90	38.75	44.605
	100	29.75	32.83	33.56	31.47	38.153
	250	21.73	24.64	24.66	19.73	29.170
	500	15.61	18.22	17.06	7.41	22.019
	1000	9.40	11.42	7.89	0.00	14.729
	2000	2.98	3.82	0.00	0.00	8.060
	4000	0.00	0.00	0.00	0.00	6.021
Circulating Water Pomp Area	50	40.79	43.93	44.90	43.75	49.605
	100	34.75	37.83	38.56	36.47	43.153
	250	26.73	29.64	29.66	24.73	34.170
	500	20.61	23.22	22.06	12.41	27.019
	1000	14.40	16.42	12.89	0.00	19.627
	2000	7.98	8.82	0.57	0.00	12.053
	4000	1.17	0.00	0.00	0.00	6.345
Building for Treatment Plants	50	35.79	38.93	39.90	38.75	44.605

Noise Source	Distance (m)	Sound Level (dBA)				Total Sound Level (dBA)
		500 Hz	1000 Hz	2000 Hz	4000 Hz	
	100	**29.75**	**32.83**	**33.56**	**31.47**	**38.153**
	250	**21.73**	**24.64**	**24.66**	**19.73**	**29.170**
	500	**15.61**	**18.22**	**17.06**	**7.41**	**22.019**
	1000	**9.40**	**11.42**	**7.89**	**0.00**	**14.729**
	2000	**2.98**	**3.82**	**0.00**	**0.00**	**8.060**
	4000	**0.00**	**0.00**	**0.00**	**0.00**	**6.021**

The total sound level during the construction phase is calculated using the following formula.

LT = Total sound level (dBA)

$LT = 10\log\sum 10Li / 10$

Equivalent noise levels, assuming that all machines in operation phase are given below (see Table 65).

Table 65: Clear Sound Levels of Noise Sources Depending on Distance in Operation Phase

Distance (m)	L(day,evening,night,) (dBA)
50	**51.73**
100	**45.28**
250	**36.30**
500	**29.15**
1000	**21.80**
2000	**14.60**
4000	**10.90**

For the construction phase, summary of background noise levels at the measurement points, noise level caused from construction activities and national and international standards are given in Table 66.

Table 66: Summary of Noise Levels Caused from Operation Phase, Background Noise Measurements and National and International Limits

Receptor	Distance (m)	Background Noise Measurements (dBA) Daytime (07:00 to 23:00)	Night-time (23:00 to 07:00)	Noise Caused By Operation Activities (dBA)	IFC's EHS Guidelines Maximum Increase in Background Levels of 3 (dBA) (max limit during construction) Total Cumulative noise (according to night time)	IFC's EHS Guidelines Maximum Increase in Background Levels of 3 (dBA) (max limit during construction) Total Cumulative noise	Night-time (23:00 to 07:00)	IFC's EHS Guidelines Daytime (07:00 to 23:00)	Night-time (23:00 to 07:00)
Waste Processing Facility Measurement Point-1	**250**	**44.41**	**37.45**	**36.30**	**45.0**				
Settlement Measurement Point-2	**990**	**41.61**	**36.90**	**21.79**	**41.7**	**55**	**45**	**55**	**45**
Settlement Measurement Point-3	**1,690**	**40.14**	**38.52**	**18.32**	**40.2**				
Settlement Measurement Point-4	**2,980**	**41.74**	**41.05**	**12.47**	**41.7**				

As seen form Table 66, noise levels during operation phase of the project is under the limit values specified for the day and night time in both national and international limits.

In addition to this, it is stated in IFC's EHS Guidelines that noise levels should not exceed the levels presented in Table 66, or result in a maximum increase in background levels of 3 dB at the nearest receptor location off-site. The baseline noise level measurement results and the noise level calculations are given in Table 66 and there is no any increase in background levels of 3 dB.

Vibration

Vibration associated with the operation of the CCGT plant is anticipated to be minimal. Minimal vibrations associated with the standard operation of the plant or machinery dissipate rapidly as they spread due to losses of energy radiating 360 degrees from the source and are only anticipated to have a negligible impact at Waste Processing Facility receptor.

Noise Impacts to Site Workers

Site workers will be exposed to varying levels of noise depending on their specific roles and activities being conducted. This may relate to exposure to noise in areas that are considered 'high' (e.g. above occupational health and safety guidelines), Without mitigation, noise impacts to the workforce could results in health impacts, for example hearing damage.

6.3.2.1 Assessment of Impacts and Mitigation Measures

By using impact assessment significance criteria approach, key potential impacts and countermeasures on air quality for the construction phase are presented in Table 67.

Table 67: Impacts Significance of the Noise and Vibration during – Operation Phase

Potential Impacts	Receptor	Severity	Probability	Significance of Impact (without Impact Mitigation Measures)	Mitigation and Management Measures	Significance of Residual Impact
Operational Noise – Noise from CCGT, control rooms, machine rooms, etc.	**Waste Processing Facility & Residential Areas**	**Marginal**	**Likely**	**Moderate (M)**	**Cooling fans could be installed with inlet and exhaust mufflers.**	**Minor (L)**
Impacts to Workers	**Site Workers**	**Critical**	**Certain**	**High (H)**	**Where noise levels exceed 80dB(A) noise protection devices will be provided to personnel on-site and the area marked as a high-noise zone where ear protection is mandatory. Note: 80dB(A) is aligned with Uzbekistan noise standards.** **Operators of vibrating hand-held machinery (if any) will be provided with appropriate PPE (e.g. protective gloves and ear muffs/plugs) and be given suitable breaks from using such equipment to reduce the impacts of vibration.** **Workers potentially exposed to high noise and vibration shall be provided with appropriate PPE with respect to the occupational H&S risk assessment conducted for that activity.** **Workers potentially exposed to high noise and vibration shall be trained to identify situation when PPE is required to be worn and how to effectively utilize the PPE.** **These mitigation measures shall be incorporated to the applicable occupational H&S plan being developed by the EPC Contractor and implemented on-site.**	**Moderate (M)**

6.4 CUMULATIVE IMPACTS

The purpose of a cumulative impact assessment is to determine how the potential impacts of a proposed development might combine cumulatively, with the potential impacts of other projects or human activities as well as natural stressors such as droughts or extreme climatic events. Summary of Cumulative Impacts of Noise & Vibration is presented in Table 68.

Table 68: Summary of Cumulative Impacts of Noise & Vibration

Environmental & Social Aspects	Construction	Operation
Noise & Vibration		
Cumulative Impacts	**No cumulative impact is expected if construction periods do not coincide.** **If construction period coincide, cumulative impact will occur at receptors within the area of influence which is defined as 10 km in this ESIA.** **Receptors within the area of influence may be temporarily impacted by the cumulative impact from the increase in ambient noise due to operation of construction machinery and equipment.**	**The cumulative Project and ambient noise levels do not increase the existing noise levels by more than 3dB(A), which aligns with the WBG EHS Guidelines where existing baseline is in excess of the applicable standard.**

6.5 MONITORING

The EPC Contractor and the Project owner will need to undertake noise monitoring on a periodic basis during both the construction, commissioning and operational phases of the project respectively. The minimum expected requirements for the noise monitoring are outlined in Table 69.

Table 69: Monitoring Requirements of Noise

Source	Parameters	Duration	Location
Construction and Commissioning Phase			
Day Time Noise	**Leq (A)**	**Monthly and if there is complaint for 10-15 minutes periods at each location**	**Baseline receptor locations and at Project boundaries.**
Night Time Noise	**Leq (A)**		
Operation Phase			
Day & night noise	**Leq (A)**	**Quarterly and if there is complaint for 10-15- minute periods at each location**	**Baseline receptor locations and at Project boundaries.**

In the event of a recorded exceedance during noise monitoring a process to investigate and take appropriate corrective actions will be outlined in the overarching 'Environmental Monitoring Plan'.

Occupational Health and Safety Monitoring

Where noise or hearing related grievances are received form the workforce, these shall be further investigated and as applicable hearing tests to applicable workers will be necessary.

7. WATER RESOURCES AND WATER ENVIRONMENT

7.1 STANDARDS AND REGULATORY REQUIREMENTS

7.1.1 National Regulations

The relevant legislation on the water resources and water environment in Uzbekistan is given below:

- Law "On Water and Water Use", No. 837-XII dated May 06, 1993 (as amended on April 21, 2021);
- Resolution of the Cabinet of Ministers of the RUz" On Approval of the Regulation on Water Protection Zones Sanitary Protection Zones of Water Bodies in The Territory of the RUz" No. 981 dated December 11, 2019.

Main objectives of the Law "On Water and Water Use", are to ensure the rational use of water for the needs of the population and economic sectors, protect water from pollution, contamination and depletion, prevent and eliminate the harmful effects of water, improve the condition of water bodies, as well as protect the rights and legitimate interests of enterprises, institutions, organizations, farms, dekhkan farms and citizens in the field of water relations.

Resolution of the Cabinet of Ministers of the RUz No.981, determines the procedure for establishing water protection zones and sanitary protection zones for water bodies on the territory of the RUz, as well as the regime for carrying out economic activities in these zones to prevent pollution, clogging, and depletion of water resources, effective use of water bodies and rational management of water resources.

In related with the project, the regulation sets a water protection zone around water canals and lake for the protection of the water bodies from industrial activities or construction works. It is understood that a water protection zone of 150 m is applicable for the Uchkizil lake according to the article 18 based on a water volume in the lake of ≈0.2 billion m^3 (see Figure 13).

For drinking, domestic water supply, as well as for other needs of the population, water bodies are provided, the water quality of which meets the established sanitary and hygienic requirements and state standards. Ambient water quality is regulated through sanitary norm and standard in Uzbekistan which are given below:

- SanPiN RUz No. 0318-15 "Hygienic and anti-epidemic requirements for the protection of water in reservoirs on the territory of the RUz."
- SanPiN RUz No. 0173-04 "Sanitary and hygienic requirements for the protection of groundwater from pollution in the specific conditions of Uzbekistan."
- SanPiN No. 0255-08 "The main criteria for hygienic assessment of the degree of pollution of water and water bodies in terms of danger to public health in Uzbekistan."
- SanPİN No. 0202-06 "The procedure for issuing permits for special water use, development and approval of projects of maximum Permissible discharges (MPD) of substances entering with wastewater into water bodies and on the terrain."

- List of Maximum permissible concentration (MPC) of pollutants in water by categories of watercourse use.
- State standard O'z DSt 951:2011 "Sources of centralized household water supply. Hygienic, technical requirements and classification code"
- State standard O'z DSt 950:2011 "Drinking water. Hygienic requirements and quality control"

Subject to the purpose of use, watercourses could be categorized as for domestic use (could be used as a source for drinking water after treatment), cultural&service and fishery, communal use in Uzbekistan. Uzbekistan general effluent standards into the water bodies are classified by type of use and presented in Table 70.

Table 70: General Water Standards

Indicators	Purpose of water use			
	Domestic use	Cultural and service	Fishery needs Highest and first category	Second category
Suspended solids	**Compared with the natural conditions the content of suspended solids at wastewater discharge shall not be increased by more than** **0.25 mg/dm³**	**0.75 mg/dm³**	**0.25 mg/dm³**	**0.75 mg/dm³**
	For reservoirs and watercourses containing at low water above 30 mg/dm³ suspended solids, there may be an increase to 5%. Suspensions with fallout rate of more than 0.4 mm/s for watercourses and more than 0.2 mm/s for discharge lake are prohibited			
Floating matter	**There shall not be a film of oil products and concentrations of other contaminants on the water surface**			
Color	**Shall not be detected in the column of height** **20 sm**	**10 sm**	**There shall be no foreign colour**	
Smell and test	**Intensity of more than 1 point is not permitted**		**Water must not give extraneous odours and flavours to fish meat**	
Temperature	**Temperature of water at the discharge point must not exceed 3ºC in comparing with average monthly temperature of the hottest month**		**Temperature of water at the discharge point must not exceed 5ºC in comparing average monthly temperature of the hottest month. Increasing of temperature more than 28 ºC in summer and till 8ºC in winter is not allowed**	

Indicators	Purpose of water use		Fishery needs	
	Domestic use	Cultural and service	Highest and first category	Second category
Hydrogen exponent (pH)	**Shall not beyond 6.5 8.5 pH**		**Shall not beyond 6.5 8.5 pH**	
Mineralization	**Shall not exceed by dry residue 1000 mg/dm³, including chlorides - 350mg/dm³ and sulphates - 500 mg/dm³**		**Rated according to water bodies intoxications**	
Dissolved oxygen	**No less than 4 mg/dm³ in any period of the year in a sample taken by 12 a.m. on the same day**		**In winter shall be no less than 6 mg/dm³ No less than 6 mg/dm³ in any period of the year in a sample taken by 12 a.m. on the same day**	
BOD	**At 20ºC must not exceed 3.0 mg/dm³**	**6.0 mg/dm³**	**At 20 º C shall not exceed 3.0 mg/dm³ if in winter the dissolved oxygen content in the water of the first* category fishing water bodies fell to 6.0 mg/dm³, and in the second** – to 4 mg/dm³, then discharge in them is only permitted to wastewater that does not change the BOD**	
COD	**Shall not exceed 15.0 mg/dm³**	**30.0 mg/dm³**	**-**	**-**
Causative agent (of a disease)	**Not allowed**			
Chemicals (pollutants)**	**Shall not be contained in concentrations exceeding the MAC**			

** The first category includes water bodies, where valuable fish species highly sensitive to oxygen are kept and reproduced in.*

*** The second group includes water bodies used for other aquatic economy needs.*

The List of MPC of pollutants in water by categories of watercourse use (see Table 71) is a document of Centre for Specialized Analytical Control in the Field of Environmental Protection. This list establishes the national water quality standards depends on the purpose of the usage water body. Since Uchkizil lake has aquatic life in it, it is accepted as fishery reservoir according to the regulation.

Table 71: Maximum permissible concentration (MPC) of pollutants in water by categories of watercourse use, mg / l

Parameter	Category of the watercourse			
	Fishery	Cultural and household	Potable	Irrigation
COD	15	40	30	40
BOD20, mgO / l	3	3-6	3-7	10
pH	6.5-8.5	6.5-8.5	6.5-8.5	6.5-8.5
Suspended particles	15	30	30	50
Mineralization, including:	1000	1000	1000-1500	1000
Sulfates (SO4)	100	500	400-500	-
Chlorides	300	350	400-500	-
Ammonium nitrogen (NH4)	0.5	2.	0.5	1.5
Nitrite nitrogen (NO2)	0.02	0.5	3	0.5
Nitrite nitrogen (NO3)	9.1	25	45	25
Nitrite	0.08	3.3	3	-
Nitrates	40	45	45	-
Phosphates (PO43)	0.3	1	3.5	1
Ether-soluble	0.05	0.8	0.8	0.8
Petroleum products	0.05	0.3	0.1	0.3
SPAV	0.1	0.5	0.5	0.5
Phenol	0.001	0.001	0.001-0.1	0.001
Fluorine (F)	0.05	1.5	0.7	1
Arsenic (As)	0.05	0.05	0.05	0.1
Iron (Fe)	0.05	0.5	0.3-3	5
Chromium (Cr6)	0.001	0.1	0.05	0.1
Copper (Cu)	0.001	1	1	1

Parameter	Category of the watercourse			
	Fishery	Cultural and household	Potable	Irrigation
Zinc (Zn)	**0.01**	**1**	**3**	**5**
Cyanide	**0.05**	**0.1**	**-**	**-**
Lead (Pb)	**0.03**	**0.1**	**0.03**	**0.2**
Nickel (Ni)	**0.01**	**0.1**	**0.1**	**-**
Cadmium (Cd)	**0.005**	**0.01**	**-**	**-**
Cobalt (Co)	**0.1**	**1**	**-**	**-**
Molybdenum (Mo)	**0.0012**	**0.5**	**0.25**	**-**
Strontium (Sr2)	**-**	**2**	**7**	**-**
Saline (Se)	**0.001**	**-**	**0.01**	**-**
Rodanids	**0.1**	**-**	**-**	**-**
Mercury (Hg)	**-**	**0.005**	**0.0005**	**-**
Coloration	**20 cm.**	**-**	**10 cm.**	**-**
Smells	**The water should not acquire odors with an intensity of more than 2 points, detected by:**			
	directly or with subsequent chlorination	**-**	**directly**	**-**
Floating impurities	**Films of oil products, oils, fats and the accumulation of other impurities should not be found on the surface of the water**			
Temperature	**Summer water temperature as a result of wastewater discharge should not be exceeded by more than 3ºC, compared to the average monthly water temperature of the hottest month of the year over the past 10 years**			

According to SanPİN No. 0202-06, "The norms of maximum permissible discharges of harmful substances are established for each source of pollution, based on the conditions of inadmissibility of exceeding the maximum permissible concentrations of harmful substances in water bodies and its intended use. These limits are established and approved by the State Committee Ecology and Environmental Protection.

In all cases, the MPD will consider the existing background natural water quality for the body of water into which effluents will be discharged and the water quality objectives for the classification applied to the waterbody, which is Uchkizil Lake for this Project.

In no case will the MPD be set below the current background natural water quality value (in the case of polluted water bodies) or lower than the MPC set for category of water to be discharged into (for non-polluted water courses).

Moreover, in terms of compliance with the requirements of the resolution of the Cabinet of Ministers of the RUz, the enterprise will ensure the implementation of appropriate measures to ensure the protection of waters from pollution, clogging and depletion, as well as improve the state and regime of water use in Lake Uchkizil. In particular, in the water protection zone with a width of at least 150 meters from industrial buildings and structures to the water edge of Lake Uchkizil.

7.1.2 Lender Requirements

7.1.2.1 International Finance Corporation (IFC)

The IFI's applicable water use and discharge standards for the Project are given below:

- Guidance values for drinking water quality established by the World Health Organization (WHO, 2011) - IFC General EHS Guidelines
- IFC Environmental, Health, and Safety Guidelines for Thermal Power Plants
- EU BAT Reference (BREF) Note - Large Combustion Plant (LCP)

IFC PS3 for Resource Efficiency and Pollution Prevention, state that "recognizes that increased economic activity and urbanization often generate increased levels of pollution to air, water, and land, and consume finite resources in a manner that may threaten people and the environment at the local, regional, and global levels". Specifically, for water consumption, PS3 requires that the client (in addition to applying resource efficiency measures) shall adopt measures that avoid or reduce water usage so that the Project's water consumption does not have a significant adverse impact on others. These measures include, but are not limited to, the use of additional technically feasible water conservation measures within the client's operations, the use of alternative water supplies, water consumption offsets to reduce total demand for water resources to within the available supply, and evaluation of alternative project locations.'

According to Environmental Water Quality, all kinds of drinking water sources should always be protected to meet or not exceed applicable national regulations. In the absence of national restrictions, the current WHO Guidelines for Drinking-Water Quality should be consulted. The quality of the water should comply with national standards even when the project is transmitted to the community or to the users of the project infrastructure where water can be used for drinking, cooking, washing and bathing.

The IFC, a member of the World Bank Group, has produced General EHS Guidelines that apply to investment projects in various industry sectors. Also, Project will be required to meet EU Best Available Techniques (BAT) and related emission and discharge standards, regardless of location. The relevant limit values for Thermal Power Plants wastewater are given in Table 72 with EU BAT Reference (BREF) Note.

General EHS Guidelines state that "If sewage from the industrial facility is to be discharged to surface water, treatment to meet national or local standards for sanitary wastewater discharges or, in their absence, the indicative guideline values applicable to sanitary wastewater discharges shown in Table 73.

Table 72: Effluent Discharge Requirements

Parameter	IFC EHS Guidelines Thermal Power Plant (Table 5 – effluent guidelines)[7] mg/l, except pH and temperature(unless stated)/General EHS Guidelines	EUBAT Conclusions/ BAT-AEL mg/l (daily average) unless stated
pH	**6-9**	
TSS	**50**	**10-30**
Oil and Grease	**10**	**-**
Total Chlorine Residual	**0.2**	**-**
Fluoride	**-**	**10-25**
(Total)Chromium (Cr)	**0.5**	**10-50 µg/l**
Copper (Cu)	**0.5**	**10-50 µg/l**
Iron (Fe)	**1.0**	**-**
Zinc (Zn)	**1.0**	**10-20 µg/l**
Lead (Pb)	**0.5**	**10-20 µg/l**
Cadmium (Cd)	**0.1**	**2-5 µg/l**
Nickel (Ni)	**-**	**10-50 µg/l**
Mercury (Hg)	**0.005**	**0.2 – 3 µg/l**
Arsenic (As)	**0.5**	**10 to 50**
Phosphorous	**0.5**	
Salinity (dry residue)	**-**	**20-50**
Chemical consumption oxygen	**-**	**60-150**

[7] To be applicable at relevant wastewater stream: e.g. from FGD system, wet ash transport, washing boiler, air preheater and precipitator, boiler acid washing, regeneration of demineralisers and condensate polishers, oil-separated water, site drainage, coal pile runoff and cooling water

Parameter	IFC EHS Guidelines Thermal Power Plant (Table 5 – effluent guidelines)[7] mg/l, except pH and temperature(unless stated)/General EHS Guidelines	EUBAT Conclusions/ BAT-AEL mg/l (daily average) unless stated
Temperature increase by thermal discharge from cooling system	**3 degrees[8]**	

Table 73: Treated sanitary waste water discharge requirements

Pollutants	IFC/WBG General EHS Guidelines (2007), Table 1.3.1 Indicative Values for Treated Sanitary Sewage Discharges mg/l
pH	**6-9**
BOD	**30**
COD	**125**
Total nitrogen	**10**
Total phosphorus/ Tricresyl phosphate (UZB)	**2**
Oil and Grease	**10**
Total Solids Suspended	**50**

7.2 NATIONAL CONTEXT

Water resources in Uzbekistan consist of the surface runoff of Amudarya and Surkhandarya rivers (55%), small rivers (33%), underground water (approximately 10%) and collector/drainage waters (2%). All watercourses in Uzbekistan are attributed to the Aral Sea basin. The Surkhandarya is a primary right tributary of the Amudarya in Uzbekistan. It is formed at the confluence of the rivers Karatag and To'polondaryo near the city Denov. It flows into the Amudarya in the city Termez. The river is 175 kilometres long (287 km including its source river Karatag) and has a basin area of 13,500 km^2.

[8] The effluent will be result in a temperature change of no more than 3°C at the edge of a scientifically established mixing zone which takes into account ambient water quality, receiving water use, potential receptors, and assimilative capacity. The EA for a specific project may specify a more stringent temperature change guideline

The construction site of the SCE-1600 MW power plant is located on the shore of the Uchkizil lake.

The Uchkizil lake is located on the lower reaches of the Surkhandarya (Surkhan River), 14 km northwest of the city of Termez and is part of Amudarya (Amu River) basin.

The Uchkizil lake is located in a natural horseshoe-shaped basin within the Kattakum tract near the Uchkizil irrigation reservoir.

The Uchkizil lake is a seasonally filled impoundment with a total volume of 160 million m^3 80 million m^3 of which is usable, and is used to impound the autumn-winter runoff of the Surkhandarya River. It is filled from the main Zang canal through the lower Zang distributary and the feeder canal.

7.2.1 Basin Water Organisation of Amudarya (Amu Darya)

In 1992, BWO Amudarya became the executive body of Interstate Coordination Water Commission of Central Asia (ICWC) under the Almaty agreement signed by five countries - Republic of Kazakhstan, Kyrgyz Republic, Republic of Tajikistan, Turkmenistan and the Republic of Uzbekistan.

The Amudarya Basin Water Organization has 7 sub-organizations located in three countries (Tajikistan, Turkmenistan and Uzbekistan). The BWO manages and monitors the functions for the interstate distribution of Amudarya's water resources among the three riparian countries. It was created to assess and improve the management of water resources in the basin and to develop solutions to problems of water management of the Amudarya River and its main tributaries: The Pyanj River, the Vakhsh River and the Kafirnigan River.The location of Surkhandarya (Surkhan River) and relation to Amudarya (Amu Darya River) can be seen in Figure 35.

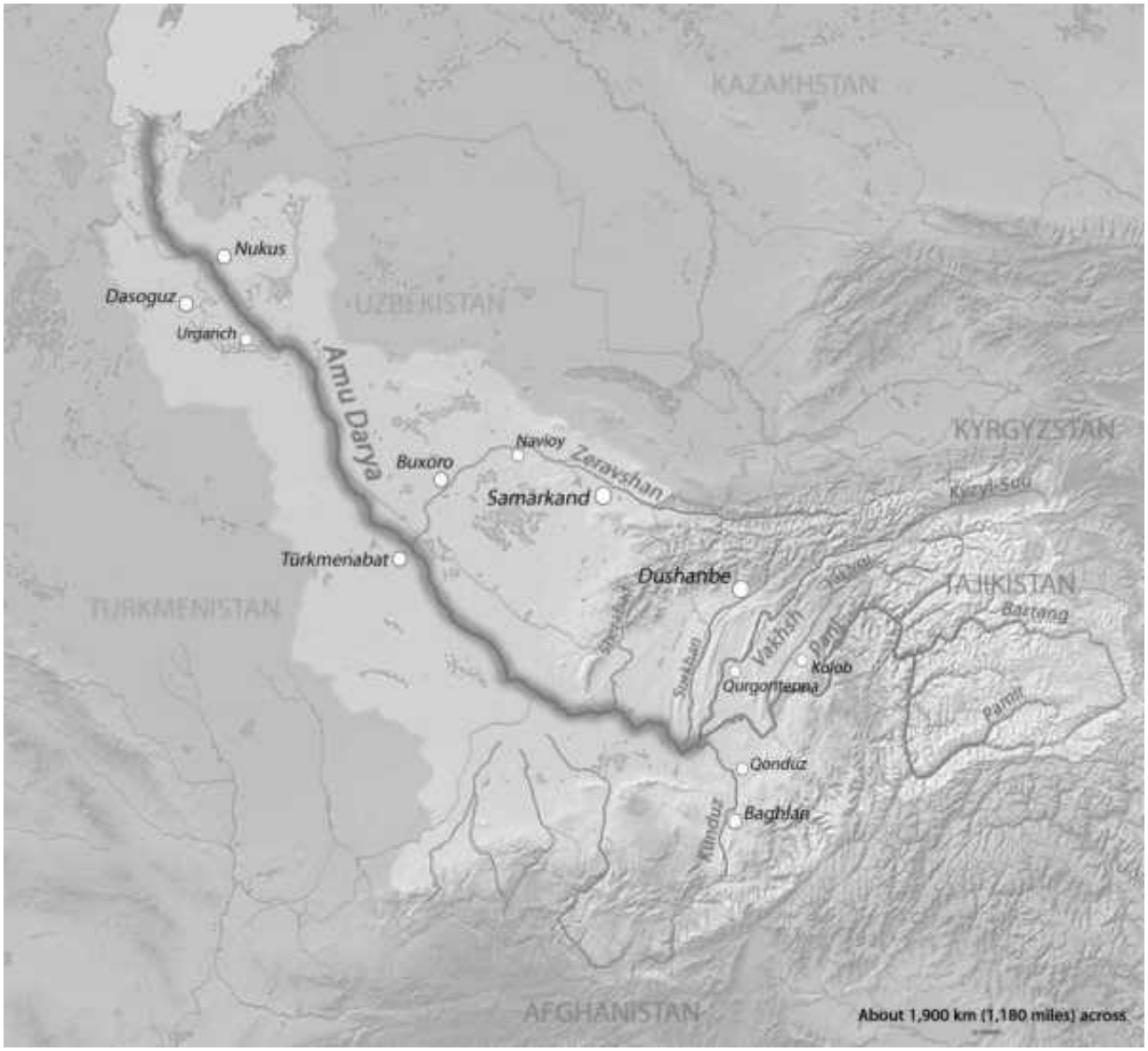


Figure 35: Amudarya River Basin

7.2.2 Existing Water Management Issues

7.2.2.1 Water Usage

The Amudarya River, the main river in the basin is a snow and glacier-fed river. The main volume of its flow originates from melting glaciers (44%), high-mountain snow and snowdrifts (37%). Rainwater runoff accounts for 1-2% and groundwater 16-18%.

The maximum flow rate of the Amudarya varies from 2800 to 6900 m^3/s (with an average maximum of 4450 m^3/s), with minimum values varying from 130 to 600, with an average minimum of about 325 m^3/s.

The Surkhandarya is one of the large tributaries of the Amudarya. The Surkhandarya basin is bounded by the Gissar Range to the north, by its south-western spurs to the west, and by the Babatag Mountains to the east; in the south it merges imperceptibly with the Amudarya Valley. The river is 200 km long and is formed by the confluence of the Karatag and Tupolang, the largest rivers in the basin. The annual flow of these rivers is 20 and 46%, respectively, of the total flow of the Surkhandarya. According to an FAO report, as of 2010 water used from Amu River is mostly for irrigation and agricultural purposes. Average Annual Water use by country of the Amu River can be seen in Table 74.

Table 74: Average Annual Water Use

Riparian Country	Average Annual Water Use in million m3	Share of Total Average Annual Water Use in %
Tajikistan	**7500**	**11**
Afghanistan	**500**	**7**
Uzbekistan	**33000**	**47**
Kyrgyzstan	**1500**	**2**
Turkmenistan	**23000**	**33**
Total	**70000**	**100**

**Ref: FAO Report [7]*

Surverys show that livelihoods in the vicinity of the project site are primarily based on irrigated agriculture. Since Uchkizil lake is fed by Surkhandarya via Zang Canal, the lake is expected to be highly loaded with macronutrients such as nitrogen and phosphorus, which come from surface runoff due to the use of fertilizers on agricultural land.

7.3 LOCAL CONTEXT

There is no natural waterway to the irrigation reservoir: the lake is supplied with water via constructed canals, mainly the Zang Canal, from Surkhandarya (Surkhan River). The capacity of the lake is about 200 million m^3 and the water collected in the lake is used for irrigation purposes in the dry seasons. The water collected in the lake is used for the irrigation of fields in Talashkan, Chinabad, Navshahar, Uchkizil and Kaftarhana towns. The lake is a seasonally filled reservoir with a total volume of 160 million m^3, of which 80 million m^3 is usable, and is used to store the autumn-winter runoff of the Surkhandarya River. It is filled from the Zang main channel via the Zang lower distributary channel and the feeder channel.

7.3.1 Water Resources Near the Project Site

The most readily available water source in the project area is Uchkizil irrigation reservoir which is fed from Surkhandarya via Zang Canal. The main natural water resource in the area is the Surkhandarya river which is 200 km long is formed by the confluence of the basin's largest rivers Karatag and Tupalang. The annual total flow is 20 and 46% of the total runoff of the Surkhandarya River. Their catchment areas, located on the southern slopes of the Gissar Ridge, are 634 to 2,200 km^2. On the

right side, the Surkhandarya River receives two tributaries with constant inflow: Sangardak and Hodzhaipak, with catchment areas of 901 and 762 km, respectively. The tributaries are fed by snow and glacier. After they leave the mountains, they are used for irrigation and runoff reaches the main river only during floods. The Surkhandarya River is also partially replenished with discharge collector water, small rivers and thinning in the river and its tributaries.[8]

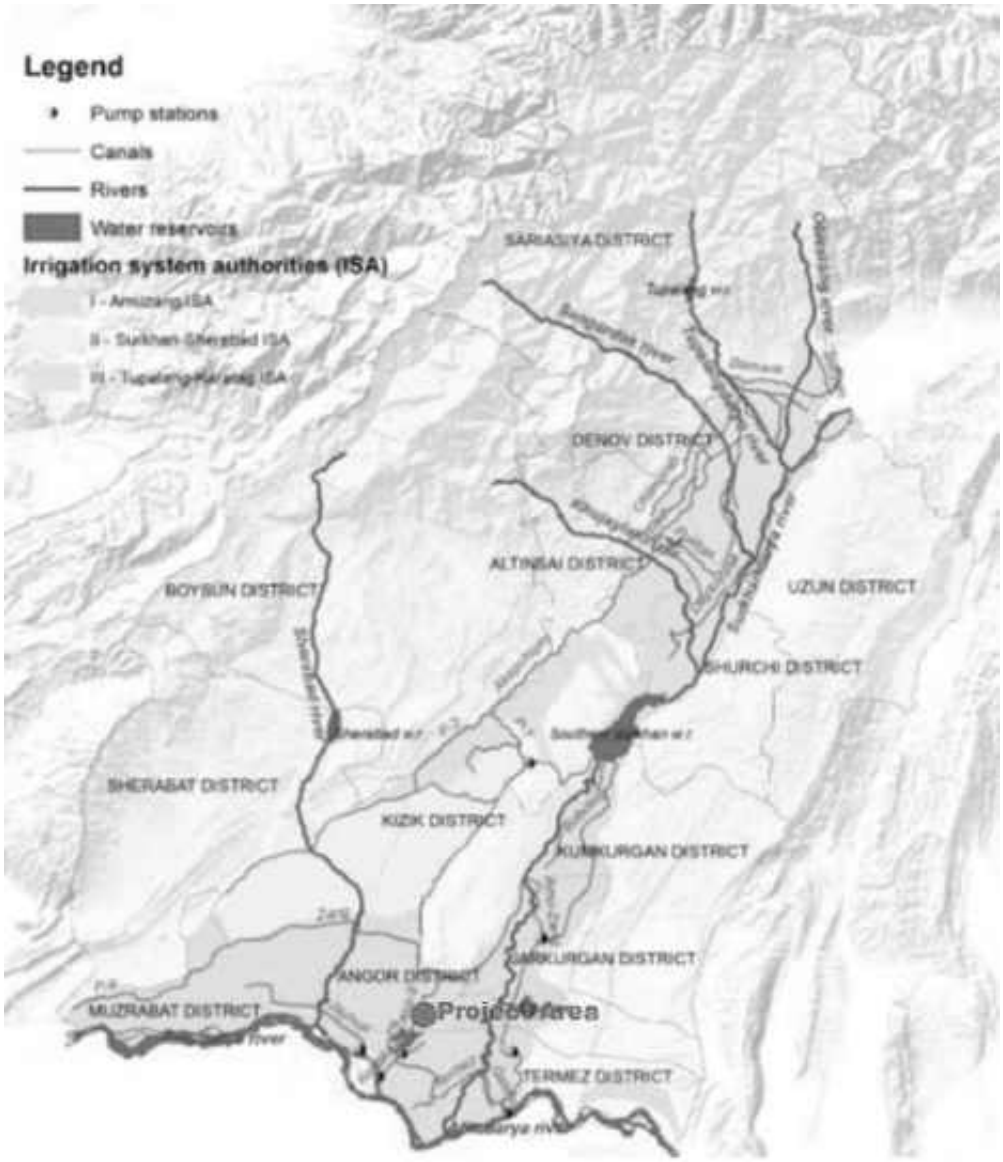


Figure 36: Irrigation System of Surkhandarya Province

7.4 BASELINE STUDIES

7.4.1 Water Quality

The main waterway of the Surkhandarya region is the Surkhandarya river, its length is 200 km, the basin area is 13,500 km^2, and the average water flow rate is 703 m^3/ s. Formed at the confluence of the Karatag and Tupalangdarya rivers the total surface inflow from the mountainous area of Surkhandarya river is equal to 128 m^3/s. In the upper reaches, the waters of the Surkhandarya River are carbonate rich, with a mineralization of 0.188 g/dm^3, in the middle and lower reaches, sulfate-hydrocarbonate, with a mineralization of 0.432-0.610 g/dm^3, average turbidity 850 g/dm^3, at the confluence with the Amudarya - 2700 g/dm^3. Floods last from April to August, the low water period - from September to February.

In the southern foothills part there are temporary streams that arise in the winter-spring period, which are fed by snow, snow-rain and spring. All of these belong to the Surkhandarya river basin. The rivers are small, 5-25 m wide, up to 1 m deep and have rocky, sandy and pebbly bottoms. Steep banks sometimes alternate with more gentle slopes. River floodplains are narrow, sometimes absent altogether.

The Uchkizil lake was built on the territory of the Project. The off-channel Uchkizil lake of seasonal regulation is located in the lower reaches of the Surkhandarya river, 14 km north-west of the city of Termez in the Angora district of the Surkhandarya region of the Republic of Uzbekistan. The Uchkizil lake was designed by the institutes of Sredazgiprovodkhlopok, Uzgiprovodkhoz and Hydroproject JSC. It was built in 1953-1957 and commenced with operations on December 29, 1957. The lake has been in operation for 64 years.

The Uchkizil lake stores the accumulation of the autumn-winter runoff and is intended to increase the water supply of the existing irrigated lands by 15,200 hectares and of new lands in the Termez and Angora districts by 6000 hectares. In addition, if necessary, the Termez Canal system can be replenished by the reservoir.

The surface water and sediment samples were taken at 2 (two) observation points (SW-01, SW-02) between July 9-16, 2021.

Table 75 shows the coordinates and location of sampling points for surface water (see Figure 37).

Table 75: Coordinates and location of sampling points for surface water

Number of monitoring station	Station location	Sampling points coordinates, deg/min/sec
SW-01	**Uchkizil reservoir**	**N = 37°22’26,7"** **E = 67°14’48,2"**
SW-02	**Zang Canal**	**N = 37°22’40,2"** **E = 67°14’32,0"**

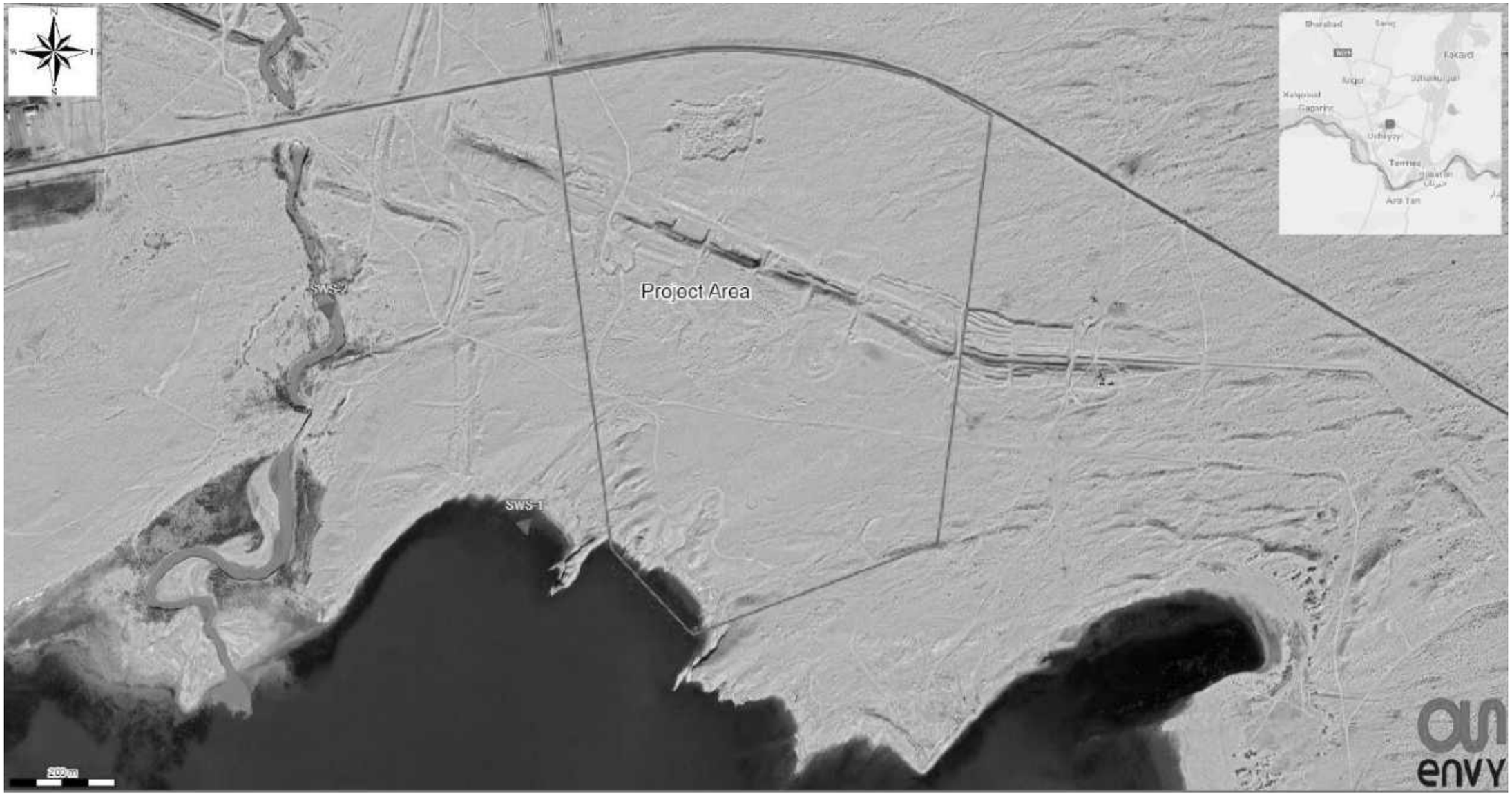


Figure 37: Location of surface water sampling points

Sampling and analysis were carried out in accordance with the established state standards according to the regulatory, methodological and instructive documents. Surface water Measurement were taken in accordance with GOST 31861-2012 "Water. General requirements for sampling".

Samples of surface water, groundwater, as well as bottom sediments were drawn up in accordance with the relevant Sampling Acts and delivered to the Center of Testing Laboratories Complex which is accredited in compliance with the requirements of the national accreditation system of the Republic of Uzbekistan O'z DSt ISO/IEC17025 for competence and independence.

The following parameters measured in-situ:

- Water temperature at the moment of sampling, °C;
- Hydrogen index (pH).

The sampling activities are presented Figure 38 and Figure 39.

Figure 38: Sampling of surface water from the Uchkizil lake at observation station SW-01

Figure 39: Sampling of surface water from the Zang Canal SW-02

Analysis methods consisted of:

- Photometric - based on the chemical transformation of harmful substances (ammonium nitrogen, nitrite nitrogen, nitrate nitrogen, phenols, phosphates, synthetic surfactants, hydrogen sulfide, aluminum, barium, cyanides, chromium (+6), COD) into color-intensive compounds when interacting with appropriate reagents, with subsequent measurement of the density of colored compounds at a certain wavelength and allowing quick measurements with a sufficiently high accuracy;
- Titrimetric - a method of quantitative / mass analysis (chlorides, sulfates, hydrocarbons, dissolved oxygen, BOD), based on measuring the volume of a reagent solution of a precisely known concentration being consumed for the reaction with the substance being determined;
- Gravimetric - a method of quantitative chemical analysis (mineralization, suspended matter), based on an accurate measurement of the mass of a substance;
- Complexometric - titrimetric method of determination (calcium, hardness), based on the formation reactions of complex compounds of metal ions with ethylenediaminetetraacetic acid, also known as complexone III and Trilon B;
- Atomic absorption - an instrumental method of quantitative elemental analysis by atomic absorption (absorption) spectra to determine the concentration of metals (cadmium, potassium, sodium, manganese, copper, nickel, mercury, lead, zinc, chromium (+3)) in surface water and ground waters.

Analyses were carried out in accordance with certified methods that passed metrological certification and registration in the agency "Uzstandart".

The assessment of the qualitative composition of water was carried out in accordance with the document "The Generalized List of Maximum Permissible Concentrations (MPC) and Approximately Safe Exposure Levels (TSEL) of Harmful Substances for Water in Fishery Water Bodies for Surface Water", as well as certified methods for measuring pollutants (MVI - O'zO'U), which reflect the values of maximum permissible concentrations (MPC) used for analytical control in the water of reservoirs of fishery importance.

Table 76 provide a list of the methods of determination used.

Table 76: List of substances in water and methods for their determination

Parameter	Method of determination	Used Books
Hydrogen exponent (pH)	**The method is based on measuring the potential difference arising at the boundaries between the outer surface of the glass membrane of the electrode and the test solution.**	**O'zO'U 0556: 2012**
Sulfates	**Methods for measuring the mass concentration of sulfate ions in natural and waste waters by the complexometric method The essence of the method is based on the precipitation of sulfate ions by barium chloride.**	**O'z O'U 07.0676: 2015**
Chlorides	**The essence of the method is based on titrimetric precipitation of chloride ion at pH = 7-10 with silver nitrate.**	**O'z O'U 0418: 2009**
Mineralization	**The method is based on the gravimetric determination of mineral and partially organic substances dissolved in water at 600 ^{0}C.**	**O'z O'U 07.0495: 2010**
Ammonium ion	**The photometric method is based on the formation of a yellow color of iodide in an alkaline medium.**	**O'z O'U 07.0682: 2015**
Nitrite	**The photometric method is based on the formation of an intensely colored diazo compound with sulfanilic acid and alphanaphthylamine (Griss reagent)**	**O'z O'U 07.0265: 2005**
Nitrates	**The determination is based on the reaction of nitrates with sodium salicylate in an acidic medium with the formation of a yellow salt of nitrosalicylic acid.**	**O'z O'U 0705: 2016**
Mercury & **Lead**	**Atomic absorption spectrometry (AAS). The method is based on the absorption of ultraviolet radiation by gas atoms.**	**O'z O'U 0422 : 2009** **O'zO'U 0482: 2009**
COD	**Method for measuring the mass concentration of chemical oxygen demand (COD) in natural and waste waters by the photocolorimetric method**	**O'z O'U 07.0147: 2000**
Metals (copper, zinc, nickel, chromium,	**Methods for measuring the mass fraction of metals (copper, zinc, nickel, chromium, iron,**	**O'z O'U 0744: 2016**

Parameter	Method of determination	Used Books
iron, manganese, cobalt)	**manganese, cobalt) in water by the atomic absorption method**	
Chromium (VI and III valence)	**Method for measuring the mass concentration of total, VI and III valence chromium in natural and waste waters by the photocolorimetric method**	**O'z O'U 0522: 2011**
BOD_5	**Technique for measuring the mass concentration of biochemical oxygen demand before and after n- days of incubation (BOD full) in natural, waste and treated waste waters**	**O'z O'U 0746: 2016**
Suspended substances	**Methodology for measuring the mass concentration of suspended solids in natural and waste waters by the gravimetric method**	**O'z O'U 0696: 2015**
Aluminum	**Method for measuring the mass concentration of aluminum in natural and waste waters by the photocolorimetric method**	**O'z O'U 0413: 2009**

The results of the physicochemical analysis of the surface of the site are presented in Table 77 .

Zang Canal water condition (SW-02): The channel is located to the west of the site.

- Mineralization levels of surface water of the river goes up to 0.532 g/dm^3.
- The concentrations of the following parameters exceed the MPC:
  - Suspended solids (25.2 times of MPC),
  - Sulfates (1.33 times of MPC),
  - COD value (1.6 times of MPC),
  - Cadmium (2.75 times of MPC),
  - Potassium (1.3 times of MPC),
  - Iron (2.88 times of MPC),
  - Lead (1.03 times of MPC)
  - Chromium (+6) (MPC level)
- Hydrogen sulphide concentration is analysed as The presence of hydrogen sulfide up to 0.0022 mg/dm^3
- The concentrations of nitrite nitrogen, nitrate nitrogen, BOD, sodium, manganese, nickel, and zinc are below the MPC.
- The pH of the waters is within the normal range (i.e. 8.33).
- Ammonium nitrogen, phosphates, cyanides, aluminum, barium, vanadium and mercury were not detected.

The concentrations of nitrite nitrogen, nitrate nitrogen, BOD, sodium, manganese, nickel, chromium (+6) and zinc are below the MPC. The pH of the waters is within the normal range up to 8.33. Ammonium nitrogen, phosphates, cyanides, aluminum, barium, vanadium and mercury were not detected in these waters.

Surface water condition in Uchkizil lake (SW -01):

- Mineralization levels of surface waters of the lake goes up to1.16 g/dm^3.
- The concentrations of the following parameters exceed the MPC:
  - Suspended solids (11.4 times of MPC),
  - Sulfates (2.9 times of MPC),
  - COD (10.6 times of MPC),
  - BOD (4.8 times of MPC),
  - Cadmium (3.6 times of MPC),
  - Potassium (1.5times of MPC),
  - Sodium (1.16 times of MPC),
  - Iron (1.9 times of MPC),
  - Copper (2.1 times of MPC)
  - Lead (1.09 times of MPC)
- Hydrogen sulphide concantrations is analysed as 0.0058 mg/dm^3.
- The concentrations of nitrite nitrogen, aluminum, manganese, nickel and zinc are below the MPC.
- The pH of the waters is measured in normal range (i.e. 8.44).
- Ammonium nitrogen, nitrate nitrogen, phosphates, cyanides, barium, chromium (+6), vanadium and mercury were not detected.

Table 77: Results of physicochemical analysis of surface waters of the site

Parameter name	Place of selection and content	
	River in the west from the site (SW-02)	Uchkizil reservoir (SW-01)
pH	**8.33**	**8.44**
Suspended substances, mg/dm ^{3}	**378.6**	**172.0**
Ammonium nitrogen, mg/dm ^{3}	**<0.2**	**<0.2**
Nitrite nitrogen, mg/dm ^{3}	**0.012**	**0.012**
Nitrate nitrogen, mg/dm ^{3}	**1.36**	**<0.09**

Parameter name	Place of selection and content	
	River in the west from the site (SW-02)	Uchkizil reservoir (SW-01)
Chlorides, mg/dm ^{3}	85.96	361.0
Sulfates, mg/dm ^{3}	133.0	290.0
Phosphates, mg/dm ^{3}	<0.01	<0.01
Mineralization, mg/dm ^{3}	532.0	1160.0
Cyanides, mg/dm ^{3}	<0.03	<0.03
Hydrogen sulfide, mg/dm ^{3}	0.0022	0.0058
COD, mg/dm ^{3}	24.0	160.0
BOD $_5$, mg/dm ^{3}	2.16	14.4
Aluminum mg/dm ^{3}	<0.02	0.01
Barium, mg/dm ^{3}	<1.0	<1.0
Vanadium, mg/dm ^{3}	<0.005	<0.005
Cadmium, mg/dm ^{3}	0.00275	0.00361
Iron, mg/dm ^{3}	0.144	0.0954
Manganese, mg/dm ^{3}	0.0213	0.00421
Copper, mg/dm ^{3}	0.00296	0.00206
Sodium, mg/dm ^{3}	105.50	140.85
Potassium, mg/dm ^{3}	65.20	76.73
Nickel, mg/dm ^{3}	0.0043	0.0076
Mercury, mg/dm ^{3}	<0. 000005	<0. 000005
Lead, mg/dm ^{3}	0.0103	0.0109
Chromium (+3), mg/dm ^{3}	0.00128	0.00071
Chromium (+6), mg/dm ^{3}	0.001	< 0.0005
Zinc, mg/dm ^{3}	0.0092	0.0088

7.4.2 Sensitive Receptors

Along the project area sensitive receptors defined. List of sensitive receptors can be found in Table 78.

Table 78: List of Sensitive Receptors – water

Receptor	Sensitivity	Justification
Water and Sediment Quality	**Medium**	**Any impact caused by construction and operation on water quality is expected to be time limited.**
Reservoir Fauna	**High**	**Impacts during the construction phase of the Project from dewatering and construction of the intake and outfall have the potential to have significant impacts in case management and mitigation measures are not implemented. Project area and the habitat is modified. In addition, the operational phase of the Project will only include discharge of treated sanitary waste and storm water.**
Fishes **Luciobarbus conocephalus** **Sabanejewia aralensis**	**Medium**	**Sabanejewia aralensis is a near threatened species according to Red book of Ruz. Not listed in CITES or IUCN. At the other hand Luciobarbus conocephalus is VU according to Red Book of the RUz**
Reservoir's water users (fishermen, farmers, recreational users)	**Medium**	**Reservoir water users found downstream will be particularly vulnerable to any changes in reservoir water quantities and quality as a result of Project construction and operation.**

7.5 POTENTIAL IMPACTS, MITIGATION, MANAGEMENT & RESIDUAL IMPACT

7.5.1 Construction Phase

During construction, the main activities that could negatively impact the aquatic life and water quality can be listed as follows:

- Laying of the outfall and water intake pipelines to the reservoir;
- Water usage for construction and domestic purposes
- Groundwater dewatering discharge on the reservoir banks from the construction activities on site (discussed under the soil and groundwater Section of this ESIA (Section 9));
- Habitat fragmentation as a result of construction of the intake and outfall.
- Discharge of dust into air and water due to heavy duty vehicles and working machines activities.

- Erosion due to soil movement in case unappropriated management of top soil, surplus soil, dumpsites and borrow pits.

7.5.1.1 Construction of water inlet and outlet structures on banks of reservoir

Excavation of the reservoir banks for inlet and outlet construction will permanently alter the Uchkizil lake banks, including the potential temporary loss of associated fauna and localized impacts to water chemistry associated with an increase in suspended sediment. An increase in suspended sediment results in turbidity, which can reduce light penetration in the water column and lead to a reduction in photosynthetic activity of aquatic life in the reservoir. Turbid conditions in the water column could negatively impact the production and growth of organisms present.

Therefore, without remedial action, suspended sediment is expected to build up, causing a temporary increase in turbidity in the water column and potentially smothering the adjacent riparian flora of the reservoir and disturbing wildlife. Once excavation near the reservoir is complete, turbidity levels are expected to return to background levels as suspended sediment settles. This can be achieved practically by not disposing of excavated material into the reservoir and by using effective silt fences. Construction impacts will be limited in size and scope because they are, by definition and design, confined to the narrow corridor of the outlet pipe and inlet channel on the banks of the reservoir.

7.5.1.2 Water consumption for construction and domestic purposes including test and commissioning

Water will be used during construction, test and commissioning phases of the project for several activities including but not limited to;

- Domestic use
- Dust suppression
- Compaction
- Concrete production
- Civil works
- Hydro testing
- Steam cleaning
- Cooling

Water consumption for each activity shall planned and drawn from boreholes, reservoirs, or municipal water supply lines, depending on availability. If potable water is sourced from neighboring towns, the Contractor shall engage licensed suppliers and obtain the appropriate permits (if required) to ensure that the demand for water under the project does not result in a shortage for local communities or an increase in the price of water. If wells are drilled on site, the contractor must also apply for the appropriate permits and comply with the consumption limits specified in the permits.

During commissioning, large amounts of water are required for hydro testing and steam cleaning that may not be reused. Much of the water consumed during commissioning will be used for testing pipes and tanks (testing) and cleaning equipment (steam cleaning). This wastewater is expected to contain oily/greasy residues and possibly concentrations of heavy metals. This wastewater will be treated and discharged to the on-site evaporation pond.

7.5.1.3 Waste Water

The Project will involve construction near Uchkizil reservoir. The project also will require storage, handling and use of dangerous hazardous materials such as hydrocarbons, hazardous chemicals, paints, thinner etc. Also waste water during construction phase is expected to derive from several processes. These processes are mainly expected to be followings;

- Sanitary domestic wastewater from camps, canteens
- Waste water from carwash and vehicle maintenance
- Concrete waste water from concrete production
- Storm water which might has oil and silt
- Accidental hazardous material spills

The washing of equipment and vehicles, as well as dirty water run-off from different Project components has the potential to contaminate surface- and groundwater resources if not managed appropriately.

Waste water from car wash and vehicle maintenance activities at the other end expected to has high content of TSS, oil and grease. Appropriate silt and oil trap structures will be constructed on car wash areas prior to discharge on the reservoir to avoid future damage on water quality and aquatic life.

The waste water and sludge from concrete production shall be treated. Waste water from concrete batch plant is expected to has high pH values and high amount of TSS.

Mitigation measures to reduce impacts on water quality for construction phase are given below and summarized in Table 79.

- The Project will consult with the Uchkizil Lake to confirm the need and applicability for water discharge permits/licenses necessary for the successful construction of the Project. Such discharge permits/licenses will be associated with effluent discharges (including stormwater and treated sanitary/domestic sewage). The Special Terms and Conditions associated with each Water Use Permit will be followed, and adherence to such will be monitored and confirmed through routine inspections and/or audits;
- Method Statements detailing spill emergency response and clean-up procedures for spills will be developed including process, responsibilities, training and drill needs.
- Training regarding proper methods for transporting, transferring and handling hazardous substances that have the potential to impact surface and groundwater resources will be undertaken.
- Areas where spillage of soil contaminants occurs will be excavated (to the depth of contamination) and suitably rehabilitated. If any other minor spillage occurs, the spillage will be cleaned immediately and the contaminated area will be rehabilitated. All contaminated material will be suitably disposed of.
- The washing of Project vehicles in and aroud any surface water bodies in will be prohibited. All Project vehicles will be washed at designated wash bays on site. These wash bays should include oil/grease and sediment traps for grey water.
- The ad hoc maintenance of vehicles in and around the contruction area will be prevented. All vehicles will be maintained at a designated workshop. The workshop should include containment berms and an oil/grease trap.

- All construction areas and associated facilities will be maintained in a good and tidy condition; debris and wastes will be contained in such a way that they cannot become entrained in surface run off during periods of heavy rain.
- Where practical, exposed surfaces and friable materials will be covered / sheeted.
- To the furthest extent practicably possible, construction activities will be conducted > 150 m away from water bodies as defined in "Regulation on procedure of establishing water protection zones and sanitary protection zones for water bodies".
- Sufficient toilets at active work areas will be provided for site staff and workers and these will be serviced regularly by a competent and suitably qualified person.
- The sewage treatment system will be managed in a manner that results in zero discharge of raw sewage to the environment, and if treated sewage is discharged into the environment then this should conform to recognized Uzbekistan discharge standards prior to discharge (which will be prescribed in effluent discharge permits).
- All wastewater which may be contaminated with oily substances will be managed in accordance with an approved Waste Management Plan, and no hydrocarbon-contaminated water will be released into the environment.
- Fixed fuel storage infrastructure will be on flat, impermeable surface and surrounded by a bond with a volume of 110 percent of the volume of the storage tank(s), and fuel transfer at fixed stations will be performed on a concrete surface draining to a mechanical oil separator.
- Chemicals storage and dispensing areas will be located as far as possible from surface water bodies, and in no instance should they be located drained on an irrigation channel. Storage will be on flat, impermeable surface and surrounded by a bund or enclosed storage. To avoid siltation of rivers and other surface water bodies, soil stockpile will be located away from surface water bodies.

Table 79: Impacts Significance of the Water Resources and Water Enviroment during - Construction Phase

Potential Impacts	Receptor	Severity	Probability	Potential Impact Significance(Pre Mitigation)	Mitigation and Management Measures	Residual Impacts (Post Mitigation)
Water Intake Structure Construction	**Reservoir's aquatic life,** **Water and Sediment Quality**	**Negligible**	**Certain**	**Moderate (M)**	**The Contractor's HSE department shall oversee the impacts caused by clearance of vegetation on reservoir banks before any excavation Fauna shouldn't be damaged during excavation and proper escape path should remain during excavation in case any nest of animal find..** **Any animal mortality will be recorded in incident log and corrective actions should be taken for future incidents to minimize the occurrence.** **Even if the impact is short term, silt curtain should be on place to avoid siltation and suspended soilds to the water bodies. Silt curtain should has concrete block attachment to avoid them floating.** **Disposal of any kind of concrete, soil or chemical will not be done nearby the reservoir.** **Surplus soil should be stored at least 100 meters away from the reservoir to avoid erosion impacts on the reservoir.** **Even after construction of the structure completei silt curtain should be on place to allow complete settlement of Total suspended solids. The curtain should be removed after the water TSS level reduced to the threshold limits identified in Uzbek and International regulations whichever is more stringent.** **The Project should consult with the authority to confirm the need and applicability for water discharge permits/licenses necessary for the successful construction of the Project.**	**Minor (L)**
Environmental Emergencies (Spills, Mismanagement of HAZMAT)	**Reservoir's aquatic life** **Water and Sediment Quality**	**Critical**	**Very Likely**	**High (H)**	**Method Statements detailing spill emergency response and clean-up procedures for spills should be developed.** **Training regarding proper methods for transporting, transferring and handling hazardous substances that have the potential to impact surface and groundwater resources should be undertaken.** **Areas where spillage of soil contaminants occurs should be excavated (to the depth of contamination) and suitably rehabilitated. If any other minor spillage occurs the spillage should be cleaned immediately and the contaminated area should be rehabilitated. All contaminated material should be suitably disposed of.** **The washing of Project vehicles in any surface water bodies in and around the reservoir should be prohibited. All Project vehicles should be washed at designated wash bays on site. These wash bays should include oil/grease and sediment traps for grey water.** **All construction areas and associated facilities should be maintained in a good and tidy condition; debris and wastes should be contained in such a way that they cannot become entrained in surface run off during periods of heavy rain.** **To the furtherest extent practicably possible, construction activities should be conducted > 150 m, further of sanitary buffer zone, away from water bodies (in conformance to the requirements of the Uzbekistan legal requirements),.** **All wastewater which may be contaminated with oily substances should be managed in accordance with an approved Waste Management Plan, and no hydrocarbon-contaminated water should be released into the environment.**	**High (H)**

Potential Impacts	Receptor	Severity	Probability	Potential Impact Significance(Pre Mitigation)	Mitigation and Management Measures	Residual Impacts (Post Mitigation)
					Fixed fuel storage infrastructure should be on flat, impermeable surface and surrounded by a bund with a volume of 110 percent of the volume of the storage tank(s), and fuel transfer at fixed stations should be performed on a concrete surface draining to a mechanical oil separator. **Chemicals storage and dispensing areas should be located as far as possible to the irrigation reservoir, and in no instance should they be located within irrigation channel (Zang Canal). Storage should be on flat, impermeable surface and surrounded by a bund or enclosed storage. To avoid siltation of rivers and other surface water bodies, soil stockpile should be located away from surface water bodies.**	
Waste Water Treatment Plant Effluents	**Reservoir's aquatic life** **Water and Sediment Quality**	**Marginal**	**Very Likely**	**Moderate (M)**	**The sewage treatment system should be managed in a manner that results in zero discharge of raw sewage to the environment, and if treated sewage is discharged into the environment then this should conform to recognized Uzbekistan discharge standards prior to discharge (which will be prescribed in effluent discharge permits)** **Sufficient toilets at active work areas should be provided for site staff and workers and these should be serviced regularly by a competent and suitably qualified person.** **Waste water infrastructure will be checked regularly to ensure that there is no leakage on pipelines, storage tanks or in WWTP** **The contractor should set a grievance mechanism to allow Zang Canal and Irrigation reservoir users to report any water quality decrease caused by the project. The complaints and concerns of the reservoirs users should be solved and reported to the community.** **Any grievances will be addressed in accordance to the SEP and corrective action taken immediately.**	**Moderate (M)**
Water Consumption (Surface water, drinking water and boreholes)	**Reservoir's aquatic life** **Water and Sediment Quality**	**Marginal**	**Very Likely**	**Moderate (M)**	**procurement of any bottled water from neighboring towns will be carefully assessed to ensure that it does not create a shortage to local communities or drive up the price of water.** **Water infrastructure will be inspected regularly to ensure that there are no leakage or overflow** **To minimize water usage during construction should be evaluated such as using treated waste water on irrigation or usage of Concentrate water on dust suppression, water efficient taps and shower heads etc.**	**Moderate (M)**
Test and Commissioning Wastewater	**Reservoir's aquatic life** **Water and Sediment Quality**	**Marginal**	**Very Likely**	**Moderate (M)**	**To minimize usage in test and commissioning phase, recycling and reuse of water should be assessed. Hydro testing water can be resued in same testing procedure until this phase of testing is completed and the water is no longer usable in the process.**	**Moderate (M)**

7.5.2 Operational Phase

Water is a key resource required for the operation of the Power Plant. It will be used in several processes and will be sourced from the Uchkizil reservoir. There is a possibility that groundwater is used for water source for operation phase. If groundwater is considered to be used in the Project, a Hydrogeological Investigations Report should be prepared before starting the work.

This report should be prepared with site surveys to determine the groundwater potentials together with hydraulic performance, cumulative effects and interactions between each well including water supply resources of the vicinity settlement area.

Water is a key resource required for the operation of the Power Plant. It will be used in several processes and will be sourced from the Uchkizil reservoir. The water consumption for service and sanitary water will be equal. That means the difference of water consumption is the use of ACC or CTs. Solutions consume between 20 and 30 m^3/h water for the steam cycle and service / sanitary water, that is a yearly amount of 200.000 to 280.000 m^3.

The main function of the Wastewater System is to collect, temporary store and deliver for treatment and final disposal the aqueous effluents derived from the Power Plant operation.

The wastewater system shall comply with the Laws and the guidelines for liquid emissions of the plant in operation for the combined effluent stream and for the sanitary effluent stream.

The Wastewater Treatment System (WWTS) consists of the following sub-systems:

- Industrial Wastewater Treatment System (IWWTS) to treat:
    - Chemical wastewater, including laboratory wastes, regeneration wastes, and Heat recovery steam generator (HRSG) continuous and intermittent blowdown and drains.
    - Clean (non-oily) floor and equipment drains.
    - Treated oily wastewater from the Plant Oily Water Treatment System (POWTS).
- Plant Oily Water Treatment System (POWTS) to treat oily water from floor and equipment drains.
- Other Chemical wastes like from the regeneration of the Polishing Plant resins. These effluents are stored for off-site disposal by trucks.

In the Industrial Wastewater Treatment System (IWWTS) incoming categories of wastewater streams shall be routed to the IWWTS Waste Neutralization Basin.

In the IWWTS wastewater is mixed, pH is adjusted using acid and caustic dosing in the basins as needed for final discharge.

The Plant Oily Water Treatment System (POWTS) removes the oil from potentially oil contaminated plant floor and equipment drains such that the treated wastewater meets the allowed discharge limit for Oil and Grease prior to being further processed by the IWWTS.

The Oily Water Separators provide oil removal to the environmental limit requirements after which the treated wastewater is forwarded to the IWWTS Waste Neutralisation basin.

Sanitary waste for the Facility shall be treated in the Facility Sanitary Wastewater System.

All treated Industrial Wastewater shall be discharged to the Uchkizil water reserve terminal point.

Recovered oil from the packaged oil water separators of the Plant Oily Water Treatment System (POWTS) will be disposed off-site by trucks.

7.5.2.1 Industrial Wastewater Treatment System (IWWTS)

The IWWTS consists mainly of the following sub-systems and equipment:

- HRSG Effluents and Wastewater from the demineralized water treatment Collection Subsystem This subsystem, comprising all the necessary components including accessories, instrumentation and control devices to collect effluents from the HRSG and Wastewater from the demineralized water treatment
- Collection and Neutralization subsystem, including wastewater control conditioning and discharge system including:
    - Two (2) x 100% air blowers (common for each compartment) and one air distribution system for each basin compartment;
    - Neutralization Subsystem of the including:
- Neutralization basin (divided in two compartments, one compartment filling and one controlling the PH and discharging);
- One (1) pumping station equipped with two (2) 100% pumps for wastewater recirculation and, if possible, discharge to the wastewater collection and equalization basin;
- Two (2) mechanical agitator;
- Dosing equipment of chemical products for pH adjustment in the neutralization basins;
- Instruments for continuous flow, pH and conductivity measurement
- A water fogging system to cool down the effluents and one service water distribution system to cool down the effluents directly in the basin in case the system fogging is not enough to comply with the maximum temperature discharge;
- Instruments for continuous flow, pressure, temperature, pH, turbidity and conductivity measurement.
    - A water fogging system to cool down the effluents and one service water distribution system to cool down the effluents directly in the basin in case the system fogging is not enough to comply with the maximum temperature discharge;
    - Instruments for continuous flow, pressure, temperature, pH, turbidity and conductivity measurement.
- The necessary electrical control panels and junction boxes;
- Power, control and instrumentation cables inside the Wastewater Treatment Package Plant;
- One (1) PLC with communication with the Distributed Control System (DCS);
- Complete control system design, including operation philosophy, logic diagrams, process displays and wiring diagrams;
- Necessary instrumentation for the automatic and continuous operation of the WWTP.

7.5.2.2 Plant Oily Water Treatment System (POWTS)

The Plant Oily Water Treatment System (POWTS) removes oil from potentially oil-contaminated plant floor and equipment runoff so that the treated effluent meets the allowable discharge limit for oil and grease before it is further processed by the IWWTS.

7.5.2.3 POWTS Collection System

The POWTS Collection System collects and conveys facility effluent with the potential for oil contamination by gravity. The POWTS collects the oily wastewater from each area in local oil separators (lamella separators) from which the treated water is pumped to the IWWTS and the oil sludge is trucked off-site for disposal.

7.5.2.4 Sanitary Waste System

The sanitary waste water collection system collects and treats all sanitary waste produced within the Facility.

The sanitary drains shall provide discharge from all lavatories, showers, sinks and similar facilities. The drains shall be plumbed from the various buildings.

Wastewater from the sanitary waste water collection system is further transferred to wastewater neutralization basin.

7.5.2.5 Final Effluents Discharge

The final treated wastewater shall be discharged towards the Uchkizil water reserve. The current scope includes only onshore routing up to the Plant Fence. Final Discharge to the water reserve is considered by others. Final Discharge to the water reserve can be investigated to be provided as option subject to availability of further bathymetric data of the water reserve.

Mitigation measures to reduce impacts on water quality for construction phase are given below and summarized in Table 81.

- SCE employees will be trained on how to minimize water consumption and ensure they have an understanding of the water issues in the Project area.
- Mechanisms and management practices to further reduce the volume of water required in the plant (e.g. increased reuse rates of treated effluent) will be considered, as this would help decrease freshwater consumptions.
- Limit water intake velocity with 0.15 m/s according to IFC EHS Guideline for Thermal Power Plants at the entrance of inlet structure.
- A bubble curtain shall be installed across the entrance of the intake channel to prevent fish and other fauna from going through the intake channel.
- Periodic monitoring of intakes will be undertaken during the first year of operation to record the effectiveness and ensure that there is no injury to the vulnerable fish species.
- Brief visual observation of the intake channel will be undertaken daily to check that reptiles and large fish are not within the channel.
- Maintenance program and competent teams will be on board. Capacity of the team shall be appropriate to handle maintenance and emergencies.
- Facility management shall be informed about possible negative impacts related with water use and wastewater treatment and awareness program for entire facility team shall be on place.
- Oily wastewater will be treated via an oil/water separator. A specialist contractor will remove the recovered oil for recycling. Any residual sludge will be taken to a Municipality approved hazardous waste landfill.

- Wastewater collection systems and oil water separators shall be inspected frequently, to ensure that no blockages could result in overflowing.
- Sludge from all treatment systems will be disposed in accordance with national, EBRD and IFC regulations for the hazardous wastes.
- Provisions for the containment of the first flush of storm water will be considered to ensure that the initial runoff from rainfall events does not lead to contamination of the receiving canal waters.
- All discharges into the canal will meet all the specific Project discharge requirements set by the State Committee on Ecology and Environmental Protection.

7.5.3 Calculation of the Water Consumption in Construction and Operation Phases

7.5.3.1 Construction Phase

At the construction stage of the combined cycle power plant, water is used to prepare mortars, as well as to irrigate the territory in order to reduce dusting on the construction site.

The source of water supply during the construction process will be imported water from the nearest settlement. Water consumption for household and drinking needs will consist of water consumption for drinking needs of personnel, showers, cooking.

In general, no impacts on surface water courses are expected during construction.

During construction

The water is used for the preparation of concrete and cement, reducing dust emissions, as well as for the household needs of workers. Water supply during construction work brought from regional center - in containers (reservoirs) special for this purpose.

For the drinking needs of workers, bottled water will be used partly, which will be purchased independently by the construction contractor. Drinking water storage meets sanitary and hygienic requirements.

Wastewater disposal

During the construction, the daily water consumption rate was determined according to KMK 2.04.01.98, which assumes workers will consume 25 liters/personnel.day, and engineering personnel will consume 12 liters/personnel.day.

Calculations of water consumption for production needs during the construction

At the construction phase, water will be required for the preparation of concrete, cement, as well as for watering the territory in order to reduce dust emission, etc.

Water consumption during construction works is determined by their volumes, and this water consumption will be an irretrievable loss.

Preparation of concrete and cement during construction.

For the preparation of 1 m^3 concrete, approximately 180-liter water will be used and for the preparation of 1 m^3 cement, approximately 165-liter water will be used

Therefore, the water consumption for the preparation of concrete (about 10,000 m^3) and cement (about 8500 m^3) will be:

Q1 = 180 x 10000/1000 = 1800 m³ / year or 4.931 m³ / day.

Q2 = 165 x 8500/1000 = 1402.5 m³ / year or 3.842 m³ / day.

Total 3202.5 m³ / year or 8.773 m³ day.

Water consumption during dust emissions reduction

When carrying out construction work, it becomes necessary to reduce dust emission, which can be calculated via following formula:

$$Q3 = nr \times Sp \times dp / 106;$$

where:

Sp is the area to be watered in order to reduce dusting

nr –2.0 l is the rate of water consumption for irrigation of the territory in order to reduce dusting, nr = 2.0 l / m²

dp - number of waterings per year = 100

The watering area is assumed as 10% of the total construction area and is determined as follows

$$Sp = S \times 0.1;$$

S - total allocated area S = 73.4 ha or 734000 m².

Sp = 734000 × 0.1 = 73400 m²

Then, the water consumption for reducing dust emission will be:

Q3 = 2.0 × 73400 × 100/106 = 14.68 thousand m³ / year or 14680 m³ / year.

Q3 =14.68 thousand m³ / year × 103/100 = 146.8 m³ / day.

Calculations of water consumption for household needs during the construction phase

Drinking needs during the construction

2048 total manpower will be work during commissioning phase, of which 134 SEPCOIII are engineering and management of Client personnel and 1920 are subcontractor workers. Engineering personnel work in one shift, workers - in three shifts, 8 hours, 365 workers per shift.

Water consumption for drinking needs.

- Household drinking and household needs of production personnel: A total of 1920 people. The rate is 25 liters / day for 1 person. 365 days.

  Vp = 1920 × 0.025 = 48 m³ / day × 365/1000 = 17.520 m³ / year.

- Household drinking and household needs of the daytime management personnel (134 people). The rate is 12.0 liters / day for 1 person. 365 days

  Vp = 134 × 0.012 = 1.608 m³ / day × 365/1000 = 0.587 m³ / year

- Total: necessary imported drinking water

  Σ = 17.520+ 0.587 = 18.107 m³ / year.

  Σ = 48 + 1.608 = 49.608 m³ / day

Water consumption for household needs

amount of water for household needs can be calculated via following formula:

$$Vh = [(n \times k \times h) \times d] / 1000;$$

where:

Vh - Amount of water consumed for household needs [tm³/ year]

n is the rate of water consumption per person. [l / hour]

k - Number of toilet glasses, urinals, showers and sinks. [PCS]

h is the working hours of the bathrooms. [hour / day]

d is the number of working days in a year.

- Shower room: There are 10 pieces of showers. Works 365 days a year. The norm is 500 l / h. The work at the enterprise is organized in the third shift. Works 1 hour per day per shift.

  Vh = 0.500 × 10 × 3 = 15.0 m³ / day × 365/1000 = 5475.0 m³ / year
- Toilet (toilets with tanks): 8 points (sewage). The rate is 83 l / h for 1 point. They work 3 hours a day.

  Vh = 0.083 × 8 × 3 = 1.992 m³ / day × 365/1000 = 727.08 m³ / year
- Sinks: On the territory there are 3 units. They work 3 hours a day, 365 days a year. The rate is 30.0 l/h.

  Vh = 0.030 × 3 × 3 = 0.27 m³ / day × 365/1000 = 98.55 m³ / year

In total:

Σ = 5.475 + 0.72708 + 0.09855 = 6300.63 m³ / year

Σ = 15.0 + 1.992+ 0.27 = 17.262 m³ / day

Water consumption for cooking during the construction of the CCGT

The kitchen is intended for preparing food for the employees. The rate of water consumption for cooking and washing dishes is 12.0 liters per dish for one visitor. 2048 meals are prepared every day. The facility has up to 300 visitors.

The amount of water consumption in the dining room.

$$W_P = \frac{[(n_s \times b \times d_s)]}{10^3};$$

where:

WP - the amount of water in the dining room. [thous. m³ / year]

ns is the rate of water consumption per dish. [m³]

ds is the number of working days in a year. [day]

b - number of dishes [pcs.]

Wp1 = [(0.012 × 2048 × 365)] / 1000 = 8.970 thousand m³ / year = 24.57 m³ / day

Commissioning Phase

Table 80:Commissioning phase water consumption

Process	Total Volume(m3)
Steam flushing	**60 000**
Acid Cleaning	**18 000**
Hydraulic tests (mainly boilers and tanks)	**15 000**
Total	**93 000**

Then, the total water consumption during the construction will be 168.98 m³ / day. or 29347.88 m³ / year, of which for: production needs - 8.773 m³ / day. or 3202.5 m³ / year; household and drinking needs - 91.44 m³ / day. or 33375.6 m³ / year; irrigation of the territory - 146.8 m³ / day. or 14680.0 m³ / year.

Total water consumption for commissioning phase is approximately 93 000 m^3 in total.

The total water disposal (effluent) of household wastewater during the construction of a combined cycle power plant will be: 91.44 m³ / day. or 33375.6 m³ / year.

Household wastewater generated during construction is planned to be directed to a temporarily installed storage tank (a waterproof cesspool) with subsequent removal to the nearest treatment facilities in the city of Termez.

7.5.3.2 Operation Phase

The source of water supply for the facility will be Uchkizil Lake. Water consumption for industrial needs is the sum of the water consumption:

- to feed the circulating cooling system of auxiliary equipment;
- to make up the steam-water cycle;
- for the need for additional water of the chemical water treatment system No. 1 and No. 2.

A closed-loop cooling system will be used to cool the auxiliary equipment. Demineralized water will be used as a cooling medium in a closed loop. The initial water of the circulating cooling system will be taken water from Uchkizil Lake.

The make-up water consumption consists of the losses of water treatment, the circulating cooling system of auxiliary equipment, the water consumption for blowing the boilers, as well as the intake of the make-up water into the chemical water treatment system.

Calculations of industrial water consumption:

- for the needs of a gas turbine unit (make-up, blowdown, flushing) - 52.4 m3 / hour, 1.258 thousand m^3 / day. or 440,172 thousand m^3 / year;
- for replenishment of the circulating system of industrial water - 9.78 m^3 / hour, 0.234 thousand m^3 / day or 82.156 thousand m^3 / year;
- consumption for other production needs (water treatment, dilution of solutions, etc.) - 7.71 m^3 / hour, 0.185 thousand m^3 / day. or 64.793 thousand m^3 / year.

Adjustment of water consumption rates will be carried out after determining all the characteristics of the equipment before putting the Project into operation.

In total, clean water will be consumed for production needs in the amount of 1.677 thousand m^3 / day. or 587,121 thousand m^3 / year.

Calculation of water consumption for household and drinking needs

The number of employ of the combined cycle power plant will be 300 employees of whom 45 are AUP and engineering personnel, 255 are workers, security guards, etc.

Working hours: workers - in three shifts, 8 hours per shift, 365 days a year; Engineering and technical staff - in one shift for 8 hours 260 days a year.

Household drinking needs of personnel during operation.

The amount of water for household drinking needs

$$Vp = [(k \times n \times d) / 1000];$$

where:

Vp - Amount of water consumed for drinking needs [tm^3 / year]

k - Number of employees. (workers - 255 people, engineers and technicians - 45 people);

n is the rate of water consumption for 1 person (the rate of water consumption per person per shift, N = 25 l

for workers and N = 12 liters for employees and engineers;

d is the number of working days in a year. (365 days (for working personnel) and T = 260 days for engineers and technicians);

- Household and drinking needs of production personnel: 255 people. The rate is 25 l / day for 1 person. 365 days.
- Vp = 255 × 0.025 = 6.375 m^3 / day × 365/1000 = 2326.875 m^3 / year.
- Household and drinking needs of the daytime management personnel: 45 people. The norm is 12.0 l / day for 1 person. 365 days
- Vp = 45 × 0.012 = 0.54 m^3 / day × 260/1000 = 140.4 m^3 / year
- Total: necessary water for drinking needs

$$\Sigma = 2326.88 + 140.40 = 2467.28 \text{ m}^3 \text{ / year.}$$

$$\Sigma = 6.375 + 0.54 = 6.915 \text{ m}^3 \text{ / day}$$

Household needs of personnel during operation

The amount of water for household needs can be calculated via following formula:

$$Vh = [(n \times k \times h) \times d] / 1000;$$

where:

Vh - Amount of water consumed for household needs [tm³ / year]

n is the rate of water consumption per person. [l / hour]

k - Number of toilet glasses, urinals, showers and sinks. [PCS]

h is the working hours of the bathrooms. [hour / day]

d is the number of working days in a year.

- Shower room: There are 2 pieces of shower. Works 365 days a year. The norm is 500 l / h. The work at the enterprise is organized in the third shift. Opens for 1 hour per day.
  Vh = 500 × 2 × 3/1000 = 3.0 m³ / day × 365 = 1095.0 m³ / year;
- Toilet (toilets with tanks): 2 points (sewage). The rate is 83 l / h for 1 point. They work 3 hours a day.
  Vh = 83 × 2 × 3/1000 = 0.498 m³ / day × 365 = 181.77 m³ / year;
- Sinks: There are 2 units on the territory. They work 3 hours a day, 365 days a year. The rate is 30.0 l / h.
  Vh = 30 × 2 × 3/1000 = 0.18 m³ / day × 365 = 65.7 m³ / year;
- In total, you need tap water for household needs.

$$\Sigma = 1095.0 + 181.77 + 65.7 = 1342.47 \text{ m}^3 / \text{year};$$

$$\Sigma = 3.0 + 0.498 + 0.18 = 3.678 \text{ m}^3 / \text{day};$$

Water consumption for cooking in the kitchen during the operation phase.

The kitchen is intended for preparing food for the employees of the enterprise. The rate of water consumption for cooking and washing dishes is 12.0 liters per dish for one visitor (paragraph 20 of the table in Appendix 3 KMK 2.04.01-98, p. 158). 600 meals are prepared every day. The facility has up to 300 visitors.

The amount of water consumption in the dining room.

$$W_P = \frac{[(n_s \times b \times d_s)]}{10^3};$$

where:

WP - the amount of water per dining room. [m³ / year]

ns - is the rate of water consumption per dish. [m³]

ds - is the number of working days in a year. [day]

b - number of dishes [pcs.] (600 pieces (90 pieces for engineers, 510 pieces for workers)).

- When working personnel work 365 days

  $Wp1 = [(0.012 \times 510 \times 365)] / 10^3 = 2.233$ thousand m³ / year=6.12 m³ / day.

- When the engineering and technical personnel work 260 days

  $Wp2 = [(0.012 \times 90 \times 260)] / 10^3 = 280.8$ m³ / year 1.08 m³ / day;

- Total: water required for the dining room is 2514.6 m³ / year;

  $Wp = Wp1 + Wp2 = (2.233 + 280.8) \times 1000 = 2514.6$ m³ / year.

  Total per day $\Sigma = 6.12$ m³ / day + 1.08 m³ / day = 7.2 m³ / day.

Water consumption for cleaning the premises (washing floors) during the operation phase.

Wet cleaning of the premises is carried out at the facility. The total area of the floors to be washed is: S = 1500m². The rate of water for washing is 1m²–2l/m². The floors are washed once every 3 days, 121 days a year.

The amount of water for cleaning the premises (floor cleaning).

$$P = [(sp \times np) / 10^3] \times d];$$

where: P - amount of water for cleaning floors [m³ / year];

np is the rate of water consumption for cleaning floors per 1m2. N = 0.5 l / m²; [l / m²];

sp - floor area S = 1500 m²; [m²];

d - the number of working days per year. T = 365 days [day];

Calculation: $P = [(1500 \times 2) / 10^3 = 3$m³ / day × 121 = 363 m³ / year;

Per year is spent 3 m³ / day or 363 m³ / year of water for cleaning floors

Watering the territory during the operation phase.

The amount of water for irrigation of the territory.

$$W = n \times s \times d;$$

where:

W is the amount of water for irrigation [m³ / year];

n - the rate of water consumption for irrigation [l / m²];

s - irrigated area [m²];

d -the number of working days per year. [day];

- Watering green spaces. Green area S = 21500m². Irrigation rate 6.0 l / m². Watering is done 3 times a week for 6 months (30 weeks) - 72 times / year.
  W1 = 3 × 21500 = 64.5 m³ / day × 72 = 4644 m³ / year
- Watering the territory. (Road surface) Area S = 25800m². The norm is 0.5 l / m². Watering is done 5 times a week for 6 months - 120 times.
  W2 = 0.0005 × 25800 = 12.9 m³ / day × 120 = 1548.0 m³ / year
- In total:

$$\Sigma = 4644 + 1548.0 = 6192 \text{ m}^3 \text{ / year.}$$

$$\Sigma = 64.5 + 12.9 = 77.4 \text{ m}^3 \text{ / day.}$$

In total, the standard volume of water consumption during the operation of the combined cycle power plant will amount to 1.776 thousand m³ / day 600.0 thousand m³ / year, of which: for production needs - 1677 thousand m³ / day 587.121 thousand m³ / year; for household and drinking needs - 98 m³ / day 12.879 thousand m³ / year.

Wastewater disposal

All effluent from wastewater treatment plants, sample racks, laboratory wastewater, etc. will be collected and pumped out into the neutralization system. The rinse water for the gas turbine is collected in the GT rinse water reservoir and is separately discharged into the storage tank.

Industrial wastewater will be sent for treatment to a neutralization tank, a coagulation tank and further to a clarifier. Purified water enters the storage tank. In the case of extreme wastewater parameters, the treated wastewater from the holding tank can be redirected to the inlet of the wastewater treatment plant. Temperature and pH levels are continuously monitored and recorded. Alarm levels will be present for operator actions.

Wastewater treatment of waste heat boilers

The waste heat boiler blowdown water will be partially cooled by water quenching and transferred to the waste heat boiler blowdown water cooling pond. Chilled purge water (temperature approximately 80 ° C) is further cooled to acceptable limits using a jet aerator prior to neutralization. The cooled and neutralized water is directed to the tank.

Oily water separation

The oily water separation system will be sufficient to purify all oily water from the territory of the combined cycle power plant (diverted from the transformer area, the floor of the gas turbine, and so on). Waste water from oily water collected in the sump will be pumped into the buffer tank of the oily water separation system.

CPI Oil Separator (Pleated Plate Interceptor) is used to separate oil from water. The oil rising to the surface flows through the overflow of the skimmer, which is adjustable at a fixed height. The separated oil sludge will be directed by gravity into the oil sludge mine. Periodically, oil sludge should be transferred for disposal to a specialized organization.

The aqueous phase will be directed to a control tank where the residual oil content is constantly monitored. The water from the oil separator will be directed to the wastewater neutralization system.

- During water treatment in clarifiers, a sediment with a moisture content of 98-99% is formed, which is periodically sent to the thickener in a volume of about 6 m^3 / hour.
- In addition, during water treatment, after washing the two-layer filters, waste water (12.52 m^3/h) is formed, which enters the neutralization system.
- Waste water generated in a volume of 14.68 m^3 / h after the installation of the primary reverse osmosis enters the neutralization system.
- Wastewater storage ponds through the blowdown well also receive wastewater after blowing the boilers and cooling blowdowns (114.1 m^3 / h).
- The enterprise also generates rainwater wastewater containing oil products (140 m3 / year) and rainwater wastewater not containing oil products (560 m^3 / year), which also comes from the neutralization system.

Domestic waste water from the entire combined cycle power plant is transferred to a biological treatment plant, where it will be purified from organic matter with the formation of a stable sludge. The cleaning process is carried out as follows. Untreated wastewater from every building (toilets, showers, sinks, etc.) flows into modular septic tanks where solids are separated from liquids. Heavy solids settle to the bottom of the tank, the remaining liquids flow out of the tank into a wastewater sump, from which they are pumped to an aeration tank equipped with an extended aeration device. The aeration tank makes it possible to clean the effluent by oxidizing organic pollutants of both liquid and solid phases under aerobic conditions (oxygen saturation occurs). The wastewater is then sent to a sump where the liquid is separated from the sludge.

In the secondary sludge zone, the return of sludge to the primary sump is organized. The return of the sludge is made forcibly by an air lift. Surface liquids from the sump are disinfected in the chlorine contact chamber by dosing a hypo-chlorite solution before draining.

The total volume of water disposal (effluent) from the territory of the power plant during its operation will be 1,087 thousand m^3 / day. or 380.0 thousand m^3 / year, of which: generated in the production process - 1.066 thousand m^3 / day. or 373.313 thousand m^3 / year; domestic waste water – 21 m^3 / day. or 6.687 thousand m^3 / year.

Conditionally clean water generated during the operation of a combined cycle power plant (make-up, blowdown, flushing, cooling - 36.9 m^3 / hour, 0.887 thousand m3 / day or 310.55 thousand m3 / year, other consumption for production needs - 7, 5 m^3 / hour, 0.179 thousand m^3 / day or 62.763 thousand m^3 / year) in the total volume of 1.066 thousand m^3 / day. or 373.313 thousand m3 / year is planned to be sent to Lake Uchkizil.

The total volume of recycled water supply for the power plant will amount to 3.285 thousand m^3 / day. or 1150.0 thousand m^3 / year.

Domestic wastewater with a total volume of 21 m^3 / day (with the assumption of all water consumed for drinking, household, kitchen and cleaning will be convert into wastewater) or 6.687 thousand m^3 / year, generated during the operation of the combined-cycle power plant, is planned to be sent to a temporarily installed storage tank (waterproof cesspools, 2 units) with a volume of 30 m^3 each, with subsequent removal to the treatment facilities of the city of Termez. These storage tanks can hold wastewater generated during 3 days.

Table 81:Impacts Significance of the Water Resources and Water Environment during - Operation Phase

Potential Impacts	Receptor	Severity	Probability	Significance of Impact (without Impact Mitigation Measures)	Mitigation and Management Measures	Significance of Residual Impact
Water consumption during operations	Reservoir users	Marginal	Very Likely	Moderate (M)	SCE employees will be trained on how to minimise water consumption and ensure they have an understanding of the water issues in the Project area. Mechanisms and management practices to further reduce the volume of water required in the plant (e.g. increased reuse rates of treated effluent) will be considered, as this would help decrease freshwater consumptions.	Minor (L)
Stormwater and Operation Wastewater	Reservoir water and sediment quality	Marginal	Certain	High (H)	Maintenance program and competent teams should be on board. Capacity of the team shall be appropriate to handle maintenance and emergencies. Facility management shall be informed about possible negative impacts related with water use and wastewater treatment and awareness program for entire facility team shall be on place. Oily wastewater will be treated via an oil/water separator. A specialist contractor will remove the recovered oil for recycling. Any residual sludge will be taken to a Municipality approved hazardous waste landfill. Wastewater collection systems and oil water separators shall be inspected frequently, to ensure that no blockages could result in overflowing. Sludge from all treatment systems will be disposed in accordance with national, EBRD and IFC regulations for the hazardous wastes. Provisions for the containment of the first flush of storm water will be considered to ensure that the initial runoff from rainfall events does not lead to contamination of the receiving reservoir waters. All discharges into the reservoir will meet all the specific Project discharge requirements set by the State Committee on Ecology and Environmental Protection.	Moderate (M)
Disturbance to aquatic life due to water intake	Reservoir fauna				To avoid any harm to the aquatic life, water Intake velocity of the water should be less than 0,15 m/s in compliance with "IFC EHS Guidelines for Thermal Power Plants" which allow any fish species to escape easily from the flow. Bubble curtain shall be installed at the entrance of water intak structure to avoid fish and other animals to go through intake channel Periodic monitoring of intake structure should be done to ensure that there is no injury to aquatic life.	

7.6 CUMULATIVE IMPACTS

The purpose of a cumulative impact assessment is to determine how the potential impacts of a proposed development might combine cumulatively, with the potential impacts of other projects or human activities as well as natural stressors such as droughts or extreme climatic events. The summary of cumulative impacts of water resources and water management is presented in Table 82.

Table 82:Summary of Cumulative Impacts of Water Resources and Water Management

Environmental and Social Aspects	Construction	Operation
Water Resources and Water Management		
Cumulative Impacts	**Increasing in water consumption during construction and commissioning phase of the Project may potentially affect the users downstream.** **Discharge of dewatering if not properly managed could impact the water quality for downstream users and biological environment of the waterbody.**	**Additional water consumption from the Project may potentially affect the users downstream and the discharge could lead to slight changes in the water quality of the waterbody that may affect biological environment.**

7.7 MONITORING

The Contractor will undertake canal monitoring during the construction, commissioning and operational phase of the Project. The minimum expected requirements for the monitoring are outlined in the Table 83. The final monitoring methodology with specific details (i.e. locations, frequencies, durations, parameters etc.) will be developed in a specific 'Environmental Monitoring Plan'.

Table 83: Monitoring Requirements of Water Resources and Water Environment

Source	Parameters	Duration	Location
Construction Phase			
Fauna species	**Species in the canal and its banks.**	**Daily visual observations in the canal banks construction areas**	**All work areas at the canal**
	Total Suspended Solids, Turbidity	**Continuous water quality analysis**	**Representative locations outside the silt curtains**
Ambient Water Quality	**Range of parameters including physical, heavy metals, bacteriological and hydrocarbons (ref. to ESIA baseline)**	**Monthly sampling and laboratory analysis.**	**Representative locations outside the silt curtain**
Commissioning Phase			
Commissioning Discharge Monitoring	**pH, temperature, conductivity and flow rate**	**Continuous**	**Discharge point**
	COD, Oils, TSS, Nitrogen, Phosphorous	**Bi-weekly**	
	Suite of heavy metals	**Quarterly**	
Operation Phase			
Operational Discharge Monitoring	**pH, temperature, conductivity and flow rate**	**Continuous**	**Discharge point**
	COD, Oils, TSS, Nitrogen, Phosphorous	**Bi-weekly**	
	Suite of heavy metals	**Quarterly**	
Water & Sediment Quality	**Canal fauna species, water and sediment quality**	**Annually**	**Discharge point**

8. ECOLOGY

8.1 STANDARDS AND REGULATORY REQUIREMENTS

8.1.1 National Regulations

The relevant legislation related with ecology and biodiversity in Uzbekistan are given below:

- Law "On Nature Protection", No: 754-XII, dated December 09,1992, as amended on April 21 2021)"
- Law "On Protected Natural Territories", No. 13 dated January 08, 2018 (as amended on December 28, 2020)
- Law "On Ecological Expertise", No. 73-II dated May 25, 2000 (as amended on April 29 2021)
- Law "On Protected Natural Reserves", No. 710-II dated December 03, 2004 (as amended on September 30 2020)
- Law "On Protection and Use of the Wildlife", No. 545-I dated December 26, 1997 (as amended on September 19 2016)
- Law "On Protection and Use of Flora (new edition)", No. 409 dated September 21, 2016 (as amended on April 21, 2021)
- Law "On Protection and Use of Fauna (new edition)", No. 408 dated September 19, 2016 (as amended on April 21, 2021)
- Law "On Plant Quarantine", No. 113-I dated August 31,1995 (as amended on July 09, 2018) [10]
- Decree of the Cabinet of Ministers of the RUz "On the Settlement of the Use of Biological Resources and the Procedure of Permission of the Resolving Procedures in the Field of Nature Use", No. 290 dated October, 2014 (as amended on 27.05.2019);
- Decree of the Cabinet of Ministers of the RUz "On Measures to Improve the Public Administration System in the Sphere of Protected Natural Territories" No. 4247 dated March 20, 2019;
- Decree of the Cabinet of Ministers of the RUz "On the Approval of the strategy for the preservation of biological diversity in the RUz for the period 2019-2028" No. 484 dated June 11, 2019;
- Decree of the Cabinet of Ministers of Uzbekistan About measures on the organization of the preparation, edition and management of the red book of the RUz, No. 1034 dated December 19, 2018;
- "Decree of the Supreme Council of Uzbekistan "On Reinforcement of the Protection of Valuable and Endangered Species of Flora and Fauna and Harmonization of their Use" No. 937- XII dated September 03,1993;
- European Water Framework Directive (Directive 2000/60/EC)
- Appendix of the Decree of the Cabinet of Ministers of the RUz "On Classification of techno genetic, natural and environmental emergencies" No. 455, October 27,1998)

"Law on Nature Protection" states legal, economic, and organizational bases for the conservation of the environment and the rational use of natural resources. Its purpose is to ensure balanced relations between man and nature, to protect the environmental system and to guarantee the rights of the population of a clean environment. Article 25 of this law states that SEE is a mandatory measure for environmental protection, preceded to decision-making process. In addition, article 25 says that the implementation of the project without a positive conclusion of SEE is prohibited [11].

"Law on "Protected Natural Territories" regulates relations in term of organization, protection and use of protected natural territories. The main tasks of this Law are the preservation of typical, unique, valuable natural objects and complexes, the genetic fund of plants and animals, the prevention of the negative impact of human activities on nature, the study of natural processes, the monitoring of the environment, the improvement of environmental education.[11]

"*Law on "Ecological Expertise*" provides for conducting a mandatory expert assessment of impacts on the environment and human health, as well as a legal basis for conducting expert assessments [11].

"Law on "Protected Natural Reserves" regulates relations in term of organization, protection and use of protected natural territories. The main tasks of this Law are the preservation of typical, unique, valuable natural objects and complexes, the genetic fund of plants and animals, the prevention of the negative impact of human activities on nature, the study of natural processes, the monitoring of the environment, the improvement of environmental education [11].

Law on "Protection and Use of the Wildlife" regulates relations in the field of protection, use, restoration and reproduction of the wildlife in order to ensure the conditions of its existence, conservation of species diversity, integrity of natural communities and habitat [11].

"Law on Protection and Use of Flora" regulates protection and usage of flora growing in natural condition, as well as in cultivation and its reproduction and conservation of gene pool of wild plants[12].

"Law on Protection and Use of Fauna" regulates relations in the field of protection and use of wild animals living in a state of natural freedom on land, water, atmosphere and soil, constantly or temporarily inhabiting the territory of the Republic of Uzbekistan, as well as contained in semi-free conditions or artificially created habitat for scientific or nature protection goals [12].

Law "On Plant Quarantine" regulates measures on external and internal plant quarantine, aimed at the protection of the territory of the Republic from the penetration of quarantine and other dangerous pests, diseases of plants and weeds from foreign countries, which can cause significant economic damage to the national economy [13].

In addition, Uzbekistan has adopted a number of other international conventions, protocols, agreements and memoranda of understanding in the field of environmental protection and sustainable development. The following are global agreements related ecology in which Uzbekistan is involved[10]:

- Convention on International Trade in Endangered Species of Wild Fauna and Flora (July 01, 1997);
- Convention on the Conservation of Migratory Species of Wild Animals (May 01, 1998);
- Ramsar Convention on Wetlands of International Importance, especially as Waterfowl Habitat (August 30,2001).
- United Nations Framework Convention on Climate Change (March 24, 1994)
- The Convention on Biological Diversity (October 17, 1995)

- United Nations Convention to Combat Desertification (August 31, 1995)
- Convention on Biodiversity, Cartogena Protocol (October 11, 2019)

8.1.2 Lender Requirements

All the studies on terrestrial and aquatic ecology, will be followed IFC Performance Standard 6 "*Biodiversity Conservation and Sustainable Management of Living Natural Resources*". This Performance Standard reflects the objectives of the Convention on Biological Diversity to conserve biological diversity and promote use of renewable natural resources in a sustainable manner.

Since 1995, the RUz is a party to the *UN Framework Convention on Biological Diversity*. The laws of the RUz "On Nature Protection", "*On Protected Natural Territories*", "*On Protection and Use of Flora",* "*On Protection and Use of Fauna*" are the legislative basis in the field of biodiversity protection. The main program document is the "National Strategy and Action Plan on Biodiversity Conservation" (1998)[10].

Moreover, where relevant, the Project will aim to follow ratified conventions and *Habitats Directive 92/43/EEC* and the *Birds Directive 2009/147/EC*.

8.2 GENERAL OVERVIEW OF BIODIVERSITY IN UZBEKISTAN

Uzbekistan is located in the central part of Central Asia and has borders with the four republics: Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Afghanistan in the south. This geographical location at the junction of several biogeographic regions determines antiquity, diversity, nature of origin, complex genetic relationships of flora and fauna. The gene pool of wild animals inhabiting the territory of the Republic of Uzbekistan is unique. Uzbekistan is an important habitat for endemic species and subspecies of animals of Central Asian origin. Most of it is represented by native fauna [15].

The special geographical position of Uzbekistan within the Central Asian region at the junction of several biogeographic provinces determines the significant wealth of its animal world. At the same time, it is also a reflection of the exceptional diversity of the natural conditions of the republic, where vast plains occupied by deserts of various types, mountain steppes, forests and alpine meadows, riparian thickets, reservoirs, cultural landscapes form characteristic ecosystems with their faunal assemblage. The fauna of the republic is distinguished by its antiquity and complex genetic relationships. Turanian and Turkestan endemic and autochthonous species play a significant role here. A large place also belongs to the group of animals that entered the country in the historical past from other regions of Central Asia, Indochina, the Mediterranean, and the planes of Eurasia. Part of the fauna is represented by acclimatizers from the Far East, Transcaucasia, Europe and America. In general, the modern fauna of vertebrates in Uzbekistan numbers 714 species (107 species of mammals, 467 species of birds, 61 species of reptiles, 3 species of amphibians and 76 species of fish), while the fauna of invertebrates is estimated at 15 thousand species and the flora of Uzbekistan accounts more than 4000 species of vascular plants. Over the past decades, because of increased nature management, many species of animals in Uzbekistan have experienced a strong anthropogenic impact and have reduced their area and number; some of them have completely disappeared. The greatest threat is faced by large species of mammals and birds, which are of great practical value as objects of hunting, as well as endemic and locally widespread species found within vulnerable ecosystems intensively developed by humans. In particular, the Turanian tiger, cheetah, and Aral trout have already disappeared. On the verge of extinction are the leopard, striped hyena, bustard,

Syrdarya, Amudarya small and large shovelnose sturgeon, Aral sturgeon. Ustyurt and Bukhara crested sparassis, markhoor, caracal lynx, Central Asian otter, stifftai, mute swan, marbled duck, houbara bustard, pin-tailed sand grouse, Hentaun toad agamas, striped Fergana desert lacertas, the Aral barbel, pike asp, some helmet-shell & insects. The number of many animals has not yet reached a critical level but is steadily decreasing. All this is a consequence of the economic development of territories, environmental pollution, and the irrational use of biological resources [15].

An ecological network, consisting of 7 reserves (Gissar, Zaamin, Kitab, Nurota, Kizilkum, etc.), 3 national natural parks (Zaamin, Ugam-Chatkal, Zeravshan), complex (landscape) nature reserve "Saigachy", state reserve "Sudochye", reserves (Dengizkul, Karakir, Arnasaysky, etc.), Nizhne-Amudarya and Ugam-Chatkal biosphere reserves, 10 natural monuments ("Vardanzi", "Yazyavan", "Mingbulak" and etc.). The status of a protected natural area is also unique not only in the republic, but also in the region, the Bukhara specialized nursery "Jeyran", which is engaged in breeding, conservation, and reintroduction of rare species of animals. Many species of animals included in the Red Book are protected in the republic's reserves: Bukhara deer, markhoor, Severtsov's crested sparassis, Menzbir's marmot, Turkestan lynx, large birds of prey, invertebrates. A promising direction in the preservation and restoration of the number of rare and endangered species of animals is their breeding in semi-free conditions. An important practical step in this regard is the work carried out in the Bukhara specialized nursery "Jeyran" (Bukhara region). Here, species included in the national Red Book and the International Red List (IUCN) are preserved and bred: Equus onager, Przewalski's horse (Equus caballus), goitered gazelle, markhoor, Bukhara crested sparassis. Breeding of the endangered houbara bustard in artificial conditions with subsequent release into the wild is carried out in nurseries located in Navoi and Bukhara regions [16].

8.2.1 Protected Ecological Sites

Uzbekistan's current designated conservation areas fall into five categories: nature reserves/national reserves (zapovedniks); national parks; one ecological centre; wildlife areas (zakazniks); and landmarks The Republic of Uzbekistan has two National Parks, two Natural Monuments, 9 State Nature Reserves, 5 Nature Sanctuaries or Partial Reserves, two Breeding Reserves, and 9 Wildlife Refuges [17]

The Project area on the northern shore of the Uchkizil lake does not occupy and does not border on any Protected areas higher than status V category (forestry, hunting management areas, breeding centers) according to the classification of the status of protected natural areas of the Law of the Republic of Uzbekistan "On Protected Natural Areas" No. 710-II dated December 3, 2004. However, the project area is part of the water protection zone of the Uchkizil lake (No. J096018) and the coastal strip of the Uchkizil lake (No. K096017), and also borders the protected coastal strip of the Zang canal (No. K096004). It is also worth mentioning that the area is adjacent to the western end of the Kattakum sandy massif, home to rare and endemic plant and animal species. These territories are the most significant for the biodiversity of the project area and connected with it indirectly due to their proximity.

Also, as can be seen on the Figure 40, there are several international protected sites which locate close to the project area. 3 International Bird Areas (IBA) and 2 Key Biodiversity Areas (KBA) that are noted as areas of potential conservation importance are found within 50km radius of the Project site (see Table 84): Amudarya Floodplain near Termez" (10 km) and IBA "Aktepa and Three lakes" (15 km), and Key Biodiversity areas (KBA) "Khaudaktau" (11 km) [18]. Kelif-Sherobad Range (KBA) (38km) Kugitang and Baysuntau mountains (IBA) (50km).

Table 84: Protected Areas within 50km Radius of the Project site

Name of the Protected Area	Approximate Distance From The Project Site (Km)	Description [18] [19]
Amudarya Floodplain near Termez (IBA)	**10 km**	**Location: The IBA is situated 23 km to the NW of Termez town, in the first floodplain terrace of the Amudarya river between Kaptarhona and Sholiker villages (on the border with Afghanistan). It is 1.5-6 km wide and about 30 km long.** **Total area: 10,693 ha** **The Amudarya river is on the south and south-west boundary, loess precipices which border the first and second floodplain terraces, waterlogged areas and reedbeds are the natural borders of the site. There are also rice and winter wheat fields, sandbanks, rivers, stream, marshes, canals and roads.** **Most recent IBA monitoring assessment by Bird Life International:** **Year of assessment: 2006 - Threat score: High**
Aktepa and Three lakes (IBA)	**15 km**	**Location: Aktepe Reservoir, and adjoining lakes, are situated in the south of Uzbekistan, 22-25 km NE of the town of Termez and 7 km SE of the town of Jarkurgan, in the valley of the River Surkhandarya. It is situated in the sandy desert on the border of developed land.** **Total area: 2,987 ha** **There are three islets with precipitous shores in the reservoir. Around the reservoir, there are shoreline thickets of reed, tugai forest and a sandy desert. A small canal flows into the SE part of the reservoir, feeding it with the water from the Amuzang canal. The average depth is 6.5 m. The water flow is regulated. There is a wastewater canal in the SE part of the reservoir. There is a chain of small lakes situated 7 km to the south of the reservoir, which include the so-called Three Lakes. The water level and salinity in these lakes have not been studied. In winter, these water bodies are not frozen.** **Most recent IBA monitoring assessment by Bird Life International:** **-Year of assessment: 2018- Threat score: Low**

Name of the Protected Area	Approximate Distance From The Project Site (Km)	Description [18] [19]
Khaudaktau (KBA)	**11 km**	**Location: The KBA Is situated in the south of Uzbekistan, nearly 30 km of Termez.** **KBA Criteria: B1 (presence of geographically restricted species)** **Total area: 44,000 ha** **Most recent IBA monitoring assessment by Bird Life International** **Year of assessment: 2018 - Theat Score: Unknown**
Kelif-Sherobad Range (KBA)	**38 km**	**Location: The IBA and KBA is situated in the southern part of Uzbekistan in the valley of the Sherobad river and includes the adjacent mountains, 25 km to the north of Sherobad.** **Total Area: 144,576 ha with Sherobad River** **The mountains are south-western branches of the Baysuntau ridge. The valley is narrow with adjoining foothills lacking forest-shrub vegetation.** **Most recent IBA monitoring assessment by Bird Life International:** **Year of assessment: 2007 - Theat Score: Very High**
Kugitang and Baysuntau mountains **(IBA)**	**50 km**	**Location: The IBA occupies the southwest slope of the Koytendag (Kugitang) ridge - the southwest termination of the Hissar range of the Pamir-Alay mountain system. Administratively the IBA is located in the southeast of Turkmenistan, and occupies the middle.** **Total Area: 198,178 ha** **Most recent IBA monitoring assessment by Bird Life International:** **-Year of assessment: 2018- Threat score: not assessed**

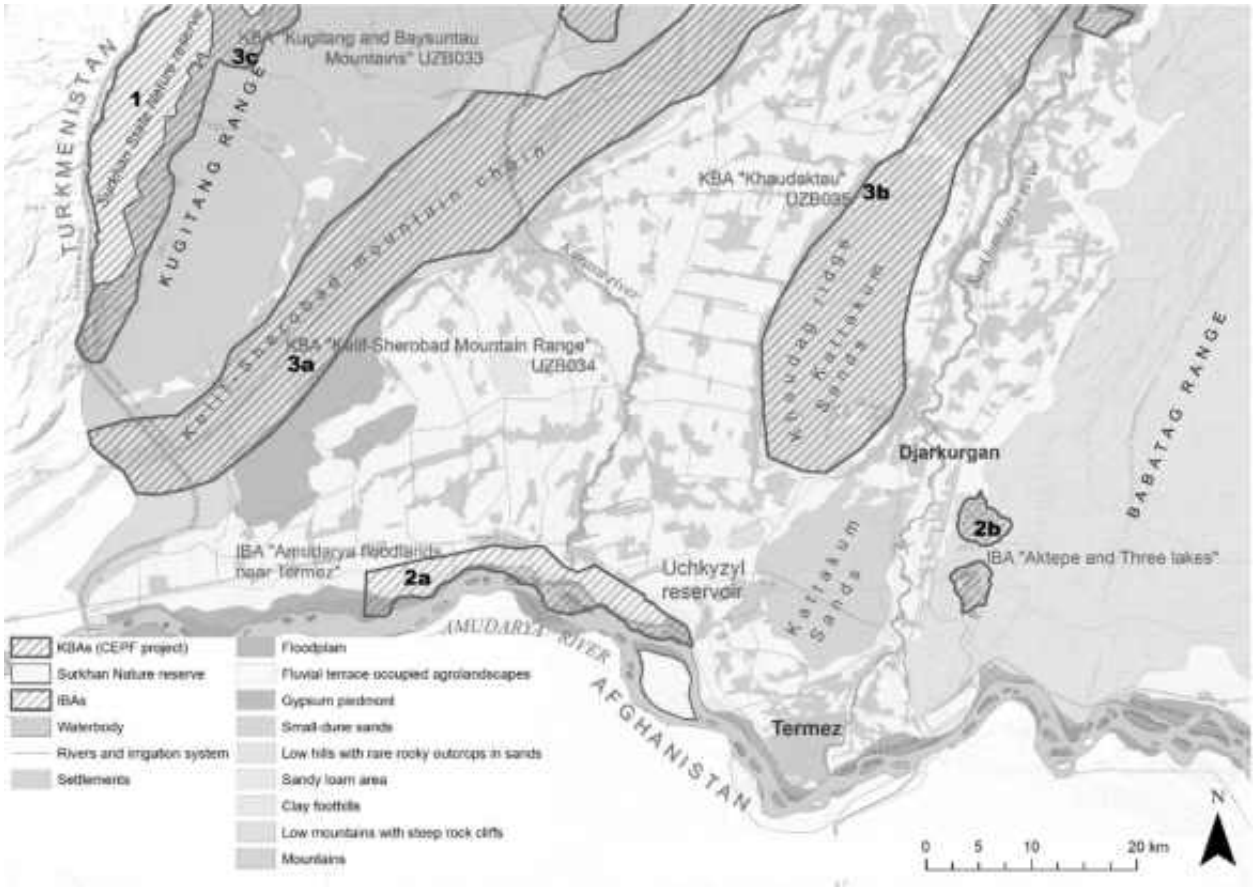


Figure 40: The map showing the Protected areas of National and International level of designation near the Project Area

The market areas in Figure 40 are:

1. Surkhan State nature reserve
2. Important Bird areas [18]
    a. *Amudarya Floodplain near Termez*
    b. *Aktepa and Three lakes*
3. Key biodiversity areas [18]
    a. *Kelif-Sherobad Range*
    b. *Khaudaktau*
    c. *Kugitang and Baysuntau mountains*

8.3 TERRESTRIAL ECOLOGY

This chapter specifies the baseline terrestrial ecology data both flora and fauna. The aims of the study were to:

- Carry out field work to identify the terrestrial flora and fauna that may reside or range within the region of the proposed Project.
- Provide detailed lists of the plant, mammal, reptile, and amphibian fauna species in the region.
- Provide the IUCN Red Data rating and protected status in Uzbekistan for each of the flora and fauna species determined to be present or potentially occurring at the site.
- Identification of any direct or indirect impacts, whether they are beneficial, adverse or neutral, on the current terrestrial biodiversity and provide relevant mitigation measures.

The baseline condition is obtained form from literature research; and site survey team is presented Table 85. The ecological surveys are conducted on 15-19 July and 22-25 July 2021.

Table 85: Site survey experts

Name	Profession
Timur Abduraupov	**Herpetologist**
Anna Ten	**Ornithologist**
Maria Gritsyna	**Theriologist**
Zuri Mustafayeva	**Hydrobiologist**
Ulugbek Mirzaev	**Ichthyologists**
Askar Kuvatov	**Ichthyologists**

8.3.1 Observation and Terrestrial Baseline Conditions

The baseline studies cover protected areas, habitats and species, and ecosystem services, with information adopted and derived from primary and secondary sources.

The project area includes a site of Kattakum sands with an area of about 100 hectares on the northeastern coast of the Uchkizil reservoir, on the border of Termez and Angora administrative districts of the Surkhandarya region of the Republic of Uzbekistan. The absolute altitude on the study area is from 319 m above sea level near the water edge of the Uchkizil lake up to 342 m above sea level. According to the scheme adopted in Uzbekistan for identifying vertical geographical belts [15]; the study area belongs to the chul belt (plains).

Physiographically, the study area is located in the south of Uzbekistan, in the Surkhandarya intermountain area (Surkhan-Sherabad valley), inclined from north to south, to the floodplain of the Amudarya river. In the north and west, the Surkhan-Sherabad valley is limited by the Gissar ridge, the height of the axial part of which exceeds 4000 m above sea level and its southwestern spurs, including the Chulbair Mountains (the highest elevation 3812 m above sea level), Baysuntau (3920 m), Susyztau (2124 m), Tyubere-Oland (2139 m) and the ridge Kugitang (3137 m). In the east, the Surkhandarya intermountain area is bounded by the Babatag ridge (2290 m above sea level), and in

the south - by the Amudarya, the largest river in Central Asia. The territory of the Surkhan-Sherabad Valley is crossed in the meridional direction by the right-bank tributaries of the Amudarya - the Surkhandarya and Sherabaddarya rivers. In the central part of the valley, there are relict sand massifs of Kattakum and Khaudaktau and the remnant upland of Khaudaktau, composed of red sandstones.

The climatic conditions of the project region are determined by its geographic location and the peculiarities of the orography. The powerful mountain ridges of the Pamir-Alai protect this territory from the influence of cold northern air masses, and from the south it is open to hot and dry air. According to the Köppen-Geiger climate classification [20], the territory is located in the cold desert climate zone (BWk). According to the Termez weather station, the average annual air temperature is 17.5 °C, the average January temperature is 3.9 °C, the average July temperature is 29.9 °C, the absolute minimum air temperature is -23.9 °C, the absolute maximum is 47.0 °C, average annual rainfall 155 mm. Due to high temperatures and moisture deficit, the region is characterized by intense chemical and physical weathering.

The landscape of the peripheral part of the Kattakum sands is a wavy or slightly hilly sandy plain, the central part is occupied by a rather extensive massif of semi-fixed hilly sands (the height of the hillocks is 3–7 m), among which there are small saline settlings. The Uchkizil lake has an area of about 10 km^2 and a depth of maksimum 37 m, a sandy bottom, and mostly low and gentle sandy and sandy loam shores, but its northern coast, adjacent to the project area, has relatively steep, eroded slopes, composed of outcrops of gypsum and saline depressions.

The southern and southwestern expanses of the Surkhandarya region are open for the penetration of warm tropical air masses. The location of the mountain ridges prevents the penetration of cold air masses from the north, and the openness of the valleys from the south has formed a zone of dry subtropics with extremely hot, dry and long summers and very mild winters. The Surkhan-Sherabad depression is currently almost completely developed and is a zone of irrigated agriculture. Various industrial crops are grown here; the largest number of sunny days in the country allows you to harvest some garden crops 2-3 times a year; horticulture and viticulture are well developed [21].

These orographic features determine the natural and climatic features of this territory.

The low-lying part in the southern part of the valley (formerly the bottom of a brackish lagoon) is a flat fan that has undergone repeated aeolian treatment; an ancient, natural desert isolate with a unique spectrum of flora and fauna species.

Due to the isolation of the sandy massifs of the Surkhandarya region and the uniqueness of biodiversity, in particular, a number of reptile species living there, a number of authors proposed to create a specialized reserve in the Kattakum desert [21].

8.3.2 Terrestrial Survey Methodology

The ecological baseline studies (habitat identification, floral survey, terrestrial fauna, avifauna survey and literature researches) was conducted by the experts during site surveys. As a result of this field visit, the Project area and its vicinity have been surveyed.

A group consisting of specialists in herpetologist - Timur Abduraupov, ornithologist - Anna Ten and theriologist Maria Gritsyna worked on the project area from 16 to 19 July 2021 to determine flora and fauna species arounf the Project area.

The Baseline both desktop and field Studies focused on the flora and fauna species present along the project and its surrounding area in order to identify potential endemic, restricted-range, critically endangered (CR), endangered species (EN) and vulnerable species (VU).

During the field study, vegetation data were collected to identfy habitat types and created a habitat map from satellite imagery. Plant species were identified, and distributions were checked using relevant literature. The conservation status of each of the plant species documented was researched using the IUCN data basesand the Uzbek Red List to determine the presence of species of conservation importance. Since the date of field studies was not in the appropriate season for flora researches, it is recommended to conduct secondary field surveys during the maximum vegetation development season (i.e. March to May and September).

During constitute of the preliminary list of the flora of the Kattakum sands, available sources, including reports, literature, herbarium data, as well as photographs taken by field team during the field survey was used. Latin names of plant species in the list of flora are given in alphabetical order, in accordance with the international taxonomic databases, as International Plant Names Index [22], The Plant List [23] and Plants of the World Online [24]. Their synonyms are given according to the "Conspectus Florae Asiae Mediae" [25] (optional) are provided in parentheses.

During fauna survey, 16.7 km were covered by pedestrian routes (transects) during the field trip for herpetafaunal and mammal observations. All facilities encountered were photographed and recorded in a field notebook. To analyze the availability /non-availability as well as to determine the degree of activity, a Nasedal hygro-thermometer with an elongated sensor was used to determine the temperature and humidity of the air and an infrared remote electronic thermometer to determine the temperature of the substrate DT-8380. A digital camera with wide-focus lens was used for visual record. Also, in this section, it is tried to show the primary number of reptiles found during surveyat the counting points (transects) and the average density at each of their transects derived by analyzing the primary data. In order to obtain more comprehensive information on vertebrate representation in the area, surveyed not only the area proposed for the construction, but also adjacent areas - the coastline on the east, south and west sides. The ornitological survey does not allow a full assessment of nesting birds in the project area as nesting ended in June. However, conclusions was made based on habitat conditions and the location of the area, how the area is used by birds. In total the survey covered 5 sites in different biotopes. In addition, the breeding and migratory habits were researched using Bird Life International databases to derive the species lists. Birds that could potentially frequent the proposed Project site have been classified according to their migratory, breeding and resident statuses.

Considering that the activity patterns of many terrestrial species are hugely variable (i.e. many are nocturnal), it is possible that certain small species (particularly small mammals, reptiles and amphibians) could have been overlooked during the daily site surveys.

8.3.3 Habitat Classification

Like other intermountain valleys of Central Asia, the Surkhan-Sherabad Valley is a densely populated ancient agricultural oasis. With reference to the IFC PS 6 Habitat Classification, the half of project site can be classified as “Modified Habitat” due to the agricultural practices and activities, and the remaining parts can be classified as "Natural Habitat" [26].

Most of the valley is occupied by cultural landscapes (mainly agricultural landscape and residential landscape). Areas of natural landscapes preserved in the central part of the valley on the Kattakum

sandy massif and on the Khaudaktau Upland are intensively used by the local population for grazing, including the project area.

The habitat classification was conducted based on the available literature data and the data obtained during the field trip on the confinement of phytocenoses to a certain range of elevations, relief and soils, stock geobotanical descriptions, topographic, landscape and geobotanical maps, field survey and interpretation of satellite images available on Internet resources [27].Following 4 types of biotopes were preliminarily identified in the project area (see Figure 41 and Figure 42)

- Flat or wavy sandy plain with desert bindweed-ephemeral- ephemeroid (Convolvulus hamadae, Carex pachystylis, Carex physodes, Poa bulbosa, Bromus tectorum, Hordeum murinum subsp. leporinum), saltwort-desert bindweed-ephemeroid (Convolvulus hamadae, Salsola arbuscula, S. orientalis, Carex pachystylis, Carex physodes, Poa bulbosa) and ephemeroid-sagebrush (Artemisia diffusa, Carex physodes, Carex pachystylis, Poa bulbosa) vegetation;
- Shallow, semi-fixed sands with ephemeral-ephemeroid- Calligonum (Calligonum microcarpum, C. setosum, Carex physodes, Poa bulbosa, Bromus tectorum, Hordeum murinum subsp. leporinum) and ephemeral-desert bindweed-calligonum (Calligonum microcarpum, C. setosum, Carex physodes, Poa bulbosa, Bromus tectorum, Hordeum murinum subsp. bulbosa, Bromus tectorum, Hordeum murinum subsp. leporinum) vegetation, in places with saxaul and calligonum;
- Outcrops of gypsum-bearing and saline sandstones with camel thorn-saltwort vegetation (Salsola arbusculiformis, S. orientalis, Climacoptera sp., Halostachys caspica, Halimocnemis sp., Suaeda sp., Alhagi kirghisorum), in some places with tamarisk (Tamarix laxa) and bean caper (Zygophyllum atriplicoides);
- Anthropogenically disturbed areas with sparse secondary weed-ephemeral vegetation (Poa bulbosa, Bromus tectorum, Hordeum murinum subsp. leporinum, Alhagi kirghisorum, Peganum garmala, Sophora pachycarpa, Salsola paulsenii).

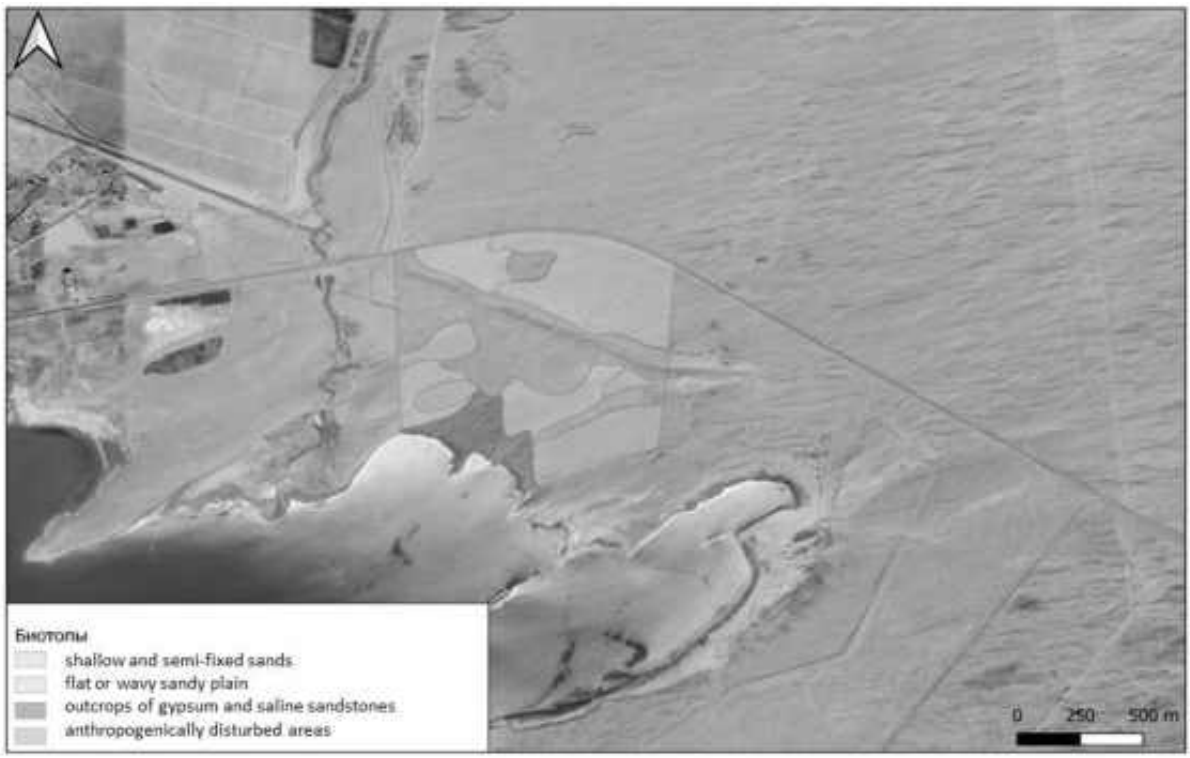


Figure 41: Preliminary biotope map of the project area, compiled with the help of a free software QGIS v 3.18

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Figure 42: The project territory, with an area of 103 hectares, occupies a section of the sandy Kattakum desert (55% of the territory), the rest of the territory is clayey and loamy

Figure 43: At least 26% of the territory (26.82 ha) has been degraded due to clay extraction to produce bricks. These areas are highlighted with yellow polygons

In general, there are degraded areas of anthropogenic origin in the project area. There are quarries for clay extraction to produce bricks and sand extraction. All this led to a strong degradation of the substrate on the territory. At least 26.82 hectares (or 26% of the site) of the territory have traces of anthropogenic impact associated with damage to the soil cover (see Figure 43).

Anthropogenically disturbed areas are located in the central part of the project site and occupy aproximately 1/3 of its area. The photographs of these habitats are represented between Figure 44 to Figure 49.

Figure 44: Wavy sands with saltwort-desert blindweed-ephemeroid vegetation

Figure 45: Semi-fixed hilly sands. On the background – anthropogenically disturbed area (clay extraction place)

Figure 46: Anthropogenically disturbed area (clay extraction place) with community formed by camel thorn, saltworts and weeds

Figure 47: Steep northern coast of the Uchkizil water reservoir, with outcrops of saline sandstones and with sparse camel thorn-saltwort vegetation

Figure 48: Saline lands with tamarisk thickets near the shore of water reservoir

Figure 49: Anthropogenically disturbed area with camel thorn and weeds

8.3.4 Terrestrial Ecological Surveys

8.3.4.1 Flora and Vegetation

The flora and vegetation of the Surkhandarya region of the Republic of Uzbekistan, and in particular, the Surkhan-Sherabad valley are well studied. The history of botanical research in this region goes back about 140 years.

According to the modern scheme of botanical-geographical zoning of Uzbekistan the Uchkizil project area belongs to the Surkhan-Sherabad botanical-geographical region of the West Gissar district of the Mountainous Central Asian province. This botanical-geographical region covers the Surkhan-Sherabad valley, expanding from north to south, and the foothills of the Gissar ridge, Kugitang and Babatag, bordering it [15].

According to the typology of vegetation used in Uzbekistan [15], the predominant type of vegetation in the Kattakum sands is psammophilic vegetation of sandy deserts (Psammophyta), on the outcrops of sandstones, gypsophilic vegetation (Gypsophyta), and along the coast of the Uchkizil lake and in saline depressions among the sands, there is fragmentary saline vegetation (Halophyta).

According to the literature data [15] within the sandy massif of Kattakum, on hilly sands, psammophilic arboreal and shrub vegetation is developed, represented mainly by communities of the Juzgun formation (Calligoneta), such as the ephemeral-ephemeroid-saxaul-juzgun (Calligoneta) , *C. setosum, Haloxylon persicum, Carex physodes, Poa bulbosa, Bromus tectorum, Hordeum murinum subsp.leporinum*, *Calligonum microcarpum, Convolvulus hamadae, and Hordeum murinum subsp.leporinum*. In the vertical structure of these kindred, a shrub layer with a closeness of up to 0.3–0.4 is distinguished, formed by white saxaul bushes up to 2–2.5 m high and kandym or juzgun 100–150 cm high, in some places with the participation of sandy acacia (*Ammodendron conollyi*).

The herbaceous layer of the above associations is dominated by the most important edificator of the sandy deserts of Central Asia - rhizome psammophyte bloated sedge or silt (*Carex physodes*) as well as bulbous bluegrass (*Poa bulbosa*) and annual grasses. The projective cover of the grass layer is low, on semi-fixed sands, on average, up to 15–20%, and on broken sands it does not exceed 5–10%. Partec-ephemeral-ephemeroid (*Convolvulus hamadae, Carex pachystylis, Carex physodes, Poa bulbosa, Bromus tectorum, Hordeum murinum subsp.leporinum*), saltwort-partek-ephemeral orientalis, Carex pachystylis, Carex physodes, Poa bulbosa) and ephemeroid-wormwood (*Artemisia diffusa, Carex physodes, Carex pachystylis, Poa bulbosa*) phytocenoses, in places with local thickets of yantak or camel thorn (Alhagi) kirghalaum Persian (*Hulthemia persica*), which are confined to anthropogenically disturbed areas around settlements, livestock farms, etc. Sandstone outcrops are associated with sparse gypsophyte and ephemeroid-saltwort associations (*Salsola arbusculiformis, S. orientalis, Poa bulbosa, Carex pachystylis*) or saltwort (*Salsola arbusculiformis, S. orientalis, Climacoptera sp., Halimocnehaeda sp. kirghisorum*) kindred, in places with tamarisk (*Tamarix laxa*), carabarak (Halostachys caspica), and green leaf (*Zygophyllum atriplicoides*). In saline areas in relief depressions and near the shore of the reservoir, amber-saltwort-tamarisk (Tamarix laxa, Halostachys caspica, Climacoptera sp., Salsola sp., Suaeda sp, Alhagi kirghisorum) or annual saltwort kindred (*Climacoptera sp., Salsola sp., Suaeda sp*.).

The species composition of phytocenoses is formed by natural dominants, subdominants, and characteristic species. In general, the degree of vegetation degradation in the Kattakum sandy massif can be estimated as average. The main negative anthropogenic factors are grazing, cutting down psammophilic shrubs for firewood, spontaneous expansion of the roads network.

Species included in the IUCN Red List with the status of CR, EN or VU, according to preliminary data, are absent on the territory.

The preliminary list of the flora of the Kattakum sands, compiled on the basis of available sources, including reports, literature, herbarium data, as well as photographs taken by field team during the field survey, includes 131 species (see Table 86), this check-list contains mainly typical representatives of the flora of sandy and saline deserts of the southern part of Central Asia. Most species are native, the number of alien (including invasive) plant species is extremely small. Latin names of plant species in the table are given in alphabetical order, in accordance with the international taxonomic databases, as International Plant Names Index[22], The Plant List and Plants of the World Online [23]. Their synonyms are given according to the "Conspectus Florae Asiae Mediae" [25] (optional) are provided in parentheses. Some representatives of the flora of the project area are given in Table 86 with family and status of each species. The families are listed according to the modern plant system APG IV [28]. The species assessed as threatened in the national Red Book or IUCN Red List, as well as alien species and weeds are indicated in the "Status" column. The status of alien species (non-native in Uzbekistan) and weeds was identified on the basis of available data [29], [15] [30].

Table 86: Preliminary Flora List of Project Area of Influence

Plant species	Family	IUCN Category	Red Book of RUz
Adiantum capillus-veneris	**Pteridaceae**	**LC (Least Concern)**	**N/A Native**
Aeluropus litoralis	**Poaceae**	**LC (Least Concern)**	**N/A Native**
Agriophyllum lateriflorum	**Amaranthaceae**	**N/A**	**N/A Native**
Agriophyllum latifolium	**Amaranthaceae**	**N/A**	**N/A Native**
Alhagi canescens	**Fabaceae**	**N/A**	**N/A Native**
Alhagi kirghisorum	**Fabaceae**	**N/A**	**N/A Native**
Allium borszczowii	**Amaryllidaceae**	**N/A**	**N/A Native**
Allium caspium	**Amaryllidaceae**	**N/A**	**N/A Native**
Allium griffithianum	**Amaryllidaceae**	**N/A**	**N/A Native**
Allium ophiophyllum	**Amaryllidaceae**	**N/A**	**N/A Native**
Allium protensum	**Amaryllidaceae**	**N/A**	**N/A Native**
Alyssum desertorum	**Brassicaceae**	**N/A**	**N/A Native**
Ammodendron conollyi	**Fabaceae**	**N/A**	**N/A Native**
Arnebia coerulea	**Boraginaceae**	**N/A**	**N/A Native**
Arnebia decumbens	**Boraginaceae**	**N/A**	**N/A Native**
Artemisia diffusa	**Asteraceae**	**N/A**	**N/A Native**
Astragalus campylorrhynchus	**Fabaceae**	**N/A**	**N/A Native**

Plant species	Family	IUCN Category	Red Book of RUz
Astragalus chivensis	**Fabaceae**	**N/A**	**N/A Native**
Astragalus excedens	**Fabaceae**	**N/A**	**N/A Native**
Astragalus filicaulis	**Fabaceae**	**N/A**	**N/A Native**
Astragalus kelifi	**Fabaceae**	**N/A**	**N/A Native**
Astragalus oxyglottis	**Fabaceae**	**N/A**	**N/A Native**
Astragalus persipolitanus	**Fabaceae**	**N/A**	**N/A Native**
Astragalus petunnikovii	**Fabaceae**	**N/A**	**N/A Native**
Astragalus rubromarginatus	**Fabaceae**	**N/A**	**N/A Native**
Astragalus tribuloides	**Fabaceae**	**N/A**	**N/A Native**
Astragalus unifoliolatus	**Fabaceae**	**N/A**	**N/A Native**
Atriplex dimorphostegia	**Amaranthaceae**	**N/A**	**N/A Native**
Atriplex moneta	**Amaranthaceae**	**N/A**	**N/A Native**
Bromus tectorum	**Poaceae**	**N/A**	**N/A Native (Ruderal)**
Calligonum caput-medusae	**Polygonaceae**	**N/A**	**N/A Native (Natural Dominant)**
Calligonum microcarpum	**Polygonaceae**	**N/A**	**N/A Native (Natural Dominant)**
Calligonum mongolicum	**Polygonaceae**	**N/A**	**N/A Native**
Calligonum setosum	**Polygonaceae**	**N/A**	**N/A Native (Natural Dominant)**
Capparis spinosa	**Capparaceae**	**N/A**	**N/A Native**
Carex pachystilis	**Cyperaceae**	**N/A**	**N/A Native (Natural Dominant)**
Carex physodes	**Cyperaceae**	**N/A**	**N/A Native (Natural Dominant)**
Caroxylon incanescens	**Amaranthaceae**	**N/A**	**N/A Native**
Caroxylon orientale	**Amaranthaceae**	**N/A**	**N/A Native**
Caroxylon scleranthum	**Amaranthaceae**	**N/A**	**N/A Native**
Carthamus oxyacanthus	**Asteraceae**	**N/A**	**N/A Native (Natural Dominant)**
Ceratocarpus arenarius	**Amaranthaceae**	**N/A**	**N/A Native (Ruderal)**

Plant species	Family	IUCN Category	Red Book of RUz
Ceratocephala falcata	**Ranunculaceae**	**N/A**	**N/A Native (Ruderal)**
Chorispora tenella	**Brassicaceae**	**N/A**	**N/A Native**
Climacoptera longistylosa	**Amaranthaceae**	**N/A**	**N/A Native**
Climacoptera sukaczevii	**Amaranthaceae**	**N/A**	**N/A Native**
Climacoptera turcomanica.	**Amaranthaceae**	**N/A**	**N/A Native**
Colchicum robustum	**Colchicaceae**	**N/A**	**N/A Native**
Consolida camptocarpa	**Ranunculaceae**	**N/A**	**N/A Native**
Consolida rugulosa	**Ranunculaceae**	**N/A**	**N/A Native**
Convolvulus hamadae	**Convolvulaceae**	**N/A**	**N/A Native**
Cousinia oxiana	**Asteraceae**	**N/A**	**N/A Native**
Cousinia patentispina	**Asteraceae**	**N/A**	**N/A Native**
Cousinia pusilla	**Asteraceae**	**N/A**	**N/A Native**
Cousinia resinosa	**Asteraceae**	**N/A**	**N/A Native**
Cutandia memphitica	**Poaceae**	**N/A**	**N/A Native**
Cynanchum acutum subsp. sibiricum	**Apocynaceae**	**N/A**	**N/A Native**
Descurainia sophia	**Brassicaceae**	**N/A**	**N/A Native (Ruderal)**
Eminium lehmanii	**Araceae**	**N/A**	**N/A Native**
Epilasia acrolasia	**Asteraceae**	**N/A**	**N/A Native**
Eremopyrum bonaepartis	**Poaceae**	**N/A**	**N/A Native**
Eremopyrum orientale	**Poaceae**	**N/A**	**N/A Native**
Erodium ciconium	**Geraniaceae**	**N/A**	**N/A Native (Ruderal)**
Erodium cicutarium	**Geraniaceae**	**N/A**	**N/A Native (Ruderal)**
Fritillaria gibbosa	**Liliaceae**	**N/A**	**N/A Native**
Gagea divaricata	**Liliaceae**	**N/A**	**N/A Native**
Gagea pseudoreticulata	**Liliaceae**	**N/A**	**N/A Native**
Gagea stipitata	**Liliaceae**	**N/A**	**N/A Native**
Gamanthus gamocarpus	**Amaranthaceae**	**N/A**	**N/A Native**
Gastrocotyle hispida	**Boraginaceae**	**N/A**	**N/A Native**

Plant species	Family	IUCN Category	Red Book of RUz
Halimocnemis longifolia	**Amaranthaceae**	**N/A**	**N/A Native**
Halimocnemis mollissima	**Amaranthaceae**	**N/A**	**N/A Native**
Halimocnemis villosa	**Amaranthaceae**	**N/A**	**N/A Native**
Halocharis hispida	**Amaranthaceae**	**N/A**	**N/A Native**
Halocnemum strobilaceum	**Amaranthaceae**	**N/A**	**N/A Native**
Halostachys caspica	**Amaranthaceae**	**N/A**	**N/A Native**
Halothamnus subaphyllus	**Amaranthaceae**	**N/A**	**N/A Native**
Haloxylon griffithii	**Amaranthaceae**	**N/A**	**N/A Native**
Haloxylon persicum	**Amaranthaceae**	**N/A**	**N/A Native**
Heliotropium arguzioides	**Boraginaceae**	**N/A**	**N/A Native**
Heliotropium dasycarpum.	**Boraginaceae**	**N/A**	**N/A Native**
Heliotropium lasiocarpum	**Boraginaceae**	**N/A**	**N/A Native**
Heliotropium supinum	**Boraginaceae**	**N/A**	**N/A Native**
Holosteum umbellatum	**Caryophyllaceae**	**N/A**	**N/A Native**
Horaninovia ulicina	**Amaranthaceae**	**N/A**	**N/A Native**
Hordeum murinum subsp. leporinum	**Poaceae**	**N/A**	**N/A Native (Ruderal)**
Hulthemia persica	**Rosaceae**	**N/A**	**N/A Native (Ruderal)**
Hyalea pulchella	**Asteraceae**	**N/A**	**N/A Native**
Hyoscyamus pusillus.	**Solanaceae**	**N/A**	**N/A Native**
Iris longiscapa	**Iridaceae**	**N/A**	**N/A Native**
Ixiolirion tataricum	**Ixioliriaceae**	**N/A**	**N/A Native**
Koelpinia linearis	**Asteraceae**	**N/A**	**N/A Native**
Lagonychium farctum	**Fabaceae**	**N/A**	**N/A Native (Ruderal)**
Leptaleum filifolium	**Brassicaceae**	**N/A**	**N/A Native**
Lomelosia olivieri	**Caprifiliaceae**	**N/A**	**N/A Native**
Meniocus linifolius	**Brassicaceae**	**N/A**	**N/A Native**
Nonea caspica	**Boraginaceae**	**N/A**	**N/A Native**
Oligochaeta vvedenskyi	**Asteraceae**	**N/A**	**VU Native**

Plant species	Family	IUCN Category	Red Book of RUz
Onopordum leptolepis	**Asteraceae**	**N/A**	**N/A Native (Ruderal)**
Oreosalsola arbusculiformis	**Amaranthaceae**	**N/A**	**N/A Native**
Peganum harmala	**Nitrariaceae**	**N/A**	**N/A Native (Ruderal)**
Phlomoides boissieriana	**Lamiaceae**	**N/A**	**N/A Native**
Phragmites australis.	**Poaceae**	**N/A**	**N/A Native**
Poa bulbosa.	**Poaceae**	**N/A**	**N/A Native (Natural Dominant)**
Ranunculus pinnatisectus	**Ranunculaceae**	**N/A**	**N/A Native**
Ranunculus sewerzowii	**Ranunculaceae**	**N/A**	**N/A Native**
Salsola iberica	**Amaranthaceae**	**N/A**	**N/A Native (Ruderal)**
Salsola paulsenii	**Amaranthaceae**	**N/A**	**N/A Native (Ruderal)**
Senecio subdentatus	**Asteraceae**	**N/A**	**N/A Native**
Smirnowia turkestana	**Fabaceae**	**N/A**	**N/A Native**
Sophora pachycarpa	**Fabaceae**	**N/A**	**N/A Native**
Sphaerophysa salsula	**Fabaceae**	**N/A**	**N/A Native**
Stipagrostis karelinii	**Poaceae**	**N/A**	**N/A Native**
Stipagrostis pennata	**Poaceae**	**N/A**	**N/A Native**
Stipagrostis plumosa	**Poaceae**	**N/A**	**N/A Native**
Streptoloma desertorum	**Brassicaceae**	**N/A**	**N/A Native**
Strigosella grandiflora.	**Brassicaceae**	**N/A**	**N/A Native**
Strigosella turkestanica	**Brassicaceae**	**N/A**	**N/A Native**
Suaeda arcuata	**Amaranthaceae**	**N/A**	**N/A Native**
Suaeda microsperma	**Amaranthaceae**	**N/A**	**N/A Native**
Tamarix laxa	**Tamaricaceae**	**N/A**	**N/A Native**
Tamarix meyeri.	**Tamaricaceae**	**N/A**	**N/A Native**
Tamarix ramosissima	**Tamaricaceae**	**N/A**	**N/A Native**
Tribulus macropterus.	**Zygophyllaceae**	**N/A**	**N/A Native**
Tribulus terrestris.	**Zygophyllaceae**	**N/A**	**N/A Native (Ruderal)**
Trigonella geminiflora	**Fabaceae**	**N/A**	**N/A Native**

Plant species	Family	IUCN Category	Red Book of RUz
Xanthium spinosum	**Asteraceae**	**N/A**	**N/A Native (Ruderal)**
Xanthium strumarium.	**Asteraceae**	**N/A**	**N/A Native (Ruderal)**
Xylosalsola arbuscula	**Amaranthaceae**	**N/A**	**N/A Native**
Xylosalsola richteri	**Amaranthaceae**	**N/A**	**N/A Native**
Zygophyllum atriplicoides	**Zygophyllaceae**	**N/A**	**N/A Native**

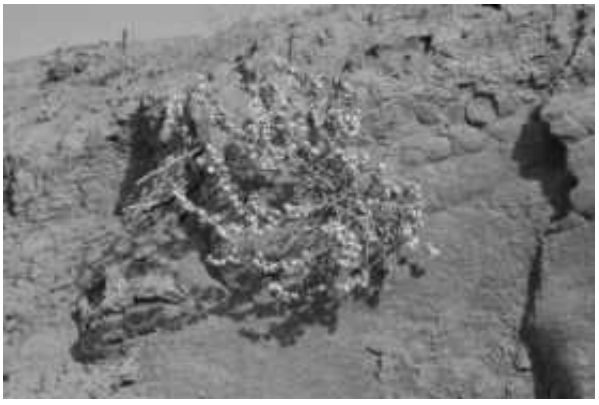
According to the local Environmental Impact Statement (EIS) draft, during the construction of the CCPP on the territory of the Kattakum village community assembly of Angor district of Surkhandarya region, no transplantation or cutting of trees is planned.

The preliminary list of the flora of the Kattakum sands, compiled on the basis of reports, literature, herbarium data and photographs taken by field team during the field survey includes 131 species, mainly typical representatives of the flora of sandy and saline deserts of the southern part of Central Asia. The vast majority of species are native; the number of alien plant species is extremely insignificant. According the estimates, anthropogenically disturbed areas occupy about 1/3 of the project area.

Only 3 species included in the Red Book of Uzbekistan (*Allium rhodanthum, Dipcadi turkestanicum, Oligochaeta vvedenskyi*) are noted based on literature and herbarium data for the sandy massifs of Kattakum and Khaudaktau in the central part of the Surkhan-Sherabad valley, the first two of them are known only from Khaudaktau and have not been noted for the past several decades, despite special searches. Nevertheless, there is a possibility of finding these species in the Kattakum sands (not excluding the project area).

The photos belonging to observed plant species are given Figure 50.

Convolvulus hamadae



Zygophyllum atriplicoides

Adiantum capillus-veneris

Xanthium strumarium and Tamarix sp.

Figure 50: The Examples Observed Plant Species in Project Area

8.3.4.2 Fauna

Herpetafauna

The lists of these species are preliminary and are based on the available literary, departmental, personal field data of the authors of the report for past studies and data from a short field trip. Tracks and locations are given in Figure 51.

There are 27 species of reptiles belonging to 12 families on a relatively small and rather highly urbanized project area.

The total number of reptile species is 43.5%. Also, the project area is inhabited by representatives of all available reptile families inhabiting the territory of Uzbekistan. Among them, 8 species included in the Red Book of the Republic of Uzbekistan (2019) (29.6% of the total number of species inhabiting the project area), 2 species included in the Red List of the International Union for the Conservation of Nature (IUCN Red List) [31] - 7.4% of the total number of species inhabiting the project area) and 4 species - in the Annex of the Convention on International Trade in Endangered Species of Fauna and Flora (14.8% of the total number of species inhabiting the project area). The list of amphibians in the project area consists of 2 species from 2 families, which is 40% of the list of all amphibians in Uzbekistan (see Table 87).

Table 87: List of potential reptile species inhabiting the project area

No	Species name	Availability of species as per literature source.	History proprietary data	Field trip data for July 2021.	Abundance of species	Endemism	Status in accordance to		
							RB RUz	IUCN	CITES
Amphibia									
Bufonidae									

No	Species name	Availability of species as per literature source.	History proprietary data	Field trip data for July 2021.	Abundance of species	Endemism	Status in accordance to		
							RB RUz	IUCN	CITES
1	***Bufotes turanensis***	+	+		**Normal**	**UZ, TM, IR, AF**			
Ranidae									
2	***Pelophylax ridibundus***	+	+		**Normal**			**LC**	
Reptilia									
Testudinidae									
1	***Testudo horsfieldii***	+	+		**Rare**		**2 (VU)**	**VU**	**II**
Gekkonidae									
2	***Crossobamon eversmanni***	+	+	+	**Normal**				
3	***Tenuidactylus bogdanovi***	+	+	+	**Normal**	**UZ, TJ, TM**		**LC**	
Sphaerodactylidae									
4	***Teratoscincus scincus***	+	+	+	**Normal**				
Agamidae									
5	***Trapelus sanguinolentus***	+	+	+	**Normal**				
6	***Phrynocephalus mystaceus galli***	+	+		**Not abundant**			**LC**	
7	***Phrynocephalus raddei boettgeri***	+	+	+	**Not abundant**	**UZ, TJ, TM**	**2 VU:D**	**LC**	
8	***Phrynocephalus sogdianus***	+	+	+	**Normal**	**UZ, TJ**			
Anguidae									
9	***Pseudopus apodus***	+			**Not abundant**				
Scincidae									

No	Species name	Availability of species as per literature source.	History proprietary data	Field trip data for July 2021.	Abundance of species	Endemism	Status in accordance to		
							RB RUz	IUCN	CITES
10	***Ablepharus pannonicus***	+			Normal				
11	***Eumeces schneideri***	+			Not abundant				
Lacertidae									
12	***Eremias grammica***	+	+		Not abundant			LC	
13	***Eremias lineolata***	+	+	+	Normal	UZ, TJ, TM, KZ, AF		LC	
14	***Eremias nigrocellata***	+	+	+	Normal	UZ, TJ, TM, AF	2 VU:D	LC	
15	**Eremias velox**	+	+	+	Normal				
16	***Eremias scripta lazdini***	+	+	+	Normal	UZ, TJ		LC	
Varanidae									
17	***Varanus griseus caspius***	+	+	+	Rare		2 VU:D		I
Boidae									
18	***Eryx tataricus***	+	+		Rare		3(NT)		II
Colubridae									
19	***Boiga trigonata melanocephala***	+	+	+	Not abundant		2 VU:R		
20	***Psammophis lineolatus***	+	+	+	Normal				
21	***Hemorrhois ravergieri***	+	+		Normal				
22	***Platyceps karelinii***	+	+		Not abundant				
23	***Spalerosophis diadema***	+	+		Not abundant				
24	***Natrix tessellata***	+	+	+	Normal				

No	Species name	Availability of species as per literature source.	History proprietary data	Field trip data for July 2021.	Abundance of species	Endemism	Status in accordance to		
							RB RUz	IUCN	CITES
25	***Lycodon striatus bicolor***	**+**			**Rare**		**2 (VU:R)**		
Elapidae									
26	***Naja oxiana***	**+**			**Rare**		**3 (NT)**	**DD**	**II**
Viperidae									
27	***Echis multisquamatus***	**+**	**+**		**Not abundant**				

RBRUz - species / subspecies is included in the Red Book of the Republic of Uzbekistan (2019) (CR - Species on the verge of extinction; VU - vulnerable species; NT - species close to vulnerable position); IUCN - species included in the Red List of Vanishing Species of the International Union for Conservation of Nature (VU - vulnerable species; NT - species close to vulnerable position); CITES I, II - a species included in Appendix (I, II) of the Convention on International Trade in Endangered Species of Fauna and Flora; Endemism: AF-Afghanistan, KZ - Kazakhstan; TM - Turkmenistan; KG - Kyrgyzstan; TJ - Tajikistan; UZ – Uzbekistan

Figure 51: Locations of transects covered in the project area during a field trip

Table 88: Results of reptiles counts in the project area during a field trip

Site No	N	E	Date	Species	No of sp.	Density in\ha	Soil t°C	Air t°C	Humidity
UK-Herp_1	37,37427	67,24974	16.07.2021	**Comb-toed gecko** ***Crossobamon eversmanni***	1	1	+26,2	+26,5	28%
				Bogdanov's thin-toed gecko ***Tenuidactylus bogdanovi***	30	12			
				Common Wonder Gecko ***Teratoscincus scincus***	2 set of footprints	-			
				Tajikistan Toadhead Agama ***Phrynocephalus sogdianus***	2	0,8			
				Lasdin's sand racerunner ***Eremias scripta lasdini***	4	1,6			
				Rapid Racerunner ***Eremias velox***	1	0,4			
				Indian gamma snake ***Boiga trigonata***	1	0,19			
UK-Herp_2	37,37819	67,24296	17.07.2021	**Bogdanov's thin-toed gecko** ***Tenuidactylus bogdanovi***	3	1,5	+42,8	+32,1	22%
				Steppe Agama ***Trapelus sanguinolentus***	2	1,03			

Site No	N	E	Date	Species	No of sp.	Density in\ha	Soil t°C	Air t°C	Humidity
				Tajikistan Toadhead Agama ***Phrynocephalus sogdianus***	**3**	**1,5**			
				Rapid Racerunner ***Eremias velox***	**2**	**1,03**			
				Dice snake ***Natrix tessellata***	**1**	**0,5**			
				Sand racer ***Psammophis lineolatus***	**1**	**0,5**			
UK-Herp_3	**37,36358**	**67,25097**	**17.07.2021**	**Bogdanov's thin-toed gecko** ***Tenuidactylus bogdanovi***	**5**	**3,3**	**+38,9**	**+33,1**	**24%**
UK-Herp_4	**37,35902**	**67,20017**	**17.07.2021**	**-**	**-**	**-**	**+36,7**	**+31,2**	**24%**
				Steppe Agama ***Trapelus sanguinolentus***	**4**	**2,3**			
				Tajikistan Toadhead Agama ***Phrynocephalus sogdianus***	**8**	**4,7**			
UK-Herp_5	**37,37885**	**67,25285**	**18.07.2021**	**Boettger Caspian Toad-head Agama** ***Phrynocephalus raddei boettgeri***	**2**	**1,2**	**+44**	**+32,3**	**24%**
				Black-ocellated racerunner ***Eremias nigrocellata***	**5**	**2,9**			

Site No	N	E	Date	Species	No of sp.	Density in\ha	Soil t°C	Air t°C	Humidity
UK-Herp_6	37,37947	67,24992	18.07.2021	**Lasdin's sand racerunner** ***Eremias scripta lasdini***	**3**	**1,7**	**+27,6**	**+27,9**	**27%**
				Caspian Monitor ***Varanus griseus caspius***	**1 chain of footprints**	**-**			
				Indian gamma snake ***Boiga trigonata***	**1**	**0,17**			
				Comb-toed gecko ***Crossobamon eversmanni***	**1**	**0,5**			
				Indian gamma snake ***Boiga trigonata***	**1 skin slough**	**-**			
UK-Herp_7	37,37560	67,25628	19.07.2021	**Comb-toed gecko** ***Crossobamon eversmanni***	**1**	**0,4**	**+26,3**	**+27,3**	**28%**
				Common Wonder Gecko ***Teratoscincus scincus***	**2**	**0,9**			

Site No	N	E	Date	Species	No of sp.	Density in\ha	Soil t°C	Air t°C	Humidity
UK-Herp_8	37,378215	67,256268	18.07.2021	**Steppe Agama** ***Trapelus sanguinolentus***	3	2	+43,3	+32,2	24%
				Tajikistan Toadhead Agama ***Phrynocephalus sogdianus***	19	9,5			
				Boettger Caspian Toad-head Agama ***Phrynocephalus raddei boettgeri***	2	1			
				Caspian Monitor ***Varanus griseus caspius***	1 chain of footprints	-			

Despite the fact that the project area is sufficiently developed and even degraded in places, in a short time, field trip, we noted 14 species of reptiles (22.6% of the entire list of species of Uzbekistan and 51.8% of those noted in this area for literature data of species), of which 4 species (28.6% of the encountered species) are rare and listed in the Red Book of the Republic of Uzbekistan, 1 species (7.1% of the encountered species) is included in CITES [32] Appendix I and 4 narrow-range, endemic taxa (28.6% of the encountered species).

The photos are given observed species and potential species in Figure 52.

Crossobamon eversmanni at point UK-Herp_1

Tenuidactylus bogdanovi at the point UK-Herp_1

Teratoscincus scincus

Trapelus sanguinolentus at point UK-Herp_5

Phrynocephalus raddei boettgeri at point UK-Herp_5

Phrynocephalus sogdianus at point UK-Herp_2

Eremias lineolata at point UK-Herp_5

Eremias nigrocellata at point UK-Herp_5

Eremias velox at point UK-Herp_2

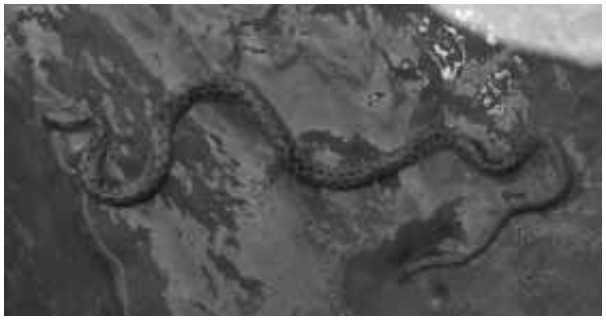
Eremias scripta lasdini at point UK-Herp_1

Tracks of a young Varanus griseus caspius at point UK-Herp_5

Eryx tataricus in Kattakum sand

Boiga trigonata melanocephala in Kattakum sands

Hemorrhois ravergieri at Karakyr foothill



Natrix tessellate at point UK-Herp_2

Echis multisquamatus in Kattakum sands

Figure 52: The Photos of Observed and Potential Reptile Species of the Project Area

Ornithofauna

The project area is located on the shore of a reservoir (Uchkizil lake) in Surkhandarya region, 10 km from IBA "Amudarya floodlands near Termez". This is the territory of regular mass wintering of a large number of waterfowl and near-water birds. This is due to the location of the region on the Central Asian flyway. Despite the fact that IBA has great attractiveness for most species, nevertheless, Uchkizil can potentially also attract them due to the water surface, food and as a recreation area.

Within the framework of this analysis, a list of key bird species (endemism, International Union for Conservation of Nature (IUCN) [31], Convention on International Trade in Endangered Species (CITES) [32], UN Convention on the Conservation of Migratory Species of Wild Animals (CMS) [34], Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention) [33] , Uzbekistan Red Data Book [16] was given in Table 89.

A total of 135 bird species can be identified for the region around the project area, which are rare or listed. The only endemic bird of Uzbekistan, Podoces panderi does not live here. Among them, 21 species have IUCN statuses (NT-10 species, VU - 7 species and EN - 4 species). 33 species are included in the Red Book of Uzbekistan (2019) 4 species with the EN status, 23 - VU and 6 NT species. CITES Appendix I includes 5 species, and 33 species in Appendix II. Appendix II of the Berne Convention included 104 species. The CMS (Convention on Migratory Speies) list in Appendix I included 12 types, and in Appendix II - 82 types. Of these species, representatives of 12 orders: Galliformes - 1 species, Anseriformes - 21 species, Pelecaniformes - 3 species, Ciconiiformes - 9 species, Podicipediformes - 2 species, Falconiformes - 29 species, Gruiformes - 3 species, Charadriiformes - 31 species, Pterocliformes - 1 species, Columbiformes - 1 species, Strigiformes - 3 species, Caprimulgiformes - 1 species, Apodiformes - 1 species, Coraciiformes - 3 species, Bucerotiformes - 1 species, Passeriformes - 25 species (see Table 89) [16][31][32][33][34].

During the field surveys, 25 bird species were recorded, 18 of them directly in the planned area (see Table 89) also shows the association of birds with the project area.

Table 89: Inventory of ornithofauna for the Amudarya floodplain area and the southern part of the Surkhandarya region

ID	Scientific name of the species	English name	IUCN status 2020	Uzbek Red Book 2019	CITES	CMS	Bern conv	Field data July 2021	Previously data
	Galliformes	**Gallinaceous**							
1	**Coturnix coturnix**	**Common Quail**				**II**			
	Anseriformes	**Geese & allies**							
2	**Cygnus olor**	**Mute Swan**		**NT**		**II**			
3	**Anser albifrons**	**Greater White-fronted Goose**				**II**			**Amudarya 21Jan2018 - 200 birds (Lampila et al. 2018a), 9Dec2018 - 500 (Lampila et al. 2019), 18 birds in 2003-2005 in Amudarya (Lanovenko 2008a)**
4	**Anser erythropus**	**Lesser White-fronted Goose**	**VU**	**VU:R**		**I**	**II**		**Amudarya 21Jan2018 - 10 birds (Lampila et al. 2018a), 9Dec2018 - 50 birds (Lampila et al. 2019), IBA data 54-500 birds in 2003-2005 in Amudarya (Lanovenko 2008a)**
5	**Anser anser**	**Greylag Goose**				**II**			**Amudarya 21Jan2018 - 800 bird (Lampila et al. 2018a), 9Dec2018 - 700-1000 (Lampila et al. 2019), 5Mar2020-170 (Ten pers.data), IBA data 5942-31010 birds in 2003-2005 in Amudarya (Lanovenko 2008a)**
6	**Branta ruficollis**	**Red-breasted Goose**	**VU**	**VU:R**	**II**	**I**	**II**		
7	**Tadorna ferruginea**	**Ruddy Shelduck**				**II**	**II**		**Amudarya 21Jan2018 - 3 birds (Lampila et al. 2018a), 9Dec2018 - 4 birds (Lampila et al. 2019), IBA data 31-69 birds in 2003-2005 in Amudarya, and 14 birds in 2004 in Aktepa (Lanovenko 2008b)**
8	**Tadorna tadorna**	**Common Shelduck**				**II**	**II**		
9	**Anas penelope**	**Eurasian Wigeon**				**II**			**IBA data 7-146 birds in 2003-2005 in Amudarya (Lanovenko 2008a), and 113-1669 birds in 2003-06 in Aktepa (Lanovenko 2008b)**
10	**Anas strepera**	**Gadwall**				**II**			**Amudarya 5Mar2020- -14 birds (Ten pers.data), IBA data 1-3 birds in 2003-2005 in Amudarya (Lanovenko 2008a), and 4-9 birds in 2003-06 in Aktepa (Lanovenko 2008b)**
11	**Anas crecca**	**Common Teal**				**II**			**Amudarya 21Jan2018 - 10 birds (Lampila et al. 2018a), 9Dec2018 – 200 (Lampila et al. 2019), 10 Mar2020 -234, IBA data 8-818 birds in 2003-2005 İn Amudarya(Lanovenko 2008a), and 10-575 birds in 2003-06 in Aktepa(Lanovenko 2008b)**

ID	Scientific name of the species	English name	IUCN status 2020	Uzbek Red Book 2019	CITES	CMS	Bern conv	Field data July 2021	Previously data
12	Anas platyrhynchos	Mallard				II			Amudarya 21Jan2018 - 4000 birds (Lampila et al. 2018a), 9Dec2018 - 4000 (Lampila et al. 2019), IBA data 5728-14057 birds in 2003-2005 in Amudarya (Lanovenko 2008a), and 308-1892 birds in 2003-06 in Aktepa (Lanovenko 2008b)
13	Anas acuta	Northern Pintail				II			IBA data 2 birds in 2003 in Aktepa (Lanovenko 2008b)
14	Anas clypeata	Northern Shoveler				II			IBA data 86 birds in 2003-2005 in Amudarya (Lanovenko 2008a)
15	Marmaronetta angustirostris	Marbled Teal	VU	EN		I	II		IBA data 4 birds in 2005-06 in Aktepa (Lanovenko 2008b)
16	Netta rufina	Red-crested Pochard				II			Amudarya 21Jan2018 - 4 birds (Lampila et al. 2018a), IBA data 10-141 birds in 2003-2005 in Amudarya (Lanovenko 2008a), and 1-457 birds in 2003-06 in Aktepa(Lanovenko 2008b)
17	Aythya ferina	Common Pochard	VU			II			Amudarya 21Jan2018 - 4 birds (Lampila et al. 2018a), 5Mar2020- 7 birds (Ten pers.data), IBA data 30-35 birds in 2003-2005 in Amudarya (Lanovenko 2008a), and 451-1067 birds in 2003-06 in Aktepa (Lanovenko 2008b)
18	Aythya nyroca	Ferruginous Duck	NT	VU:D		I			IBA data 1 birds in 2003-2005 in Amydarya (Lanovenko 2008a) and 1-3 in 2003-2006 in Aktepa (Lanovenko 2008b)
19	Aythya fuligula	Tufted Duck				II			Aktepe 21Jan2018 - 5 birds (Lampila et al. 2018a), 7Mar2020- -4 birds (Ten pers.data), IBA data 15-117birds in 2003-06 in Aktepa (Lanovenko 2008b)
20	Bucephala clangula	Common Goldeneye				II			Yuzhno-Surkhan reservoir 22 Jan2018 – 10 (Lampila et al. 2018a), IBA data 8 in 2004 in Aktepa (Lanovenko 2008b)
21	Mergus merganser	Goosander				II			Yuzhno-Surkhan reservoir 22 Jan2018 – 2 (Lampila et al. 2018a)
22	Mergellus albellus	Smew				II	II		IBA data 11-197 birds in 2003-06 in Aktepa (Lanovenko 2008b)
	Pelecaniformes	Pelicans & allies							
23	Pelecanus onocrotalus	Great White Pelican		VU:D		I	II		IBA data 1 birds in 2003in Amudarya (Lanovenko 2008b)

ID	Scientific name of the species	English name	IUCN status 2020	Uzbek Red Book 2019	CITES	CMS	Bern conv	Field data July 2021	Previously data
24	Pelecanus crispus	Dalmatian Pelican	NT	EN	I	I	II		IBA data 3 birds in 2003 in Amudarya (Lanovenko 2008a), and 3 birds in 2004-05 in Aktepa (Lanovenko 2008b)
25	Phalacrocorax pygmeus	Pygmy Cormorant		NT		II	II	8 bird Uchkizil at 17Jul2021	Amudarya 21Jan2018 - 10 birds (Lampila et al. 2018a), IBA data 30-103 birds in 2003-2005 in Amudarya (Lanovenko 2008a)
	Ciconiiformes	Storks & allies							
26	Ardeola ralloides	Squacco Heron		VU:R			II		Amudarya 9Dec2018 – 1 (Lampila et al. 2019)
27	Botaurus stellaris	Eurasian Bittern				II	II		IBA data 3 birds in 2003-2005 in Amudarya (Lanovenko 2008a)
28	Ixobrychus minutus	Little Bittern				II	II		
29	Nycticorax nycticorax	Black-crowned Night Heron					II		Amudarya 5Mar2020- - 2 birds (Ten pers.data)
30	Egretta garzetta	Little Egret		VU:D			II		IBA data 1 birds in 2003-2005 in Amudarya (Lanovenko 2008a)
31	Casmerodius albus	Great Egret				II	II		Amudarya 21Jan2018 - 5 birds (Lampila et al. 2018a), 9Dec2018 - 5 (Lampila et al. 2019), IBA data 27-103 birds in 2003-2005 in Amudarya (Lanovenko 2008a)
32	Ardea purpurea	Purple Heron				II	II		IBA data 2 birds in 2005 in Aktepa (Lanovenko 2008b)
33	Ciconia nigra	Black Stork		VU:R	II	II	II		Sherobad river 13Mar2020 – 1 (Ten pers.data), IBA data 2 birds in 2003-2005 in Amudarya (Lanovenko 2008a)
34	Ciconia ciconia	White Stork		NT		II	II		fields 1 nest 6Mar2020(Ten pers.data) IBA data 9 birds in 2003 (Lanovenko 2008a)
	Podicipediformes	Grebes							
35	Tachybaptus ruficollis	Little Grebe					II	1 bird Uchkizil at 17Jul2021	Amudarya 21Jan2018 - 1 bird (Lampila et al. 2018a), IBA data 2-1 birds in 2003-2005 in Amudarya (Lanovenko 2008a)
36	Podiceps nigricollis	Black-necked Grebe					II		Amudarya 21Jan2018 - 15 birds (Lampila et al. 2018a), 17-137 birds in 2003-06 in Aktepa (Lanovenko 2008b)
	Falconiformes	Falcons & allies							
37	Falco naumanni	Lesser Kestrel		NT	II	I	II		

ID	Scientific name of the species	English name	IUCN status 2020	Uzbek Red Book 2019	CITES	CMS	Bern conv	Field data July 2021	Previously data
38	Falco tinnunculus	Common Kestrel			II	II	II		Amudarya 21Jan2018 - 2 birds (Lampila et al. 2018a), 9Dec2018 – 5 (Lampila et al. 2019), IBA data 9-10 birds in 2003-2005 in Amudarya (Lanovenko 2008a)
39	Falco columbarius	Merlin			II	II	II		Amudarya 21Jan2018 - 2 birds (Lampila et al. 2018a), 9Dec2018 - 2(Lampila et al. 2019)
40	Falco subbuteo	Eurasian Hobby			II	II	II		
41	Falco cherrug	Saker Falcon	EN	EN	II	I	II		IBA data observed in Amudarya (Lanovenko 2008a)
42	Falco peregrinus	Peregrine Falcon		VU:R	I	II	II		IBA data observed in Aktepa (Lanovenko 2008b)
43	Falco pelegrinoides	Barbary Falcon		VU:R	I	II	II		IBA data observed in Aktepa (Lanovenko 2008b)
44	Pandion haliaetus	Osprey		VU:R	II	II	II		
45	Milvus migrans	Black Kite			II	II	II		Kattakum and Khaudag sands 4-5Mar2020 – 1 (Ten pers.data), IBA data 1-4 birds in 2003-2005 in Amudarya (Lanovenko 2008a), IBA data 5 birds in 2005 in Aktepa (Lanovenko 2008b)
46	Haliaeetus leucoryphus	Pallas's Fish-eagle	EN	EN	II	I	II		IBA data 1 birds in 2005 in Aktepa (Lanovenko 2008b)
47	Haliaeetus albicilla	White-tailed Sea-eagle		VU:R	I	I	II		Amudarya 21Jan2018 - 5 birds (Lampila et al. 2018a), 9Dec2018 – 5 (Lampila et al. 2019), IBA data 6-14 birds in 2003-2005 in Amudarya (Lanovenko 2008a), IBA data 1-14 birds in 2003-06 in Aktepa(Lanovenko 2008b)
48	Gyps fulvus	Griffon Vulture		VU:D	II	II	II		Kattakum and Khaudag sands 4-5Mar2020 - 1(Ten pers.data)
49	Aegypius monachus	Cinereous Vulture	NT	NT	II	II	II		Kattakum and Khaudag sands 4-5Mar2020 - 1(Ten pers.data)
50	Gypaetus barbatus	Bearded Vulture	NT	VU:R	II	II	II		Kattakum and Khaudag sands 4-5Mar2020 - 1(Ten pers.data)
51	Neophron percnopterus	Egyptian Vulture	EN	VU:D	II	II	II	1 juv bird in project sites at 17Jul2021	Kattakum and Khaudag sands 4-5Mar2020 - 2, project site - 1 juv (Ten pers.data)
52	Circaetus gallicus	Short-toed Snake-eagle		VU:D	II	II	II		

ID	Scientific name of the species	English name	IUCN status 2020	Uzbek Red Book 2019	CITES	CMS	Bern conv	Field data July 2021	Previously data
53	Circus aeruginosus	Western Marsh Harrier			II	II	II	2 birds in project sites and 5 birds near Uchkizil at 17Jul2021	Amudarya 21Jan2018 - 15 birds (Lampila et al. 2018a), 9Dec2018 – 10 (Lampila et al. 2019), Kattakum and Khaudag sands 4-5Mar2020 – 1 (Ten pers.data), IBA data 27-55 birds in 2003-2005 in Amudarya (Lanovenko 2008a), IBA data 3-14 birds in 2003-06 in Aktepa (Lanovenko 2008b)
54	Circus cyaneus	Hen Harrier			II	II	II		Amudarya 21Jan2018 - 5 birds (Lampila et al. 2018a), 9Dec2018 – 3 (Lampila et al. 2019), Kattakum and Khaudag sands 4-5Mar2020 – 1 (Ten pers.data) IBA data 86 birds in 2003-20052-4 in Amudarya (Lanovenko 2008a), IBA data 2 birds in 2005 in Aktepa (Lanovenko 2008b)
55	Circus macrourus	Pallid Harrier	NT	NT	II	II	II		Amudarya 21Jan2018 - 1 birds (Lampila et al. 2018a), IBA data 1 birds in 2003-2005 in Amuda rya (Lanovenko 2008a)
56	Circus pygargus	Montagu's Harrier			II	II	II		
57	Accipiter badius	Shikra			II	II	II		
58	Accipiter nisus	Eurasian Sparrowhawk			II	II	II		Amudarya 21Jan2018 - 1 birds (Lampila et al. 2018a) fields near Karasu 5Mar2020-3 (Ten pers.data)
59	Accipiter gentilis	Northern Goshawk			II	II	II		
60	Buteo buteo	Eurasian Buzzard			II	II	II		Kattakum and Khaudag sands 4-5Mar2020 – 1 (Ten pers.data), IBA data 1 birds in 2003-2005 in Amudarya (Lanovenko 2008a)
61	Buteo rufinus	Long-legged Buzzard			II	II	II		Amudarya 21Jan2018 - 4 birds (Lampila et al. 2018a), Kattakum and Khaudag sands 4-5Mar2020 – 1 (Ten pers.data), IBA data 6 birds in 2003-2005 in Amudarya (Lanovenko 2008a)
62	Aquila clanga	Greater Spotted Eagle	VU	VU:R	II	I	II		IBA data 1 birds in 2003-2005 in Amudarya(Lanovenko 2008a)
63	Aquila nipalensis	Steppe Eagle	EN	VU:D	II	II	II		Amudarya 5Mar2020- - 2 birds (Ten pers.data), IBA data 5 birds in 2003-2005 in Amudarya (Lanovenko 2008a), IBA data 2 birds in 2003 in Aktepa (Lanovenko 2008b)
64	Aquila heliaca	Eastern Imperial Eagle	VU	VU:D	I	I	II		Amudarya 21Jan2018 - 3 birds (Lampila et al. 2018a), 9Dec2018 – 1 (Lampila et al. 2019), 5Mar2020 - 1, Kattakum and Khaudag sands 4Mar2020 - 1, (Ten pers.data) IBA data 1-6 birds in 2003-2005 in Amudarya (Lanovenko 2008a), IBA data 2 birds in 2004 in Aktepa (Lanovenko 2008b)

ID	Scientific name of the species	English name	IUCN status 2020	Uzbek Red Book 2019	CITES	CMS	Bern conv	Field data July 2021	Previously data
65	Aquila chrysaetos	Golden Eagle		VU:R	II	II	II		IBA data 1 birds in 2003-2005 in Amudarya (Lanovenko 2008a)
	Gruiformes	Cranes, Rails, And Relatives							
66	Anthropoides virgo	Demoiselle Crane			II	II	II		IBA data 140-1500 birds in 2003-2005 in Amudarya (Lanovenko 2008a)
67	Grus grus	Common Crane			II	II	II		Amudarya 21Jan2018 - 2210 birds (Lampila et al. 2018a), 9Dec2018 – 1000 (Lampila et al. 2019), 5Mar2020-368 (Ten pers.data), Kattakum 5Mar2020-9 (Ten pers.data), IBA data 6010-22169 birds in 2003-2005 in Amudarya (Lanovenko 2008a)
68	Tetrax tetrax	Little Bustard	NT	VU:D	II		II		Amudarya 21Jan2018 - 1980 birds (Lampila et al. 2018a), 9Dec2018 – 400 (Lampila et al. 2019), IBA data 150-2000 birds in 2003-2005 in Amudarya (Lanovenko, 2008 a)
	Charadriiformes	Shorebirds							
69	Burhinus oedicnemus	Eurasian Thick-knee				II	II		IBA data 1 birds in 2006 in Aktepa (Lanovenko 2008b)
70	Haematopus ostralegus	Eurasian Oystercatcher	NT						IBA data 4 birds in 2006 in Aktepa (Lanovenko 2008a)
71	Himantopus himantopus	Black-winged Stilt					II	1 bird near Uchkizil at 17Jul2021	
72	Recurvirostra avosetta	Pied Avocet				II	II		
73	Vanellus vanellus	Northern Lapwing	NT			II			Amudarya 21Jan2018 - 18 birds (Lampila et al. 2018a), 9Dec2018 –55 (Lampila et al. 2019) IBA data 7-2193 birds in 2003-2005 in Amudarya (Lanovenko 2008a), IBA data 2-490 birds in 2003-06 in Aktepa (Lanovenko 2008b)
74	Vanellochettusia leucura	White-tailed Lapwing				II			IBA data 2 birds in 2006 in Aktepa (Lanovenko 2008b)
75	Charadrius dubius	Little Ringed Plover				II	II	4 birds in project sites and 8 birds near Uchkizil at 17Jul2021	IBA data 7 birds in 2006 in Aktepa (Lanovenko 2008b)
76	Charadrius alexandrinus	Kentish Plover				II	II	2 birds in project sites at 17Jul2021	

ID	Scientific name of the species	English name	IUCN status 2020	Uzbek Red Book 2019	CITES	CMS	Bern conv	Field data July 2021	Previously data
77	Gallinago gallinago	Common Snipe				II			Amudarya 21Jan2018 - 2 birds (Lampila et al. 2018a)
78	Limosa limosa	Black-tailed Godwit	NT	VU:D		II			Amudarya 9Dec2018 – 15 (Lampila et al. 2019)
79	Tringa totanus	Common Redshank				II			Amudarya 21Jan2018 - 1 birds (Lampila et al. 2018a), 9Dec2018 - 4 (Lampila et al. 2019), IBA data 2-23 birds in 2003-06 in Aktepa (Lanovenko 2008b)
80	Tringa stagnatilis	Marsh Sandpiper				II	II		
81	Tringa nebularia	Common Greenshank				II			Amudarya 9Dec2018 – 1 (Lampila et al. 2019), IBA data 2-6 birds in 2003-06 in Aktepa (Lanovenko 2008b)
82	Tringa ochropus	Green Sandpiper				II	II		Amudarya 9Dec2018 - 2 (Lampila et al. 2019), Kattakum an d Khaudag sands, fields near Karasu 4-5Mar2020 - 4 (Ten pers.data), IBA data 2 birds in 2003-2005 in Amudarya (Lanovenko 2008a)
83	Calidris minuta	Little Stint				II	II		IBA data 3 birds in 2006 in Aktepa (Lanovenko 2008b)
84	Calidris subminuta	Long-toed Stint				II			
85	Calidris temminckii	Temminck's Stint				II	II		
86	Calidris ferruginea	Curlew Sandpiper	NT			II	II		
87	Calidris alpina	Dunlin				II	II		
88	Calidris alba	Sanderling				II	II		
89	Philomachus pugnax	Ruff				II			
90	Glareola pratincola	Collared Pratincole				II	II		IBA data 21 birds in 2006 in Aktepa (Lanovenko 2008b)
91	Limicola falcinellus	Broad-billed Sandpiper				II			
92	Larus ichthyaetus	Pallas's Gull		VU:D		II			IBA data 1 birds in 2005 in Aktepa (Lanovenko 2008b)
93	Larus genei	Slender-billed Gull				II	II		IBA data 11-55 birds in 2005 in Aktepa (Lanovenko 2008b)
94	Larus minutus	Little Gull					II		
95	Gelochelidon nilotica	Common Gull-billed Tern				II			IBA data 36 birds in 2005 in Aktepa (Lanovenko 2008b)

ID	Scientific name of the species	English name	IUCN status 2020	Uzbek Red Book 2019	CITES	CMS	Bern conv	Field data July 2021	Previously data
96	Chlidonias niger	Black Tern				II	II		IBA data 2 birds in 2005 in Aktepa (Lanovenko 2008b)
97	Hydroprogne caspia	Caspian Tern				II	II		
98	Sterna hirundo	Common Tern				II		33 birds in project sites and 19 birds near Uchkizil at 17Jul2021	IBA data 168 birds in 2005 in Aktepa (Lanovenko 2008b)
99	Sterna albifrons	Little Tern				II		1bird near Uchkizil at 17-18Jul2021	IBA data 85 birds in 2005 in Aktepa (Lanovenko 2008b)
	Pterocliformes	Sandgrouses							
100	Pterocles orientalis	Black-bellied Sandgrouse					II		Kattakum and Khaudag sands, fields near Karasu 4-5Mar2020 – 18 (Ten pers.data), IBA data 9 birds in 2005 in Aktepa (Lanovenko 2008b)
	Columbiformes	Pigeons							
101	Streptopelia turtur	European Turtle-dove	VU	VU:D		II			IBA data 1 birds in 2005 in Aktepa (Lanovenko 2008b)
	Strigiformes	Owls							
102	Bubo bubo	Eurasian Eagle-owl			II		II		
103	Athene noctua	Little Owl			II		II	2 birds in project sites and 2 birds near Uchkizil at 17-18Jul2021	Kattakum and Khaudag sands 4-5Mar2020 – 1 (Ten pers.data), BA data 1 birds in 2006 in Aktepa (Lanovenko 2008b)
104	Asio flammeus	Short-eared Owl			II		II		Amudarya 21Jan2018 - 2 birds (Lampila et al. 2018a), IBA data 4 birds in 2003-2005 in Amudarya (Ten pers.data)
	Caprimulgiformes	Nightjars							
105	Caprimulgus aegyptius	Egyptian Nightjar					II		IBA data 1 birds in 2006 in Amudarya (Lanovenko 2008a)
	Apodiformes	Swifts							
106	Apus melba	Alpine Swift					II		IBA data 3 birds in 2006in Aktepa (Lanovenko 2008b)
	Coraciiformes	Rollers							
107	Coracias garrulus	European Roller				II	II		IBA data 21 birds in 2006in Aktepa (Lanovenko 2008b)

ID	Scientific name of the species	English name	IUCN status 2020	Uzbek Red Book 2019	CITES	CMS	Bern conv	Field data July 2021	Previously data
108	Alcedo atthis	Common Kingfisher					II		IBA data 1 birds in 2004-06 in Aktepa (Lanovenko 2008b)
109	Merops apiaster	European Bee-eater				II	II		
	Bucerotiformes	Hoopoes							
110	Upupa epops	Common Hoopoe					II	1 bird near Uchkizil at 17Jul2021	Amudarya 9Dec2018 – 1 (Lampila et al. 2019), Kattakum and Khaudag sands 4-5Mar2020 – 1 (Ten pers.data)
	Passeriformes	Passerins							
111	Melanocorypha calandra	Calandra Lark					II		Amudarya 21Jan2018 - 300 birds (Lampila et al. 2018a), 9Dec2018 – 200 (Lampila et al. 2019)
112	Riparia riparia	Collared Sand Martin					II		IBA data 89 birds in 2006in Aktepa (Lanovenko 2008b)
113	Riparia diluta	Pale Sand Martin					II		
114	Hirundo rustica	Barn Swallow					II	12 birds in project sites and 115 birds near Uchkizil at 17Jul2021	IBA data 134 birds in 2006in Aktepa (Lanovenko 2008b)
115	Delichon urbicum	Northern House Martin					II		
116	Motacilla flava	Yellow Wagtail					II		
117	Motacilla lutea	Yellow-headed Wagtail					II		
118	Motacilla citreola	Citrine Wagtail					II		IBA data 1 birds in 2006 in Aktepa (Lanovenko 2008b)
119	Motacilla alba	White Wagtail					II		
120	Motacilla personata	Masked Wagtail					II		
121	Erythropygia galactotes	Rufous Scrub-robin					II		IBA data 6 birds in 2006 in Aktepa (Lanovenko 2008b)
122	Erithacus rubecula	European Robin					II		
123	Luscinia megarhynchos	Common Nightingale					II		IBA data 3 birds in 2006 in Aktepa (Lanovenko 2008b)
124	Saxicola maurus	Siberian Stonechat					II		

ID	Scientific name of the species	English name	IUCN status 2020	Uzbek Red Book 2019	CITES	CMS	Bern conv	Field data July 2021	Previously data
125	Oenanthe pleschanka	Pied Wheatear					II		IBA data 1 birds in 2006in Aktepa (Lanovenko 2008b)
126	Oenanthe isabellina	Isabelline Wheatear					II		
127	Muscicapa striata	Spotted Flycatcher				II	II		
128	Sylvia communis	Common Whitethroat					II		
129	Sylvia curruca	Lesser Whitethroat					II		
130	Sylvia nana	Asian Desert Warbler					II		
131	Parus bokharensis	Turkestan Tit					II		IBA data 4 birds in 2006 in Amudarya, (Lanovenko 2008a), IBA data 4 birds in 2006in Aktepa (Lanovenko 2008b)
132	Lanius isabellinus	Isabelline Shrike					II		
133	Lanius phoenicuroides	Red-tailed Shrike					II		Kattakum and Khaudag sands 4-5Mar2020 - 6 migrating (Ten pers.data)
134	Lanius schach	Long-tailed Shrike					II		
135	Lanius meridionalis	Steppe Grey Shrike					II		Fields near Karasu 4-5Mar2020 - 4 migrating (Ten pers.data)

The field survey showed the presence of 25 bird species on and off the site (see Table 90). This survey does not allow a full assessment of nesting birds in the project area as nesting ended in June. However, conclusions can be made based on habitat conditions and the location of the area, how the area is used by birds.

In total the survey covered 5 sites in different biotopes: UK-Orn_1 - aeolian deposits forming sandy loam hills and low bluffs near the shore up to 5-6m high; UK-Orn_2 - a ravine in sandstone formed by the Amu-Zang River flowing into the reservoir, low bluffs up to 4-5m, with moss and ferns growing along the gully bed; UK-Orn_3 - southern sandy bank of the reservoir with rare comb and ambergrass bushes, low bluffs up to 5-6 m high; UK-Orn_4 - sandy bank with rare comb and ambergrass bushes, low bluffs up to 4-5 m high; UK-Orn_5 - sandy fine-hilly plain near the route with Kandym and Sarsazan (see Figure 53).

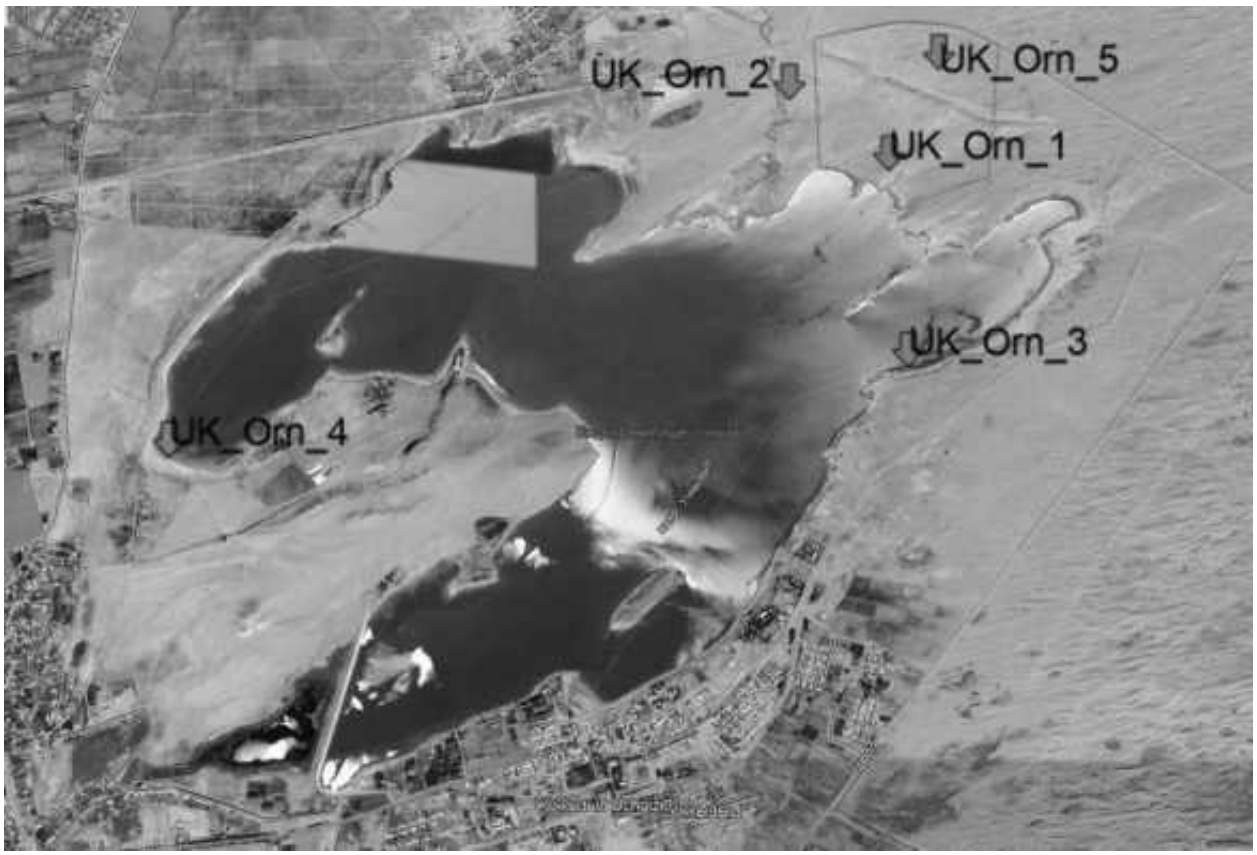


Figure 53: The ornithological fauna survey points at Uchkizil also covered the adjoining area

Table 90: Field ornithological survey data in the area

Site №	N	E	Date	Biotope	Species	Number	Activities
UK_Orn-1	**37,37427**	**67,24974**	**17.07.2021**	**Sandy loam hills, aeolian deposits, low cliffs up to 5-6 m high**	**Common Tern - Sterna hirundo**	**33**	**nesting, close foraging area on lake**
UK_Orn-1	**37,37427**	**67,24974**	**17.07.2021**	**Sandy loam hills, aeolian deposits, low cliffs up to 5-6 m high**	**Grey Heron - Ardea cinerea**	**9**	**close foraging area on lake**
UK_Orn-1	**37,37427**	**67,24974**	**17.07.2021**	**Sandy loam hills, aeolian deposits, low cliffs up to 5-6 m high**	**Barn Swallow - Hirundo rustica**	**12**	**nesting, foraging area**
UK_Orn-1	**37,37427**	**67,24974**	**17.07.2021**	**Sandy loam hills, aeolian deposits, low cliffs up to 5-6 m high**	**Rock Dove - Columba livia**	**12**	**crossing**
UK_Orn-1	**37,37427**	**67,24974**	**17.07.2021**	**Sandy loam hills, aeolian deposits, low cliffs up to 5-6 m high**	**Little Ringed Plover - Charadrius dubius**	**4**	**nesting, close foraging area on lake**
UK_Orn-1	**37,37427**	**67,24974**	**17.07.2021**	**Sandy loam hills, aeolian deposits, low cliffs up to 5-6 m high**	**Common Sandpiper - Actitis hypoleucos**	**4**	**Foraging area on lake**
UK_Orn-1	**37,37427**	**67,24974**	**17.07.2021**	**Sandy loam hills, aeolian deposits, low cliffs up to 5-6 m high**	**Masked Wagtail - Motacilla personata**	**1**	**Foraging area on lake**
UK_Orn-1	**37,37427**	**67,24974**	**17.07.2021**	**Sandy loam hills, aeolian deposits, low cliffs up to 5-6 m high**	**Western Marsh Harrier - Circus aeruginosus**	**2**	**Foraging area**
UK_Orn-1	**37,37427**	**67,24974**	**17.07.2021**	**Sandy loam hills, aeolian deposits, low cliffs up to 5-6 m high**	**Blue-cheeked Bee-eater - Merops persicus**	**6**	**nesting in close sites, foraging area**
UK_Orn-1	**37,37427**	**67,24974**	**17.07.2021**	**Sandy loam hills, aeolian deposits, low**	**Common Coot - Fulica atra**	**7**	**Foraging area on lake**

Site №	N	E	Date	Biotope	Species	Number	Activities
				cliffs up to 5-6 m high			
UK_Orn-1	37,37427	67,24974	17.07.2021	Sandy loam hills, aeolian deposits, low cliffs up to 5-6 m high	Crested Lark - Galerida cristata	2	nesting
UK_Orn-1	37,37427	67,24974	17.07.2021	Sandy loam hills, aeolian deposits, low cliffs up to 5-6 m high	Kentish Plover - Charadrius alexandrinus	2	nesting
UK_Orn-1	37,37427	67,24974	17.07.2021	Sandy loam hills, aeolian deposits, low cliffs up to 5-6 m high	Black-headed Gull - Larus ridibundus	1	nesting
UK_Orn-1	37,37427	67,24974	17.07.2021	Sandy loam hills, aeolian deposits, low cliffs up to 5-6 m high	Little Owl - Athene noctua	1	nesting
UK_Orn-2	37,37819	67,24296	17.07.2021	A small river in a sandstone flowing into a reservoir, low cliffs up to 4-5 m, mosses and ferns grow along the river bed	Common Tern - Sterna hirundo	2	nesting
UK_Orn-2	37,37819	67,24296	17.07.2021	A small river in a sandstone flowing into a reservoir, low cliffs up to 4-5 m, mosses and ferns grow along the river bed	Barn Swallow - Hirundo rustica	около сотни	nesting

Site №	N	E	Date	Biotope	Species	Number	Activities
UK_Orn-2	**37,37819**	**67,24296**	**17.07.2021**	**A small river in a sandstone flowing into a reservoir, low cliffs up to 4-5 m, mosses and ferns grow along the river bed**	**Indian Sparrow - Passer indicus**	**38**	**nesting**
UK_Orn-2	**37,37819**	**67,24296**	**17.07.2021**	**A small river in a sandstone flowing into a reservoir, low cliffs up to 4-5 m, mosses and ferns grow along the river bed**	**Little Ringed Plover- Charadrius dubius**	**4**	**nesting**
UK_Orn-2	**37,37819**	**67,24296**	**17.07.2021**	**A small river in a sandstone flowing into a reservoir, low cliffs up to 4-5 m, mosses and ferns grow along the river bed**	**Masked Wagtail - Motacilla personata**	**2 juv**	**Foraging area**
UK_Orn-2	**37,37819**	**67,24296**	**17.07.2021**	**A small river in a sandstone flowing into a reservoir, low cliffs up to 4-5 m, mosses and ferns grow along the river bed**	**Western Marsh Harrier - Circus aeruginosus**	**1**	**Foraging area**
UK_Orn-3	**37,36358**	**67,25097**	**17.07.2021**	**southern shore of the reservoir, sandy shore with rare tamarix and camel torn bushes, low cliffs max. 5-6m**	**Little Owl - Athene noctua**	**1**	**nesting**

Site №	N	E	Date	Biotope	Species	Number	Activities
UK_Orn-3	**37,36358**	**67,25097**	**17.07.2021**	**southern shore of the reservoir, sandy shore with rare tamarix and camel torn bushes, low cliffs max. 5-6m**	**Western Marsh Harrier - Circus aeruginosus**	**2**	**Foraging area**
UK_Orn-3	**37,36358**	**67,25097**	**17.07.2021**	**southern shore of the reservoir, sandy shore with rare tamarix and camel torn bushes, low cliffs max. 5-6m**	**Little Ringed Plover - Charadrius dubius**	**3**	**nesting**
UK_Orn-3	**37,36358**	**67,25097**	**17.07.2021**	**southern shore of the reservoir, sandy shore with rare tamarix and camel torn bushes, low cliffs max. 5-6m**	**Common Tern - Sterna hirundo**	**4**	**nesting**
UK_Orn-3	**37,36358**	**67,25097**	**17.07.2021**	**southern shore of the reservoir, sandy shore with rare tamarix and camel torn bushes, low cliffs max. 5-6m**	**Caspian Gull - Larus cachinnans**	**1**	**nesting**
UK_Orn-3	**37,36358**	**67,25097**	**17.07.2021**	**southern shore of the reservoir, sandy shore with rare tamarix and camel torn bushes, low cliffs max. 5-6m**	**Barn Swallow - Hirundo rustica**	**15**	**nesting**

Site №	N	E	Date	Biotope	Species	Number	Activities
UK_Orn-3	**37,36358**	**67,25097**	**17.07.2021**	**southern shore of the reservoir, sandy shore with rare tamarix and camel torn bushes, low cliffs max. 5-6m**	**Blue-cheeked Bee-eater - Merops persicus**	**8**	**nesting**
UK_Orn-3	**37,36358**	**67,25097**	**17.07.2021**	**southern shore of the reservoir, sandy shore with rare tamarix and camel torn bushes, low cliffs max. 5-6m**	**Eurasian Hoopoe - Upupa epops**	**1**	**nesting**
UK_Orn-4	**37,35902**	**67,20017**	**17.07.2021**	**Sandy shore with rare tamarix and camel torn bushes. Low cliffs with a maximum height of 4-5m**	**Black-winged Stilt- Himantopus himantopus**	**6**	**nesting**
UK_Orn-4	**37,35902**	**67,20017**	**17.07.2021**	**Sandy shore with rare tamarix and camel torn bushes. Low cliffs with a maximum height of 4-5m**	**Little Grebe - Tachybaptus ruficollis**	**1**	**Foraging area**
UK_Orn-4	**37,35902**	**67,20017**	**17.07.2021**	**Sandy shore with rare tamarix and camel torn bushes. Low cliffs with a maximum height of 4-5m**	**Grey Heron - Ardea cinerea**	**4**	**Foraging area**

Site №	N	E	Date	Biotope	Species	Number	Activities
UK_Orn-4	**37,35902**	**67,20017**	**17.07.2021**	**Sandy shore with rare tamarix and camel torn bushes. Low cliffs with a maximum height of 4-5m**	**Caspian Gull - Larus cachinnans**	**1**	**Foraging area**
UK_Orn-4	**37,35902**	**67,20017**	**17.07.2021**	**Sandy shore with rare tamarix and camel torn bushes. Low cliffs with a maximum height of 4-5m**	**Western Marsh Harrier - Circus aeruginosus**	**2**	**Foraging area**
UK_Orn-4	**37,35902**	**67,20017**	**17.07.2021**	**Sandy shore with rare tamarix and camel torn bushes. Low cliffs with a maximum height of 4-5m**	**Common Tern - Sterna hirundo**	**13**	**nesting**
UK_Orn-4	**37,35902**	**67,20017**	**17.07.2021**	**Sandy shore with rare tamarix and camel torn bushes. Low cliffs with a maximum height of 4-5m**	**Little Ringed Plover - Charadrius dubius**	**1**	**nesting**
UK_Orn-4	**37,35902**	**67,20017**	**17.07.2021**	**Sandy shore with rare tamarix and camel torn bushes. Low cliffs with a maximum height of 4-5m**	**Little Tern - Sterna albifrons**	**1**	**nesting**
UK_Orn-4	**37,35902**	**67,20017**	**17.07.2021**	**Sandy shore with rare tamarix and camel torn bushes. Low cliffs with a maximum height of 4-5m**	**Common Myna - Acridotheres tristis**	**2**	**Foraging area**

Site №	N	E	Date	Biotope	Species	Number	Activities
UK_Orn-4	**37,35902**	**67,20017**	**17.07.2021**	**Sandy shore with rare tamarix and camel torn bushes. Low cliffs with a maximum height of 4-5m**	**Little Owl - Athene noctua**	**1**	**nesting**
UK_Orn-4	**37,35902**	**67,20017**	**17.07.2021**	**Sandy shore with rare tamarix and camel torn bushes. Low cliffs with a maximum height of 4-5m**	**Wood Sandpiper - Tringa glareola**	**2**	**Foraging area**
UK_Orn-4	**37,35902**	**67,20017**	**17.07.2021**	**Sandy shore with rare tamarix and camel torn bushes. Low cliffs with a maximum height of 4-5m**	**Pygmy Cormorant - Phalacrocorax pygmaeus**	**8**	**Foraging area**
UK_Orn-5	**37,37971**	**67,25319**	**18.07.2021**	**sandy shallow hilly plain near the road, Calligonum and Halocnemum bushes.**	**Egyptian vulture - Neophron percnopterus**	**1 juv**	**Foraging area**
UK_Orn-5	**37,37971**	**67,25319**	**18.07.2021**	**sandy shallow-hilly plain near the road, Calligonum and Halocnemum bushes.**	**Little Owl - Athene noctua**	**1**	**nesting**
UK_Orn-5	**37,37971**	**67,25319**	**18.07.2021**	**sandy shallow-hilly plain near the road, Calligonum and Halocnemum bushes.**	**Indian Sparrow - Passer indicus**	**12**	**nesting**

Site №	N	E	Date	Biotope	Species	Number	Activities
UK_Orn-5	**37,37971**	**67,25319**	**18.07.2021**	**sandy shallow-hilly plain near the road, Calligonum and Halocnemum bushes.**	**Crested Lark - Galerida cristata**	**3**	**nesting**
UK_Orn-5	**37,37971**	**67,25319**	**18.07.2021**	**sandy shallow-hilly plain near the road, Calligonum and Halocnemum bushes.**	**Rock Dove - Columba livia**	**5**	**Foraging area**
UK_Orn-5	**37,37971**	**67,25319**	**18.07.2021**	**sandy shallow-hilly plain near the road, Calligonum and Halocnemum bushes.**	**Blue-cheeked Bee-eater - Merops persicus**	**6**	**nesting**
UK_Orn-5	**37,37971**	**67,25319**	**18.07.2021**	**sandy shallow-hilly plain near the road, Calligonum and Halocnemum bushes.**	**Streaked Scrub Warbler - Scotocerca inquieta**	**2**	**nesting**

Theriofauna

Approximately 22 species of mammals belonging to 6 families have been recorded in project area its surrounding area based on available literature sources.

The territory is potentially inhabited by 6 species of mammals included in the Red Book of the Republic of Uzbekistan [16]; *Otonycteris hemprichi, Vulpes corsak turkmenicus, Vormela peregusna, Lutra lutra seistanica, Hyaena hyaena, Felis margarita, Caracal caracal michaelis, Vormela peregusna*. and the 5 species are included CITES (*Lutra lutra, felis chaus, Felis lybica, Felis margarita, Caracal caracal michaelis*). Two species are Central Asian endemics that *Rhinolophus bocharicus* and *Allactaga severtzovi* (see Table 90). *Gazella subgutturosa* that used to inhabit the area has been completely exterminated.

Table 91: Rare mammal species potentially inhabiting the project area

No.	Type	Red Book (2019)	IUCN status (2021)	CITES	CMS	Endemity
1	***Rhinolophus bocharicus***	**-**	**LC**	**-**	**-**	**AF, IR, KZ, KR, TM, TJ, UZ**
2	***Otonycteris hemprichi***	**2(VU:R)**	**LC**	**-**	**-**	**-**
3	***Allactaga severtzovi***	**-**	**LC**	**-**	**-**	**KZ, TM, TJ, UZ**
4	***Vulpes corsak turkmenicus***	**2(VU:D)**	**-**	**-**	**-**	**-**
5	***Vormela peregusna***	**2(VU:D)**	**VU**	**-**	**-**	**-**
6	***Lutra lutra seistanica***	**1(EN)**	**NT**	**I**	**-**	**-**
7	***Hyaena hyaena***	**1(CR)**	**NT**	**-**	**-**	**-**
8	***Felis chaus***	**-**	**LC**	**II**	**-**	**-**
9	***Felis lybica ornata***	**-**	**LC**	**II**	**-**	**-**
10	***Felis margarita***	**3(NT)**	**LC**	**II**	**-**	**-**
11	***Caracal caracal michaelis***	**1(CR)**	**LC**	**I**	**-**	**-**

In order to obtain more comprehensive information on vertebrate representation in the area, –Project area and its surroundings are surveyed including the coastline on the east, south and west sides. The field survey locations are given in Figure 54.

The presence of 7 species was confirmed during site survey with the locations and given in Table 92.

Figure 54: Project area and sites to study the theriofauna

Table 92: Mammals on the project territory per the points (routes) of the survey

Point No.	N	E	Type	Type of activity
UK_Ter_1	37.375730	67.241900	***Hemiechinus auritus***	**3 footprints**
			Meriones meridianus	**Living colonies**
			Vulpes vulpes	**Footprints**
UK_Ter_2	37.379488	67.249397	***Meriones meridianus***	**Living colonies**
			Vulpes vulpes	**1 specimen, footprints**
UK_Ter_3	37.375974	67.254911	***Lepus tolai***	**footprint of one specimen**
			Allactaga elater	**Three footprints**
			Meriones meridianus	**Living colonies**
			Vulpes vulpes	**11 chains & one scrape**

Point No.	N	E	Type	Type of activity
UK_Ter_4	37.371922	67,250728	***Meriones meridianus***	**Living colonies**
			Vulpes corsak turkmenicus	**Footprints at two places**
			Vulpes vulpes	**24 chains of footrprints**
			Canis aureus	**Footprints**
UK_Ter_5	37.363061	67.250516	***Vulpes vulpes***	**Footprints**
UK_Ter_6	37.357979	67.246822		
UK_Ter_7	37.350256	67.213808	***Vulpes vulpes***	**Footprints**
UK_Ter_8	37.354939	67.204657	***Vulpes vulpes***	**1 specimen**
UK_Ter_9	37.370852	67.211542	***Meriones meridianus***	**Living colonies**

In general, the territory has been greatly transformed as a result of anthropogenic activity-livestock grazing is observed everywhere, the lake is used for fishing, there is a cattle burial ground, oil production is going on a network of highways is developed, there are agricultural fields and residential buildings. The southern part of the reservoir is used as a public beach and a number of recreation areas, which, in addition to the usual activities for such places, organize boat rides on the water (see Figure 55)

However, despite such pressure, the territory does not lose its importance as a habitat for a number of vertebrates – the presence of a channel is important for the vital activity of such animals as muskrat, reed and steppe cats, jackal, etc. Vegetation creates good shelters and living conditions for these animals. The reservoir itself is potentially a habitat for the Central Asian otter. Fields and ruderal areas also create shelters, are breeding grounds, a number of mammals find food here. The sand massif is part of the Kattakum Desert, which creates a connection with its fauna. It is obvious that the reservoir itself is an important source of water supply (see Figure 55)

Oil Production

Boating on the Reservoir

Canal Zang

Tamarix family thickets near the canal&lake

Kattakum desert

Agricultural fields

Figure 55: The photos of the regarding of the mammal species asssesment

In the project area, the habitats of mammals are represented by natural and anthropogenic complexes, to which different groups of mammals have adapted. Most carnivorous mammals are adapted to almost all types of deserts. The distribution of small mammals is largely dependent on the substrate and the vegetation growing on it. Thus, all habitats are inhabited by different groups of mammals.

8.3.5 Terrestrial Sensitive Receptors

The terrestrial sensitive receptors are given in Table 93 and the details are explaned in Section 8.5.

Table 93: Terrestrial Sensitive Receptors

Receptor	Sensitivity	Justification
Flora	**Low**	**There is no protected plant species in the project area.**
Fauna/Reptiles	**High**	**The region is rich in reptile diversity. The project site contains reptile species that are endemic and sensitive to the region.**
Fauna/Ornithofauna	**Medium**	**Project area is located nearly 10 km from two international bird area. Therefore, Uchkizil can potentially also attract them due to the water surface, food and as a recreation area. Nesting biotope is absent on the open banks of the Uchkizil, therefore, it is not expected to be nesting of water birds in the project area.**
Fauna/Mammals	**Medium**	**The determinated species both of potential and observed are exposed over large areas in Uzbekistan. But the reservoir is an important source of water for the mammal species in the region.**
Ecosystem Services	**Medium**	**There are ecosystem services used by the local communities such as grazing domestic animals, usage as recreation.**

8.4 AQUATIC ECOLOGY

This report presents the results of a one-time expeditionary hydrobiological survey (July 15, 2021) of the Uchkizil lake at one station, where 4 hydrobiological Measurement were taken (phytoplankton, zooplankton, periphyton, zoobenthos and additionally macrophytes).

The main task of this study is to summarize hydrobiological information on the composition and structure of aquatic biocenoses, which makes it possible to directly assess the state of aquatic biota as an element of aquatic ecosystems influenced by both seasonal and anthropogenic factors (pollution, flow regulation, etc.), to assess water quality and pollution based on the biological response of aquatic biocenoses.

8.4.1 Observation and Aquatic Baseline Conditions

Uchkizil lake is located 14 km from Termez city, in the Surkhandarya River basin, and belongs to the group of inflowing reservoirs. Uchkizil lake is located in Surkhandarya river basin, it was built in 1960, in the middle of massif of non-irrigated, water-scarce lands and occupies natural depression, full capacity 160 mln $m^{3,}$ which useful 80 mln m^3. The area of the reservoir is 10 km^2, length 5.5 km^2, maximum width 3.5 km, maximum depth 37 m, average depth 16.0 m.[29]. The reservoir is connected to the Surkhandarya River through a supply canal.

Maximum water temperature at the surface is 27.8º (June) and up to 25º at the bottom, the temperature difference reaches 10º or more. The minimum is 6.3º (February). At the same time, the temperature difference between the surface and natural water layers does not exceed 0.3º. In spring, summer and autumn, there is direct stratification throughout the reservoir, without noticeable formation of a temperature jump layer [35].

Hydrogeochemistry - The quantity of dissolved oxygen in the water ranges from 68.0 to 121.0% of saturation. The active water reaction (pH) is 7.68-8.21. Free carbon dioxide is detected only in deep waters in spring, summer and autumn (2.64-5.28 mg/l). Permanganate water acidity varies within small limits from season to season, which is explained by the low content of organic matter in the river. Extremely high values of acidity (2.12-5.54 mg O_2/l) were recorded in spring.

The water of the Uchkizil lake belongs to sulphate-calcium class II of type II. The sum of ions is 683.4-949.6 mg/l. Total water hardness 7,8-8,9 mg/l.

Aquatic organisms - Water bodies of Surkhandarya basin are poor in zooplankton. Protozoa, rotifers and crustaceans are found in mid- and downstream ponds. Zoobenthos of Surkhandarya is represented by 50 forms of organisms. Insects are dominated by the larvae of dipterans (17 species), larvae of caddisflies (10), mayflies (8), dragonflies (4), bristleworms and water mites (1 species each). Stony riverbeds are predominantly inhabited by blue-green and diatom algae. In the middle and lower reaches of the rivers, green and grey algae are the most common. In general, the benthic invertebrate fauna of the mountainous part of the basin's rivers is the most diverse - 35 species, in the foothills - 17 species, and in the plain part - 14 species. The populations of river bottoms form different communities depending on the nature of the substrate; speed of flow [36], [37].

Currently, the use of biotic indices for the determination of surface water quality and biomonitoring is of current importance in connection with the recommendations of the European Water Framework Directive [38]. Assessment of the status and dynamics of the ecological quality of surface waters is based on the ecological status of the biotic index values.

This report presents the results of one-time expedition hydrobiological survey of the Uchyzyl reservoir at one station (see Figure 56) where 4 hydrobiological Measurement (phytoplankton, zooplankton, periphyton, zoobenthos and additionally macrophytes) were collected.

Figure 56: Hydrobiological sample sampling location

The main objective of this study is to summarize hydrobiological information on the composition and structure of aquatic biocenoses, which allows directly assessing the condition of aquatic biota as an element of aquatic ecosystems under the influence of both seasonal and anthropogenic factors (pollution, flow regulation, etc.), assessing water quality and pollution by biological response of aquatic biocenoses.

The final conclusion about water quality was made on the basis of formal saprobiotic indices, as well as considering changes in species composition, structure, presence of characteristic indicator species in the dominant complex of organisms, their ecological and geographical characteristics and ecological state of aquatic biocenoses. Various visual signs of contamination of water mass and bottom sediments, morphological diversity of aquatic biocenoses or their monotony were also considered.

characteristic factor determining the processes of formation and development of aquatic biocenoses is sedimentation of suspended solids brought with water flow, siltation of water body bowl during water release for agricultural needs, etc.

At the time of sampling visual observations, the water was greenish-blue in colour, with a slight odour of hydrogen sulphide, under the upper sandstone and clay layer of black silt deposits.

Table 94: Hydrobiological sampling point data for the surveyed area of the Uchkizil reservoir

Sampling date & time	Sample log number	Station name and location	Weather conditions during sampling	Distance from shore, depth, m	Transparency, m, water colour	Water temperature	Soil	Vegetation	Number of Measurement collected
15/07/2021 **11:00)**	**No.1**	**Uchkizil Reservoir**	**Air temperature 35.7 oC, slightly windy, sunny**	**Distance from shore is 12 m (from water brim); Sampling depth is 70-90 cm**	**Light ripples** **Transparency: slightly turbid, visibility to bottom.** **Chromaticity: blue at depth** **Nature of suspended solids: sand particles, silt particles.** **Contamination of water surface: domestic and other rubbish, fragments of aquatic vegetation**	**31.4°C**	**Grey to dark grey layered silt with hydrogen sulphide odour, detritus, coarse sand, clay inclusions (household and other waste is present in the water and on the bottom)**	**Rupia, sea naiad, pierced-leaf pondweed, crested pondweed, chara**	**Phytoplankton: 500 ml** **Zooplankton: filtered 30 l and quality sampled with a 5 m d=10 cm zooplankton net;** **Periphyton: sampled from macrophytes;** **Zoobenthos: sampled with a scraper (1x) from the bottom of the pond and macrophytes.**

No current, slight ripples in the water. At the time of sampling, the water moved 20-25 m from the coast. Water temperature in the morning at 11.00 is 31.4oC, clear to the bottom, 0.90 cm over the Secchi disk. The bottom is clay-sandy with moderate silt and silty-sandy with plant detritus. The bottom is 90-95% densely covered with pondweed (Potamogeton pectinatus L., P. crispus L.), Myriophyllum spicatum up to 80%, Ceratophylum demersum L.), Haroviae up to 50% and separate spots with Najas marina L. and Carex sedges along the bank (see Figure 57)

Figure 57: Taller aquatic vegetation covering the bottom of the surveyed section of the Uchkizil reservoir

8.4.2 Aquatic Survey Methodology

The survey objects were aquatic biocenoses (ichthyofauna, phytoplankton, zooplankton, periphyton and macrozoobenthos) of the Uchkizil lake in Surkhandarya province.

Hydrobiologist - Zuri Mustafayeva worked on the project area on July 15, 2021. Ichthyologists Ulugbek Mirzaev and Askar Kuvatov worked in this area from 22 to 25 July 2021.

To determinaton of the hydrobiological state of aquatic ecosystems, it was determined of the species composition and trophic relationships in water bodies, and indicator species in biomonitoring, the ecological status of water bodies and potential productive capacity of water bodies.

For the determination of surface water quality and biomonitoring biotic indices are used with the recommendations of the European Water Framework Directive (Directive 2000/60/EC). Assessment of the status and dynamics of the ecological quality of surface waters was based on the ecological status of the biotic indices values. This report presents the results of one-time expedition hydrobiological survey of the Uchyzyl reservoir at one station where 4 hydrobiological Measurement (phytoplankton, zooplankton, periphyton, zoobenthos and additionally macrophytes) were collected.

Fish species were netted and inspected visually from 1° nets (net mesh: 30 to 55 mm), each of which were 100 meters in length and 3 in width. The species were defined in line with L.S. Berg [39], The taxonomic list of fish was provided in accordance with U. T. Mirzaev, A.Q. Kuvatov [40].

For the determination of the benthic organisms, the scraper was used to secure proper zoobenthos research in the shoreline. The quantitative probe has been sampled from the shoreline of the Uchkizil water reservoirs from the depth of 0.4-0.5 m. The soil was run through the gauze mesh (№ 36) and fixed with 4% formaline. During the sampling of the thick macrofite growth and filamentous algae, the scraper was dipped into the middle and stirred. This allows to collect good Measurement. In cases where sampling had to be done in a loamy soil, the scraper was immersed to a depth of 10 cm. The live organisms are extracted 2-3 times on average rather than the fixed. Should the immediate sorting be impossible or prompt lad delivery unfeasable, the sample was placed in the glass or polyethelen container and fixed in the 70% spirit or 4% phormaline. Once in the lab, the fixated sample was washed and rinsed – live organisms are extracted under the binocular. The rinsed sample was checked in the Petrie dish under the binoculars and the organisms were extracted by tweezers and placed in the penicillin dish with 4% formaline solution. The lab research has been conducted with МБС-10 and МС-300Х microscopes, electronic scale, as per the guidelines [41]. [42], detectors were used to identify the species [43],[44].

To determination of the phytoplanktonic organisms, batometry is the most reliable sampling method. Bathometry-sampled probes are used for both the quantitative and qualitative probe characterizartion.

Other measurements taken during the bottomline sampling are depth, lucidity, water and air temperature. Macrophytes Measurement have also been collected to define the quantitative and qualitative composition of plants.

Analysis of species, quantitiy, biomass

The lab analysis is about recalculating quantitiy indicators by 1 m^2 identifying dominant and subdominant species, assessing water quality abd the environmental conditions of the bottom biocenose with the help of formal approaches/indexes, absolute biological characteristics and visual data which is always given in the log.

Quantity recalculation by 1 m²

A standard table created by G.P. Bulgakov can generally be used to recalculate the quantities by 1 m. One scraper (1x) counts as one sample 800 m². The Table 95 contains relative abundance values for zoobenthos. This allows for a better insight into the composition and structure of benthos communities – dominant (5-9 points) and subdominant (3 points) organisms.

Table 95: Recalculation of benthos sample organisms by 1 m^2, G.P. Bulgakov's methodology [41]

Abundance point	Encounter frequency	No. of organisms discovered in a sample:							pcs/m^2
		1x	1,5x	2x	2,5x	3x	4x	5x	
1	Sporadic	-	-	1	1	1	1-2	1-3	до 6
2	Very rarely	1	1-2	2	2	2-3	3-4	4-5	7-12
3	Rarely	2-5	3-7	3-10	3-13	4-15	5-20	6-25	13-62
5	Not so rarely	6-10	8-15	11-20	14-25	16-30	21-40	26-50	63-125
7	Frequently	11-20	16-30	21-40	26-50	31-60	41-80	51-100	126-250
9	Very frequently	>20	>30	>40	>50	>60	>80	>100	>250

Zoobenthos and water quality was assessed with the help of Bulgakov's Modified Biotic Index (MBI) [41]. MBI range makes up 10 points that are correlated with water qualities same as Woodiwis points (see Table 96).

Table 96: Correspondence between MBI and water quality

Water class	Water quality	MBI values	State of biocenose (expected/ expert evaluation
I	Very clean	10	Background (standard)
II	Clean	9-7	Background (good)
III	Moderately dirty	6-5	Satisfactory
IV	Dirtied	4	Unsatisfactory
V	Dirty	3-2	Bad
VI	Very dirty	1-0	Unacceptable

Each species of flatworms, oligachoetes (save for the Nais), each type of leeches, shellfish, crustaceas, stoneflys, mayflys, beetles, dragonflies, beetles, ticks, double-winged larvae (except for chironomids and small flies), caddis flies is considered a Woodivis group in MBI.

Phytoplankton sampling has been delivered in line with the widely accepted algologic methodology [45],[46],[47] while definers are used to identify the typical composition of microweeds [48]

Sampled material has been doused in 40% phormaline and Lugole solution, has been labeled (smple No., date, station, water area, sample volume). Sedimentation has been used in the laboratory environment as the sedimentation rate of planktone cells comes to 1 cm/3 hrs [49] Measurement are kept in the darkened place for 5-10 days, and are later syphoned out. Probe gets to be compacted in 2 stages: from 0,5 l to 0,1 l (100 ml), and after 5 days in wait, the solution is syphoned out until it is 10 ml.

Goriyaev chamber is used to calculate the No. of the seaweed. The recalculation of the total count is done as per the following formula:

$N=n\times v1/v2\times W$,

where, N – is the No. of cells in 1 cm^3 of water;

n – No. of cells in a 1 mm^3 chamber;

v1 – Sample concentrate (cm^3);

v2 – Chamber volume (cm^3);

W – Sample volume (cm^3).

Zooplanktone Measurement were made through the Jedy conic net (d=10 cm, cell №68) and have been processed in line with the methodology [49].They were fixated with 40% phormaline, increasing the concentration of up to 4% and labeling as per the notes in the field log. Materials were made ready for storage right after identification and processing. Triocular and binocular microscopes are used to identify the zooplanktone species [50]. Unified water qualities research methodology was used to define the indicator values of zooplanktone saprobity.

To periphyton analysis, fouling was scraped with a scraper, scalpel, and tweezers mainly from thalloms of higher aquatic vegetation, namely, pondweeds (Potamogeton pectinatus L., P. crispus L.), urticate (Myriophyllum spicatum L.), and algae (Chara) that covered almost all bottom of the study area (see Figure 58).

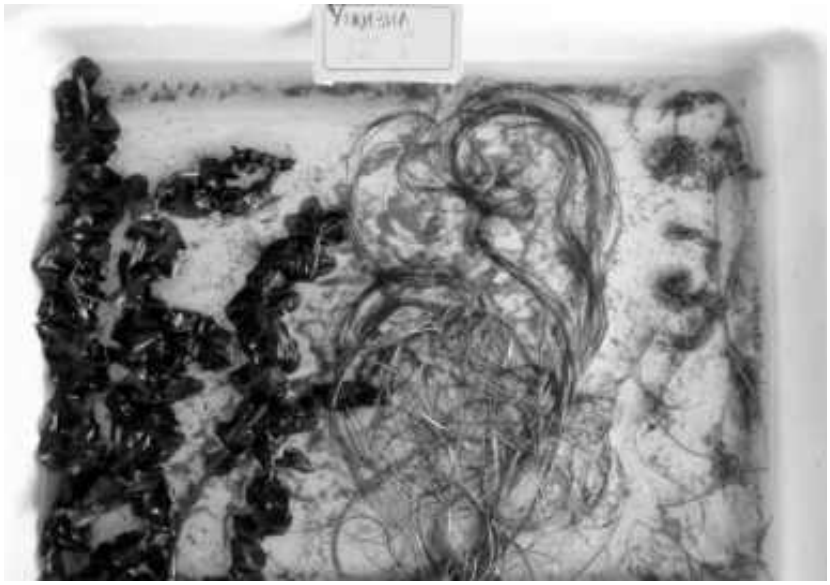


Figure 58: Macrophytes: Potamogeton crispus L., P. pectinatus L. and Chara sp., from the thalloms of which the periphyton of the Uchkizil lake was sampled

A small amount of selected material together with water was placed in a 0.5 L wide-necked jar with a lid and plenty of air. The periphyton sample was preserved with 40% formalin. In the laboratory, the selected sample was placed in a Petri dish and the material was disassembled using a soldering needle and tweezers before processing and analysis. A small amount of material was then placed on a slide, covered with a coverslip, and analyzed (microbial identification) using a Meiji microscope.

Identification of the species composition of microalgae was performed according to the qualifiers of freshwater algae according to the analyzed group of hydrobionts and other generally accepted qualifiers [51].

The indicator organisms method of Pantle and Buck, modified by Sladecek (Pantle and Buck, 1955; Sladecek, 1970), was used to estimate the saprobic index (IS) (organic pollution) of water. This method considers the frequency of occurrence (abundance) of hydrobionts h and their indicator importance S (saprobic valence). The indicator value of S and the saprobicity zone are determined for each species according to the saprobicity lists of the organisms of the CEA [52].

Mass (dominant) species, forming the main complex, are considered species whose abundance is 5-9 points; subdominant species are those whose abundance is 3 points; single species are those whose abundance is 1-2 points.

Organisms of clean water - xenosaprotonic zone species-indicators IS is in the range 0-0.50; organisms of slightly polluted water - oligosaprotonic - 0.51-1.50; organisms of moderately polluted water - b - mesosaprotonic - 1.51-2.50; a-mesosaprotonic - 2.51-3.50; organisms of dirty water - polysaprotonic - 3.51-4.00.

Conclusions about water quality by indicators of periphyton were made taking into account the information about species composition and diversity, frequency of species occurrence, saprobity of leading forms and saprobity index, as well as the biotic periphyton index (BPI) [53] and the values with BPI are given in Table 97.

Table 97: Quality and environmental classifier of the surface waters. IS values and BPI as per Talskih [53]

Water category	Water quality	IS value	BPI value	Environmental condition (desired/ expert assesment)
I	**Very pure**	**< 1,0**	**10-9**	**Background (reference value) – AB (Ф)**
II	**Pure**	**1,1–1,5**	**8-7**	**Background (good) – AB**
III	**Moderately polluted**	**1,6–2,5**	**6-5**	**Satisfactory – AB**
IV	**Polluted**	**2,6–3,5**	**4**	**Unsatisfactory – AB-AB**
V	**Dirty**	**3,6–4,0**	**3-2**	**Bad – AB**
VI	**Very dirty**	**> 4,0**	**1-0**	**Unallowable – ab**

The proposed assessment system mainly taking into consideration the sequence of loss from the periphyton composition of individual indicator species, higher taxa and groups of organisms, which are demanding on water quality, changes in the functional structure of the periphyton (change in the ratio of producers, consumers and reducers) as the pollution load increases (see Table 97).

In addition, the table shows the characteristics of the ecological invariant states of biocenoses, which are encoded in the form of letter symbols: AB (F) - a background ecological state in which biocenoses are in a state of metabolic and ecological progress and are represented by a complex of species reflecting the natural (undisturbed) gene pool of the region; AB - satisfactory ecological state, characterized by metabolic and ecological progress of biocenoses; AB-Ab - a transitional ecological state associated with a noticeable change in the taxonomic and functional structure of biocenoses; Ab - unsatisfactory ecological state, pronounced degradation of the ecological structure of the original biocenoses; ab - absolutely unacceptable ecological state, complete degradation of biocenoses [53].

Meaning of alphabetic characters: A - the state of metabolic progress of biocenoses (active metabolism of aquatic biocenoses); a - the state of metabolic regression of biocenoses (inhibition of the metabolism of aquatic biocenoses); B - the state of ecological progress of biocenoses (complication of the ecological structure of aquatic biocenoses); b - the state of ecological regression of biocenoses (simplification of the ecological structure of aquatic biocenoses).

The above assessment methods using IP and BPI indices are considered as basic indicators and their application reflects the true environmental picture.

8.4.3 Aquatic Ecological Surveys

8.4.3.1 Ichthyofauna

The formation of the ichthyofauna of the Uchkizil lake is inextricably linked to the ichthyofauna of the Surkhandarya River [54].

According to recent data, there are 20 fish species in Uchkizil reservoir, of which 9 are native and 11 are acclimatised or accidentally introduced (see Table 98). *Abramis brama* and *Chalcalburnus*

chalcoides aralensis, are the most numerous in the reservoir*. Chalcalburnus chalcoides aralensis* makes up about 50% of the total fish catch, bream from 19 to 27%, pikeperch up to 19-22% [35]. Thus, the ichthyofauna of the Uchkizil lake was formed from the aboriginal fish species of the Surkhandarya river and is represented by: Varicorhinus, *Cyprinus carpio, Luciobarbus capito conocephalus & Barbus brachycephalus brachephalus, Leuciscus lehmani, Pelecus cultratus, Silurus glanis, Capoetobrama kuschakewitschi, Aspius aspius, Rutilus rutilus bucharensis, Gobio gobio lepidolaeraus, Aspius cobitis taenia, Paracobitis longicauda, two species of Alburnoides & Gambusia affinis* [55].

The fish samples are collected from the locations given in Figure 59.

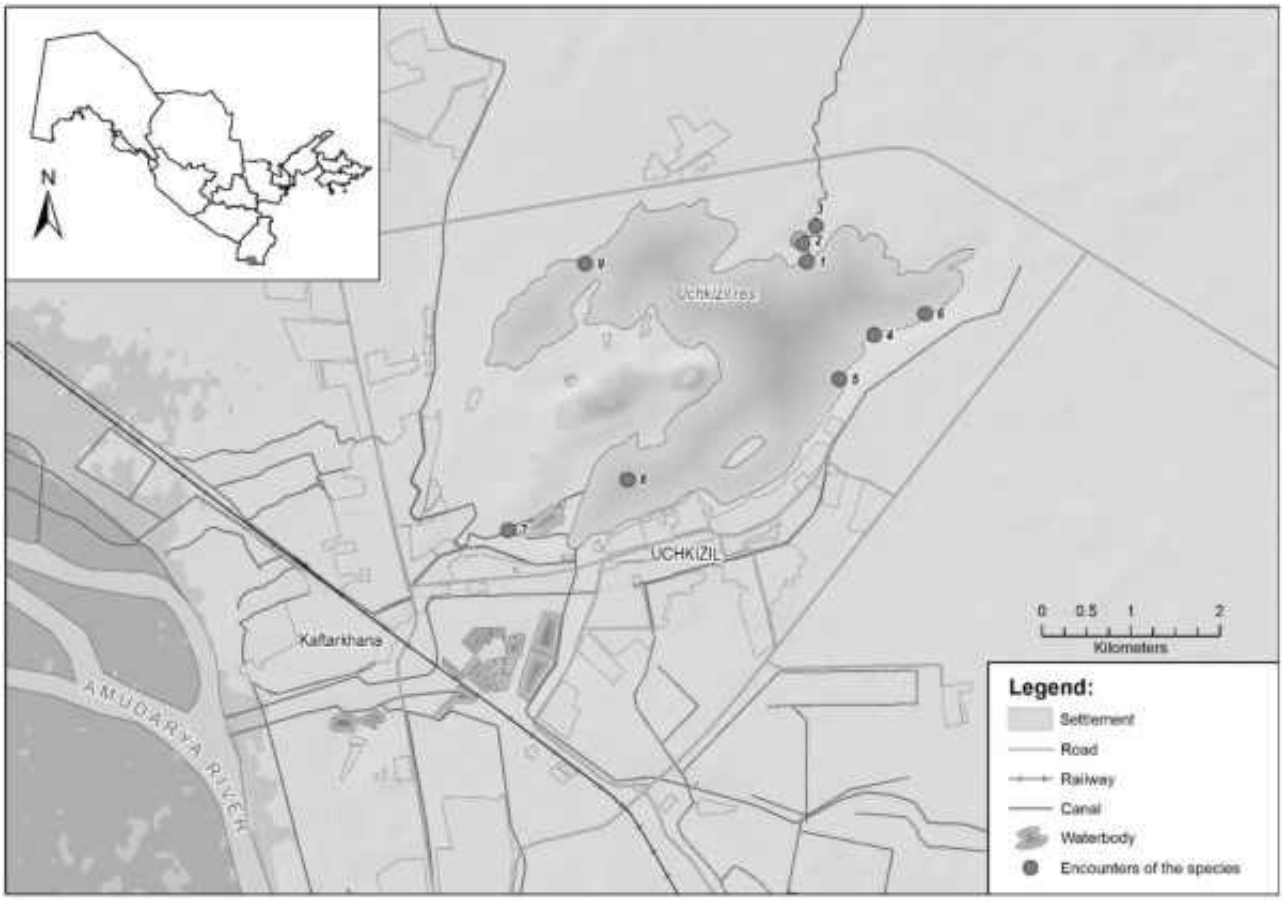


Figure 59: Fish sampling points at the Uchkizil water reservoir

Table 98: The species composition of the fish fauna of the Uchkizil reservoir

No.	Species	Local species	Alien species	Endemism	Conservation status			Commercial species
					UzRDB	IUCN	CITES	
Cyprinidae								
1	***Rutilus aralensis* (Berg, 1916)**	+	-	+	-	-	-	-
2	***Rhodeus ocellatus* (Kner, 1866)**	-	+	-	-	-	-	-
3	***Ctenopharyngodon idella* (Valenciennes, 1844)**	-	+	-	-	-	-	+
4	***Gobio lepidolaemus* (Kessler, 1872)**	+	-	+	-	-	-	-
5	***Pseudorasbora parva* (Temminck et Schlegel, 1846)**	-	+	-	-	-	-	-
6	***Luciobarbus conocephalus* (Kessler, 1872)**	+	-	+	+	-	-	-
7	***Chalcarburnus chalcaoides aralensis* (Berg, 1923)**	+	-	+	-	-	-	+
8	***Alburnoides bipunctatus eichwaldi* (Filippi, 1863)**	+	-	-	-	-	-	-
9	***Alburnoides teaniatus* (Kessler, 1874)**	+	-	-	-	-	-	-
10	***Abramis brama orientalis* (Berg, 1949)**	-	+	-	-	-	-	+
11	***Carassius gibelio* (Bloch, 1782)**	-	+	-	-	-	-	+
12	***Cyprinus carpio* (Linnaeus, 1758)**	+	-	-	-	-	-	+

No.	Species	Local species	Alien species	Endemism	Conservation status			Commercial species
					UzRDB	IUCN	CITES	
13	***Hypophthalmichthys molitrix*** **(Valenciennes, 1844)**	-	+	-	-	-	-	+
14	***Aristichthys nobilis*** **(Richardson, 1844)**	-	+	-	-	-	-	+
Cobitidae								
15	***Sabanejewia aralensis*** **Kessler, 1877**	+	-	+	+	-	-	-
Siluridae								
16	***Silurus glanis*** **(Linnaeus, 1758)**	+	-	-	-	-	-	-
Poecilidae								
17	***Gambusia holbrooki*** **(Girard, 1859)**	-	+	-	-	-	-	-
Percidae								
18	***Sander lucioperca*** **(Linnaeus, 1758)**	-	+	-	-	-	-	+
Gobiidae								
19	***Rhinogobius brunneus*** **(Temminck et Schlegek, 1845)**	-	+	-	-	-	-	-
Channidae								
20	***Channa argus*** **(Cantor, 1842)**	-	+	-	-	-	-	-
	Total:	**9**	**11**	**5**	**2**	**0**	**0**	**8**

The following locations were covered during the field visit and fish caught coordinates with the species are given in Table 99.

Table 99: Fish caught at the monitoring points of Uchkizil water reservoir

Point No.	Coordinates	Identified species
UK-Ich_1	**37°22'14.23"N, 67°14'25.32"E**	**Sander lucioperca, Rhinogobius brunneus, Rutilus aralensis, Carassius gibelio, Chalcarburnus chalcaoides aralensis.**
UK-Ich_2	**37°22'20.70"N, 67°14'23.24"E**	**Sander lucioperca, Rhinogobius brunneus.**
UK-Ich_3	**37°22'27.16"N, 67°14'29.25"E**	**Sander lucioperca, Chalcarburnus chalcaoides aralensis, Rhodeus ocellatus.**
UK-Ich_4	**37°21'47.84"N, 67°14'56.82"E**	**Rhinogobius brunneus, Rutilus aralensis, Chalcarburnus chalcaoides aralensis, Abramis brama orientalis, Carassius gibelio, Cyprinus carpio.**
UK-Ich_5	**37°21'31.45"N, 67°14'41.32"E**	**Rhinogobius brunneus, Rutilus aralensis, Chalcarburnus chalcaoides aralensis, Abramis brama orientalis, Carassius gibelio, Cyprinus carpio.**
UK-Ich_6	**37°21'55.97"N, 67°15'20.05"E**	**Rhinogobius brunneus, Rutilus aralensis, Chalcarburnus chalcaoides aralensis, Abramis brama orientalis, Carassius gibelio, Cyprinus carpio, Sander lucioperca.**
UK-Ich_7	**37°20'33.99"N, 67°12'10.99"E**	**Rhodeus ocellatus, Gobio lepidolaemus, Pseudorasbora parva, Alburnoides bipunctatus eichwaldi, Sabanejewia aralensis, Gambusia holbrooki, Rhinogobius brunneus**
UK-Ich_8	**37°20'53.35"N, 67°13'5.19"E**	**Rhinogobius brunneus, Rutilus aralensis, Chalcarburnus chalcaoides aralensis, Abramis brama orientalis, Carassius gibelio, Cyprinus carpio, Sander lucioperca.**
UK-Ich_9	**37°22'11.96"N, 67°12'43.75"E**	**Gambusia holbrooki, Rhinogobius brunneus, Rutilus aralensis, Chalcarburnus chalcaoides aralensis, Abramis brama orientalis, Carassius gibelio, Sander lucioperca, Cyprinus carpio.**

Two types of fish on a Red Book of the republic of Uzbekistan were found in the Uchkizil water reservoir - Luciobarbus conocephalus and Sabanejewia aralensis. Accordingly, five fish species are endemic.

Cyprinidae make up the majority of fish species in the Uchkizil water reservoir (see Figure 60). All in all, fish species can be subdivided into 3 groups: Commercial fishing, non-commercial and protected species.

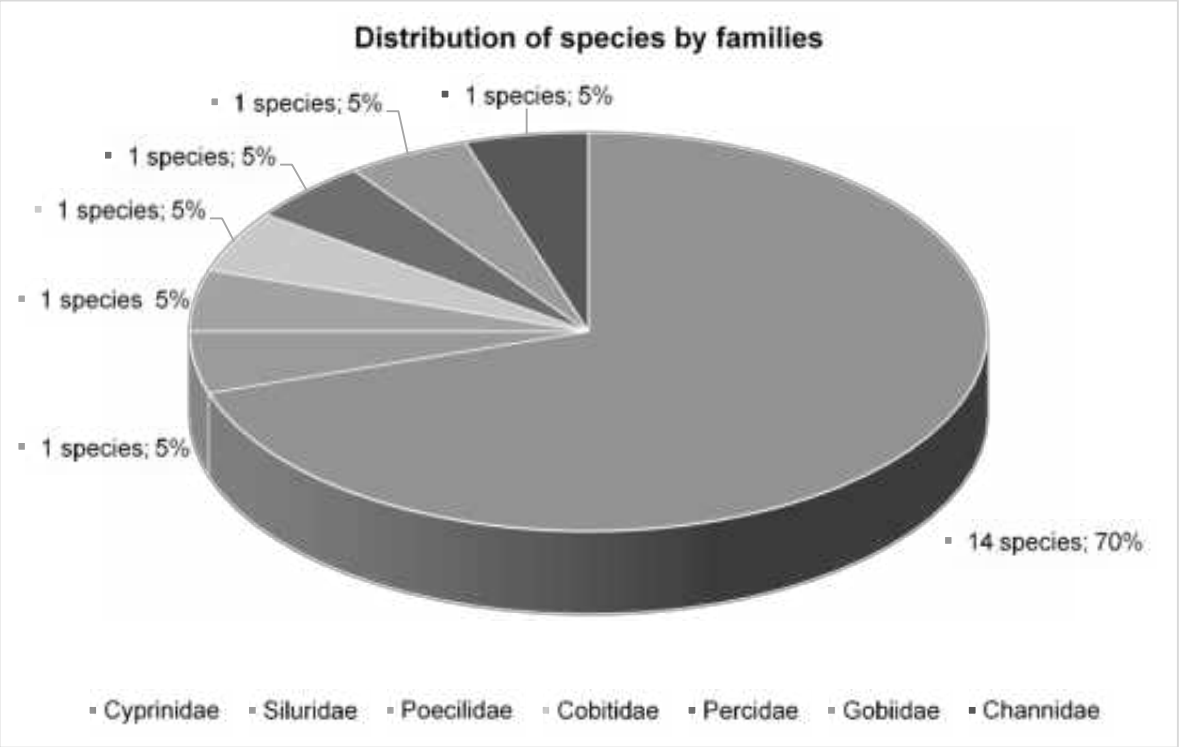


Figure 60: Distribution of fish species by families in the Uchkizil water reservoir

Commercial fish species are *Ctenopharyngodon Idella, Chalcarburnus chalcaoides aralensis, Abramis brama orientalis, Carassius gibelio, Cyprinus carpio, Hypophthalmichthys molitrix, Aristichthys nobilis, Rutilus aralensis, Siluris glanis, Sander lucioperca, Channa argus*

Non-commercial types are *Rhodeus ocellatus, Gobio lepidolaemus, Pseudorasbora parva, Alburnoides bipunctatus eichwaldi, Alburnoides teaniatus, Gambusia holbrooki*, found in the Zang canal. *Rhinogobius brunneu*s found along the shoreline of the water reservoir and are dominant species.

2 Protected species are in the Red Book of the RUz [16] were known in the reservoir:

- *Luciobarbus conocephalus* are currently in the Red Book of the RUz [16], as the "2 (VU:D): Vulnerable endemic species"
- *Sabanejewia aralensis* are in the Red Book of the RUz (2019), as the "3 (NT): Close to the vulnerable aral endemic species. Is on the Red list [16][LC]".

The aforementioned 2 species - *Luciobarbus conocephalus* and *Sabanejewia aralensis* are not in the CITES convention list [32].

Uchkizil water reservoir is not a native or relict one with unique fauna. The current fish fauna of the water reservoir has been formed by that of the Surkhandarya river. Consequently, irrespective of the damage as a result of construction, all fish type can be recovered. Some of the reservoir fish are on the Red Book of the RUz even though the water reservoir is not their natural habitat – they propagate through the river and form the fauna of the water reservoir. Fish reserves are annualy replenished by a certain number of small fish from the local fisheries. This particular water reservoir plays an

important role in providing fish reserves for both the local populace of the Surkhandarya region and fish-eating animals too.

8.4.3.2 Benthic Organizm

Macrozoobenthos (bentos - depth is the community of visible invertebrates (body size above 2 mm), that inhabit the sea bottom (benthal), aquatic vegetation (phytal), as well as other substratum, including different hydrotechnical structures. Zoobenthos is represented by: worms (planaria, oligachoete, leech, nematodes), gastropods (gastropod, bivalves), crustacean (amphipods, isopods, denocodes, etc.), arachnids, maggots (chironimids, heledes, ephemeral flies, plecopterans, tricoptherans, dragonflies, etc.). Functionally speaking zoobenthos is an important part of heterotrophic components and the living bodies thereof are consuments.

The type and quantity development of benthaly characterize contamination level of the soil and bottom waters. The phytal zone population are characterized by the large water quantities.

The composition of zoobentos communities is relatively homogenuous so long as they remain within the conditions they were developed in. Bottom communities within clear waters and well-aired areas are characterized by a variety of species, which is indicative of the normal water system. Polluted waters may contain groups of animals that are more susceptible to pollutants. This leads to the violations of special and trophic structure of zoobenthos which eventually degrades bottom-level biozenos.

Uchkizil benthos are characterized by a set of freshwater and saline organisms. Bottomline fauna make up the basis of the benthos, such as the phytophilious fauna and are represented by oligochaetes of Tubificidae family, chyronimids for the moderately dirty waters.

Species wise Zoobenthos was quite limited in July 2021. Physa fontinalis make up the most of bentofauna at the zoobentos probing point, as well as representatives of Chironomus, and Cricotopus, plus oligochets: Nais elinguis, Paranais litoralis and representatives of Tubificidae (see Table 100).

Table 100: Zoobentos species of the Uchkizil water reservoir

Species	S	Abundancy point
Ephemeptera		
Caenis macrura Stephens	**α**	**3**
Chironomidae		
Cricotopus gr. bicinctus Meigen	**β-α**	**3**
Tanytarsus gr. Gregarious Kieffer	**β-α**	**3**
Tanytarsus gr. Lobatifrons Kieffer	**α**	**5**
Tanytarsus mancus V.D. Wulp.	**α**	**5**
Chironomus plumosus Linnaeus	**ρ**	**3**
Oligochaeta		

Species	S	Abundancy point
Nais elinguis O.F. Müller	**β-α**	**3**
Nais pseudoptusa Piguet	**β-α**	**3**
Nais barbata O.F. Muller	**β-α**	**3**
Paranais litoralis O.F. Müller	**β-α**	**3**
Branchiura sowerbyi Beddard	**ρ**	**2**
Limnodrilus udekemianus Claparede	**ρ**	**5**
Limnodrilus hoffmeisteri f. typica Claparede	**ρ**	**5**
Euilyodrilus hammoniensis (Michaelsen)	**ρ**	**9**
Tubifex tubifex O.F. Muller	**ρ**	**3**
Total:		**15**

Table 100 and Table 101 show that zoobentos sampling revealed the following 15 zoobentos types, of which: 1 type of dayflys, 9 species of Oligochaete, two-wingers from the 5 species of Chironomidae family.

Table 101: Zoobentos properties at the Uchkizil water reservoir

Taxonomic group	Species	Q-ty m^2	Biomass g/m^2	Saprobity of species (S)	Saprobity of water reservoir
Ephemeroptera	**Caenis macrura Stephens**	**25**	**0.0875**	**α**	
Diptera	**Cricotopus gr. bicinctus Meigen**	**25**	**0.0575**	**β-α**	**3.23**
	Tanytarsus gr. Gregarious Kieffer	**25**	**0.0625**	**α**	
	Tanytarsus gr. Lobatifrons Kieffer	**63**	**0.1250**	**α**	
	Tanytarsus mancus V.D. Wulp.	**63**	**0.1313**	**α**	

Taxonomic group	Species	Q-ty m^2	Biomass g/m^2	Saprobity of species (S)	Saprobity of water reservoir
	Chironomus plumosus Linnaeus	**25**	**0.0286**	**ρ**	
Oligochaeta	**Nais elinguis O.F. Müller**	**38**	**0.0041**	**β-α**	
	Nais pseudoptusa Piguet	**50**	**0.0050**	**β-α**	
	Nais barbata O.F. Muller	**25**	**0.0025**	**β-α**	
	Paranais litoralis Müller	**25**	**0.0035**	**β-α**	
	Branchiura sowerbyi Beddard	**13**	**0.0390**	**ρ**	
	Limnodrilus udekemianus Claparede	**75**	**0.0011**	**ρ**	
	Limnodrilus hoffmeisteri f. typica Claparede	**100**	**0.0160**	**ρ**	
	Euilyodrilus hammoniensis (Michaelsen)	**675**	**2.7000**	**ρ**	
	Tubifex tubifex O.F. Muller	**38**	**0.3675**	**ρ**	
3 group	**15**	**1265**	**3.6311**	**α**	

Table 102: Q-ty and biomass of the taxonomic zoobenthos groups of the researched Uchkizil water reservoir

Date	Reservoir name	Taxonomic group	No. of species in a group	Q-ty Pcs./m²	Biomass g/m²
15.07.2021	**Uchkizil water reservoir**	**Ephemeroptera**	**1**	**25**	**0.0875**
		Diptera	**5**	**201**	**0.4049**
		Oligochaeta	**9**	**1039**	**3.1577**
		3	**15**	**1265**	**3.6311**

Table 101 shows that zoobentos Measurement in the Uchkizil water reservoir equals β-α- and α- of the area, i.e. saprobe indicators (S) within the 3.00 to 3.50 range. Which means that the quality of water in zoobentos equal category Ш-IV and IV (moderately dirtied waters).

The α- mesasaprobic zone is characterized by the presence of amino and amido acids in the water, the conditions of the hydroenvironment tend to turn into a semi-anaerobic regime, there is little oxygen dissolved in the water, which can cause freezing at the bottom and at night due to the cessation of photosynthesis, the presence of hydrogen sulfide in significant amounts is noted (layered gray and dark gray, or even black silts with the smell of hydrogen sulfide), the nature of the biochemical processes is reductive-oxidative.

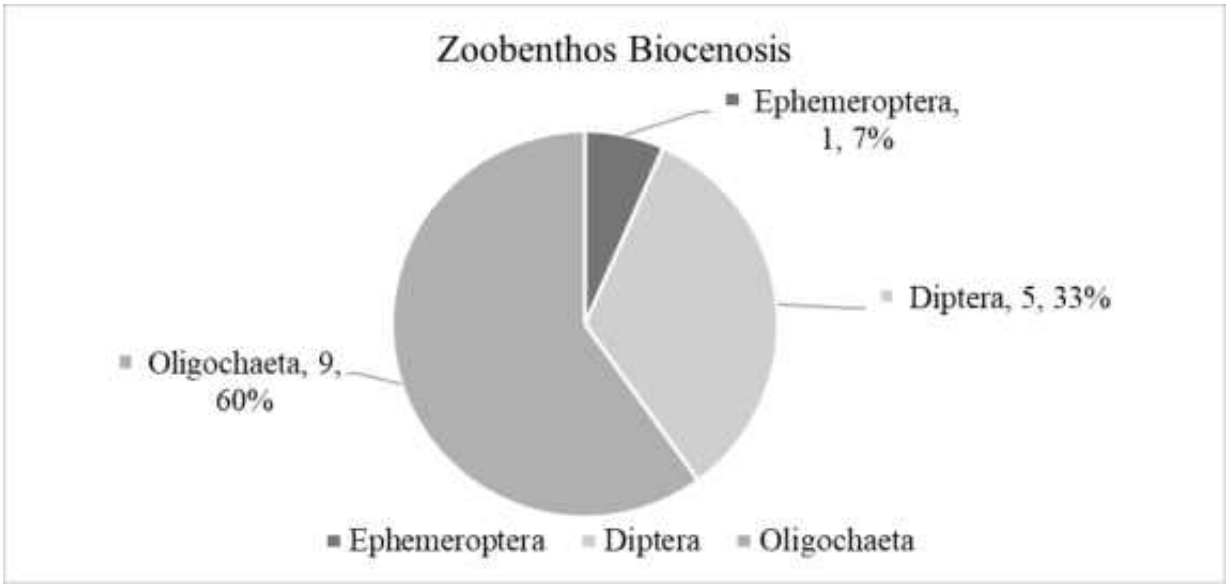


Figure 61: Taxonomic properties of zoobenthos biocenosis

The overall quantity of zoobenthos bodies sampled in the shoreline area of the Uchkizil water reservoir came to – 1265 pcs/m^2, while the biomass – 3.6311 g/m^2.

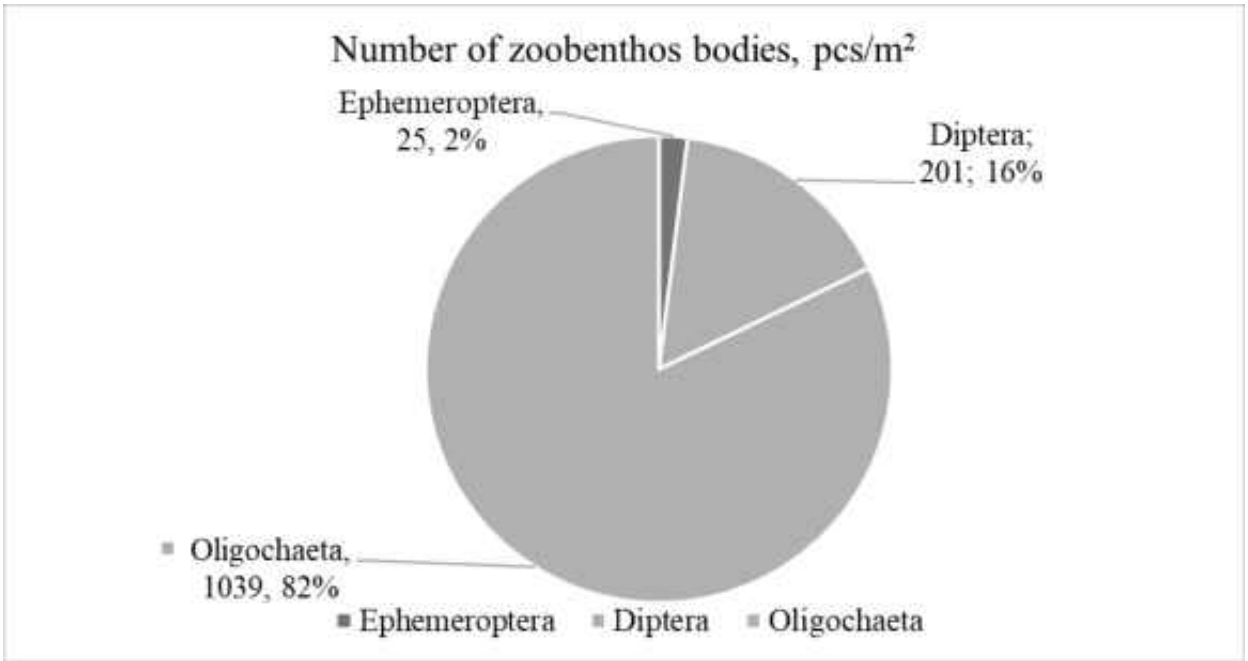


Figure 62: Abundance of zoobenthos organisms by taxonomic groups

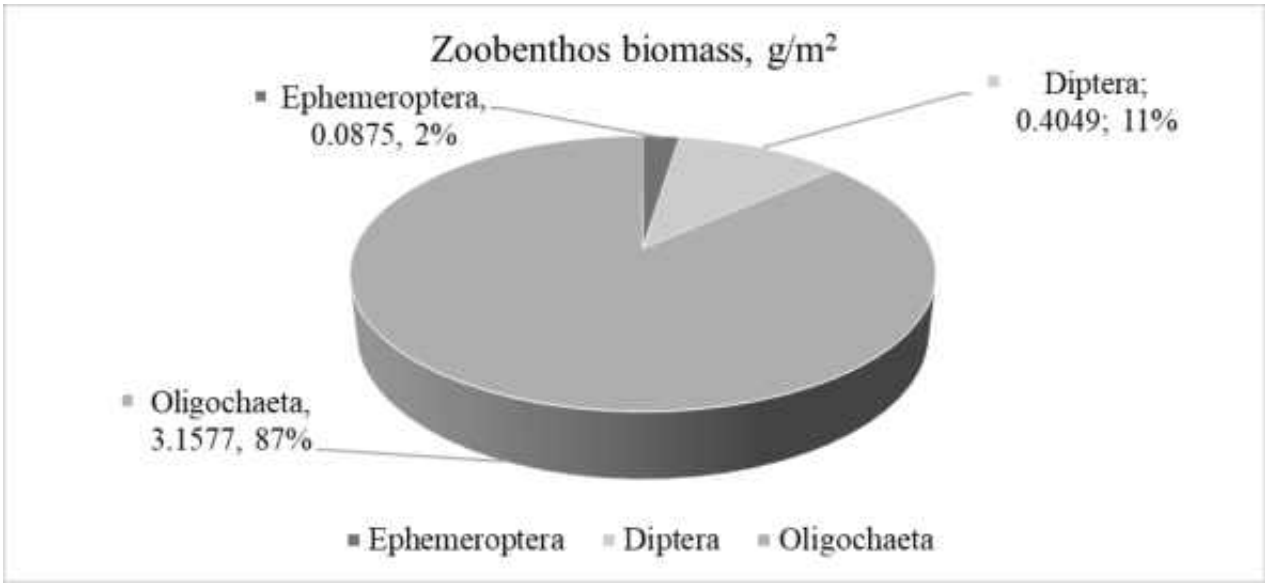


Figure 63: Biomass of zoobenthos organisms by taxonomic groups

Among the discovered organisms of zoobenthos, the dominant species are small-bristle worms of the family. Tubificidae, in particular Euilyodrilus hammoniensis.

The ecological character of the fauna develops in accordance with the peculiarities of the aquatic environment, which in the surveyed section of the reservoir include

- Increased mineralization, which is evidenced by the salt crust on the coast, as well as the presence of such macrophytes as charovaceae, rupee and sea naiad;
- Unstable hydrological state of the reservoir: at the time of sampling, the water moved from the initial level of seasonal filling by more than 20-25 meters;

The biocenose contains organisms belonging to the psammophilis populating silty and sandy sediments of the stagnating pools, as well as those, preferring acidified mineral muds: *Euilyodrilus hammoniensis* Michaelsen, *Limnodrilus hoffmeisteri f. typica* Claparede, *Limnodrilus udekemianus* Claparede, *Chironomus plumosus* Linnaeus.

8.4.3.3 Phytoplanktonic Organisms

Phytoplanktons are the microscopic bodies freely travelling in the water thickness or participating in the photosynthesis. They are considered one of the key water ecosystem elements as they participate in water reservoir productivity and shaping the water quality.

As a result of the analysis the phitoplanktone sample contains 77 seaweed varieties, of which Cyanophyta are 17 Bacillariophyta – 34, Chlorophyta – 13, Chrysophyta – 3, Dinophyta – 8, as well as 1 Cryptophyta and Xanthophyta respectively. The dominant set of phitoplanktone communities was represented in the first place by producents, namely blue and green, diatomic and green ones. Other families of microweeds appear to contain insignificant quantity and quality indicators. Taxonomic composition and the quantitative development of the phitoplanktone community at the researched area of the Uchkizil water reservoir for July 2021 can be found in Table 103 and Table 104.

Table 103: Taxonomic composition of the phitoplanktone of the Reservoir Uchkizil

Taxone/Sample No.	1
Cyanophyta	**17**
Bacillariophyta	**34**
Cryptophyta	**1**
Chrysophyta	**3**
Dinophyta	**8**
Chlorophyta	**13**
Xanthophyta	**1**
No. of microweeds	**77**

In the phytoplankton sample, a moderate development of blue-green (Cyanophyta) algae was noted, a total of 17 species (22.08%), forms and varieties of algae were noted. Blue-green colonial and filamentous β- mesosaprobic forms from the genera Synechococcus, Microcystis, Merismopedia, Gloeocapsa, Coelosphaeria, Anabaenopsis, O scillatoria, Phormidium, Lyngbya are represented. The number of blue-green algae in the sample corresponded to 8800.00 x 10 3 cells / l, and the biomass was 248,588 mg / l (see Table 104).

Diatoms (Bacillariophyta), in terms of taxonomic diversity (34 species), occupy one of the dominant positions in phytoplankton (44.16%) of the studied area and are represented by both planktonic o-, o - β - and representatives of phytobenthos β -mesosaprobic species from the genera Cyclotella, Fragilaria, Synedra, Eunotia, Cymbella, Amphora, Navicula, Nitzschia, certain types kotoryhpredpochitayut eutrophic water (Eunotiaarcus Ehr., E. gracilis (Ehr.) Rabenh., Mastogloia Smithiiv. amphicephala Hofm., Synedratabulata (Ag.) Kutz., Cymbellaobtusiuscula (Kutz.) Grun. Et al.) The number of diatoms in the sample was 562.5 00 * 10 3 cells / l, the abiomass was 382.225 mg / l (see Table 103).

Golden (Chrysophyta) algae are represented by the genera Dinopryon , Chromulina , their number in the sample was 150.00 * 10 3 cells / l, and the biomass, respectively, was 50.075 mg / l; dinophytes (Dinophyta) are represented by the genera Glenodinium , Peridinium , Ceratium , the number was 87.50 * 10 3 cells / l., and the biomass, respectively, - 118.713 mg / l; yellow-green (Xanthophyta) originally presented Tribonema , number amounted to 206.250 x 103 cells / L, respectively, and the biomass -. 185,213 mg / l (see Table 103).

Table 104: Phitoplanktone quality at the Uchkizil water reservoir

Taxone	№ 1
Cyanophyta	**8800,00** **248.588**
Bacillariophyta	**562,500** **382.225**
Cryptophyta	**12,500** **12.575**
Chrysophyta	**150,00** **50.075**
Dinophyta	**87,500** **118.713**
Chlorophyta	**368,750** **129.475**
Xanthophyta	**206,250** **185.213**
q-ty (kl*10^3) / biomass (mg/l)	**10217,500** **1126,924**

The diagrams in Figure 64 and Figure 65show the percentage ratio of taxonomic diversity and quantitative development of phytoplankton microalgae in the sample of the Uchkizil reservoir, July 15, 2021.

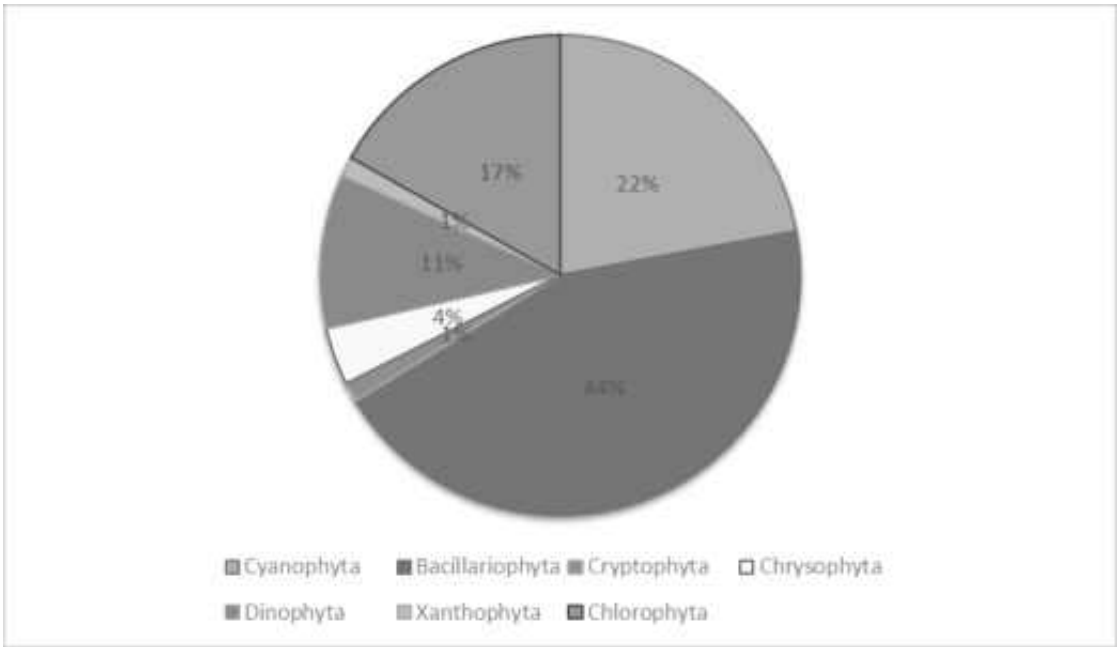


Figure 64: Percentage of phytoplankton taxa in the Uchkizil Reservoir

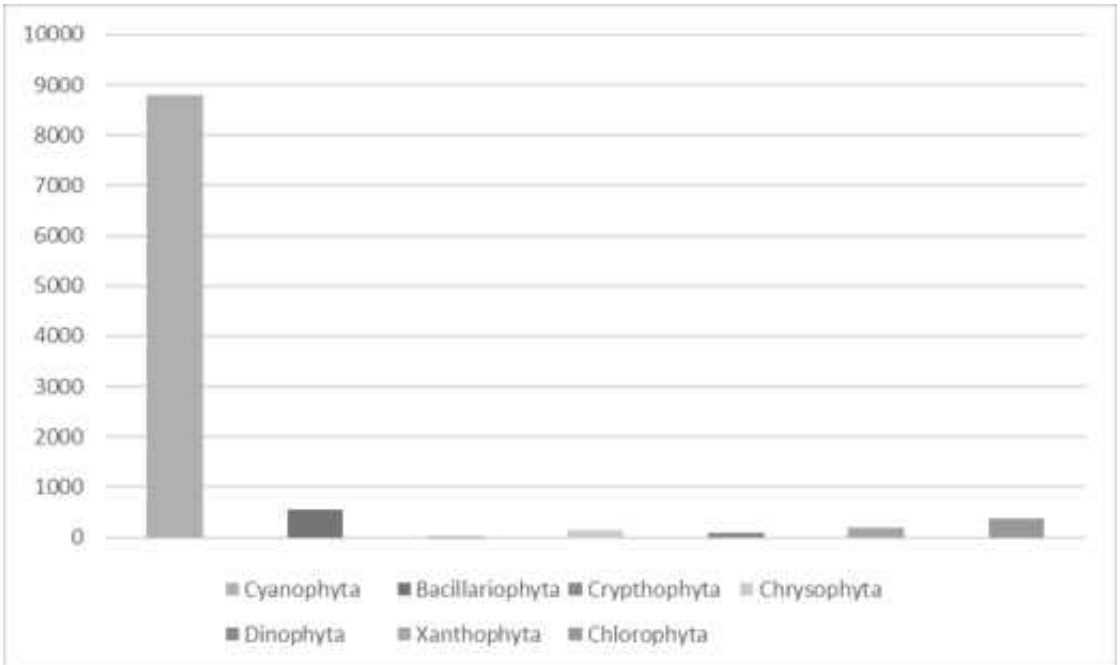


Figure 65: Quantity of phytoplankton in the Uchkizil Reservoir

Based on the results obtained, it can be noted that the dominant phytoplankton complex of the investigated section of the Uchkizil lake is represented mainly by widespread freshwater o- β - and freshwater-brackish β- mesosaprobic forms of diatoms, blue-green, green, dinophytic, golden and yellow-green algae. The ecological state in terms of the indicator corresponds to AB - a satisfactory ecological state, characterized by metabolic and ecological progress of biocenoses.

8.4.3.4 Zooplanktone

Zooplankton is a community (group) of aquatic invertebrate organisms inhabiting the body of water and leading to float freely, independent of the solid substrate as a support member, lifestyle (colorless flagellates, rotifers (Rotatoria), cladocerans (order C ladocera) and copepods copepod (order Copepoda) consuming phytoplankton, bacteria and detritus, it itself is the most important component in the diet of fish and carnivorous invertebrates. mass develop microalgae

The quantitative assessment of zooplanktone development has been conducted on the following scale (Chinov, 2007) to make sure the zooplanktone biomass (mg/m3) meets the water body trophicity values: "poorly developed" – from 1-400 (ultraoligotrophite), "poorish development" – from 400-1000 (oligatrophite), "average" - from 1000-2000 (mesotrophic) and "abundantly developed" - 2000-4000 and more (eutrophic) (see Table 105).

Table 105: Concentration of phosphorous, bio and ichtyomass of zooplanktone in water bodies

Water body type	Phosphorous, mg/m^3	Zooplanktone biomass, g/m^3	Ichtiomass, g/m^2
Ultraoligotrophite	**3**	**0.5**	**1.25**
Oligatrophite	**1-10**	**0.5-1**	**1.25-2.5**
Mesotrophic	**4-40**	**1-4**	**2.5-10**
Eutrophic	**200-400**	**4-16**	**10-40**
Hypereutrophic	**400**	**16**	**40**

In July 2021, 1 zooplankton sample was taken from the Uchkizil reservoir. Table 106 shows the species composition of zooplankton, saprobity indices for the identified species and the mass rate of their detection in each sample. 7 species of zooplankton were found: 2 species of cladocera (Cladocera) - Diaphanosomalacustris and Chydorussphaericus, 4 species of copepods (Copepoda) - Thermocyclopsvermifer dominated en masse; also found mature female cyclops Mesocyclopsaequatorialissimilis, Harpacticoidagen harpacticides. sp., immature individuals of Diaptomidaegen. sp. and 1 species of rotifers.

The level of saprobity - organic pollution of water (Table 106) for zooplankton species from the Uchkizil lake ranged from 1.5-1.75, which corresponds to the β- saprobic zone - slightly-moderate organic pollution of water: the presence of organic and mineral compounds with signs of oxygen oxidation.

Table 106: Zooplanktone species, mass propagation and saprobity index as well as quantitative characteristics of zooplanktone species in Uchkizill reservoir

No. and station name	Zooplanktone specie	Propagation (h)	Saprobity (s)
№ 1	**Rotifera:**		
	Euchlanis dilatata	**1**	**β-o – 1,5**
	Cladocera:		
	Diaphanosoma lacustris	**7**	**β-o – 1,55**
	Chydorus sphaericus	**3**	**β-o – 1,75**
	Copepoda:		
	***Thermocyclops vermifer,* Lindberg, 1935**	**9**	**β-o – 1,7**
	***Mesocyclops aequatorialis similis* Van de Velde, 1935**	**5**	**β-o – 1,65**
	Harpacticoida gen. sp.	**3**	**-**
	Diaptomidae gen. sp.	**3**	**-**

Quantitative zooplankton development Uchkizilskom reservoir was negligible: v. Total number - 7033 copies / m 3 and the total biomass - 143.02 mg / m 3 due to equal contributions to the development of quantitative Cladocera and Copepoda (Table 107).

Table 107: Number of species, overall number (pcs./m3) and biomass (mg/m^3) of 3 zooplanktone taxonomic groups of the Uchkizil water reservoir

Station No. and name	Taxonomic group	No. species per group	No. of species, pcs. m^3	Biomass, mg/m^3
№ 1	**Rotifera**	**1**	**33**	**0.02**
	Cladocera	**2**	**1200**	**68**
	Copepoda	**4**	**5800**	**75**
	Total:	**7**	**7033**	**143.02**

The level of trophicity of the Uchkizil reservoir, determined by the biomass of zooplankton, corresponds to the "oligotrophic" level and shows the lack of nutrients (nitrogen and phosphorus) in the reservoir, which affects the quantitative indicators of zooplankton.

In the summer sample of the investigated section of the Uchkizil reservoir, 7 species of zooplankton were found, which indicates the average biodiversity of the reservoir.

The species found in the sample are widespread, thermophilic species - indicators of moderately polluted waters, the indicator of indicator significance for organic pollution by decay products corresponds to the β- saprobic zone - a zone of slightly-moderate organic pollution. The level of biomass of zooplankton in the reservoir was 143.02 g / m^3, which characterizes waters with an insufficient amount of nutrients (the level of water trophicity), and poor development of zooplankton organisms (clean or unpolluted).

8.4.3.5 Periphyton

Periphyton (fouling) - communities of organisms that live on a variety of underwater (living or dead) substrates, outside the specific bottom layer of water and is one of the most complex communities in aquatic ecosystems.

Periphyton fouling includes representatives of three main functional groups of organisms: autotrophic organisms - producers - algae;

- heterotrophic organisms - consumers: protozoa, rotifers, ciliates, crustaceans, cyclops, daphnia, sponges, bryozoans, worms, bivalve molluscs and others; - decomposers - filamentous, coccoid, rod-shaped, zooglea and other bacteria, fungi.

Periphyton, as an integral part of aquatic ecosystems, undergoes various changes along with it, due to various natural and anthropogenic factors, which is expressed in the spatial and temporal successions of periphytic communities.

Outwardly, the fouling of periphyton looked mainly as brown and clay deposits, films and layers, slimy to the touch formations, from light gray to brownish-green interspersed with clay on the stems and leaves of macrophytes (

Figure 66: Uchkizil water reservoir, external appearance of periphyton

In total, 119 species of aquatic organisms were found in the selected summer sample of periphyton, of which 110 species from the producer group (microalgae), 7 species from the consumer group, and 2 species from the reducers group.

The dominant group in the Measurement consisted of producers are 110 species, varieties and forms of microalgae, of which blue-green (Cyanophyta) - 28 species, diatoms (Bacillariophyta) - 64 species, green (Chlorophyta) - 11 species, (Dinophyta) - 4 species, yellow- green (Xanthophyta) - 2 species and cryptophyte (Cryptophyta) - 1 species (see Table 108).

Table 108: Taxonomic structure of the periphyton of the investigated section of the Uchkizil water reservoir

Taxon / Sample No.	1
Cyanophyta	**28**
Bacillariophyta	**64**
Cryptophyta	**1**
Dinophyta	**4**
Xanthophyta	**2**
Chlorophyta	**11**
Number of microalgae species	**110**

In total, the periphyton sample showed good development of 28 species of blue-green (Cyanophyta) algae, or 25.45% of the total amount of algae. Blue-green are represented mainly by widespread freshwater and freshwater-brackish-water colonial and filamentous forms from the genera Synechococcus, Merismopedia, Microcystis, Gloeocapsa, Anabaenopsis, Oscillatoria, Phormidium, Lyngbya, Spirulina, etc.

The common species in the Measurement were: Synechococcus aeruginosa, Merismopedia glauca, Microcystis aeruginosa, Gloeocapsa alpina., Anabaenopsis Raciborskii, Oscillatoria amphibia, Osc.geminata, Osc.planctonica, Osc.formosa, Phormidium ambiguum, Ph. papillaterminatum, Lyngbya Kuetzingii, L. limnetica, etc.

Diatoms (Bacillariophyta), in terms of taxonomic diversity, occupy a dominant position in the periphyton of 64 species (58.18%) and are represented as widespread planktonic freshwater-brackish-water species of o-β-mesosaprobic conditions of algae of the genera Cyclotella, Fragilaria, Synedra, and phytobenthos b-, ba-mesosaprobic species from the genera Achnanthes, Denticula, Cymbella, Cocconeis, Eunotia, Mastogloia, Gomphonema, Gyrosigma, Navicula, Nitzschia, Cymatopleura. of which are simultaneously characteristic of eutrophied water bodies, as well as species characteristic of biotopes with accumulation of plant detritus (Synedra ulna, S. tabulata., Amphora veneta, Cymbella obtusiuscula., Navicula cryptocephala, Mastogloia Smithii, Amphicephala, Nitzschia vermicularis, N. obtusa, etc.

Periphytic communities of gray color, well developed and in various combinations formed the leading complex of algae.

Green algae (Chlorophyta) in the investigated section of the Uchkizil lake developed moderately, 11 species were recorded here, which accounted for 10% of the total number of species. Presented are green, mainly planktonic β-mesosaprobic chlorococcal, protococcal and desmidian algae from the genus Chlorococcum, Chlorella, Oocystis, Cosmarium, Scenedesmus, Tetraedron and filamentous yellow-green algae of the genera Vaucheria, Tribonema (see Table 110).

In the Measurement of periphyton, protozoa from the consumer group were also noted (amoeba, Rotifera: Cephalodella gibba, Chilodonella uncinata, Colurella uncinata, Rotaria, chironomid larvae, roundworms Nematoda gen.sp. and others.). It should be noted that organisms from the group of decomposers were also found in the Measurement. (Bacterium sp, Sphaerotilus dichotomus), fungus. The species composition of the periphyton organisms is presented in the Table 110.

As can be seen from Table 109, the indicators of the water quality class, the saprobity index and the ecological state of water masses in terms of periphyton correspond to class III (moderately polluted waters), IS - 1.90, the ecological state - AB, a satisfactory ecological state, characterized by metabolic and ecological progress of biocenoses.

Table 109 presents a comparative characteristic of the species composition of phytoplankton and periphyton communities in the surveyed section of the Uchkizil reservoir.

Table 109: Saprobity index, biotic periphyton index, water quality class, ecological state of the periphyton of the investigated section of the Uchkizil water reservoir

Sample No.	1
SI	**1.90**
BPI	**6**
Water quality class	**III**
Ecological condition	**АБ**

Table 110: Species composition of phytoplankton and periphyton communities in the surveyed section of the Uchkizil reservoir

Taxa / indicators	S	Phytoplankton	Periphyton
CYANOPHYTA			
1.Synechococcus aeruginosa Nag.	**o-b**	**D**	**D**
2.Merismopedia glauca (Ehr.) Nag.	**b**	**D**	**D**
3.Merismopedia tenuissima Lemm.	**b-a**	**-**	**C**
4.M.elegans A.Br.	**b**	**C**	**C**
5.Microcystis aeruginosa Woron.	**b-o**	**D**	**D**
6.Aphanothece stagnina (Spreng.) B.-Peters. et Geitl. Emend.	**o-b**	**-**	**C**
7.Gloeocapsa alpina Nag.end. Brend	**b**	**C**	**D**
8.Gl. alpina f.lignicola (Rabenh.) Hollerb.	**b**	**-**	**+**
9.Gl. mimima (Kütz.) Hellerb.	**b**	**+**	**+**

Taxa / indicators	S	Phytoplankton	Periphyton
10.Gl. turgida (Kütz.) Hellerb.	**o-b**	**-**	**+**
11.Coelosphaerium Kuetzingiana Kütz.	**b**	**C**	**+**
12.Anabaena Bergii	**b**	**-**	**+**
13.Anabaenopsis Raciborskii Wolosz.	**b**	**C**	**D**
14.Schizothrix sp.	**b**	**-**	**C**
15.Oscillatoria amphibia Ag	**b**	**C**	**C**
16.Osc.brevis Ag.	**b**	**C**	**-**
17.Osc.formosa Bory	**a**	**-**	**C**
18.Osc.geminata (Menegh.) Gom.	**b**	**D**	**D**
19.Osc.limosa Ag.	**b-a**	**-**	**C**
20.Osc.spirulinoides Woronich.	**b-a**	**-**	**C**
21.Osc.planctonica Wolosz.	**o- b**	**D**	**D**
22.Spirulina major Kütz.	**b**	**D**	**D**
23.Sp.laxa Smith.	**b**	**-**	**C**
24.Phormidium ambiguum Gom.	**b**	**-**	**C**
25.Ph.papillaterminatum Kissel.	**b**	**D**	**D**
26.Lyngbya Kuetzingii (Kütz.) Schmidle	**b**	**D**	**D**
27.L.limnetica Lemm.	**b**	**D**	**D**
28.L.martensiana Menegh.	**b**	**C**	**D**
BACILLARIOPHITA			
1.Cyclotella kuetzingiana Thw.	**b**	**C**	**+**
2.C.meneghiniana Kütz	**b-a**	**+**	**C**
3.C.caspia Grun.	**a-b**	**C**	**-**
4.Fragilaria crotonensis Kitt.	**o-b**	**C**	**C**
5.Fr.capucina Desm.	**o-b**	**+**	**D**
6.Fr.construens (Ehr.) Grun.	**b**	**-**	**D**
7.Synedra acus Kütz.	**o-b**	**-**	**C**

Taxa / indicators	S	Phytoplankton	Periphyton
8.S.capitata Ehr.	b	+	+
9.S.minuscula Grun.	a-b	+	C
10.S.tabulata (Ag.) Kütz.	b	-	+
11.S.tabulata v.parva (Kütz.) Grun.	b	+	C
12.S.tabulata v.fasciculata (Kütz.) Grun.	b	+	+
13.S.ulna (Nitzsch.) Ehr.	b	+	+
14.Eunotia arcus Ehr.	o-b	C	D
15.E.gracilis (Ehr.) Rabenh.	o-b	-	C
16.Cocconeis placentula Ehr.	o-b	-	+
17.C.placentula v.euglypta (Herib.et Perag) Cl.	b	-	+
18.Achnanthes hungarica	b	-	+
19.Ach.affinis Grun.	o	-	C
20.Ach.minutissima Kütz.	o-b	-	C
21.Mastogloia Smithii Thw.	b-a	-	+
22.M.Smithii v.amphicephala	b-a	+	+
23.Denticula tenue Kütz.	o	+	+
24.Diploneis Smithii v.pumilla (Grun.) Hust.	b	+	+
25.Navicula atomus (Nag.) Grun.	b	-	+
26.N.anglica Ralf.	b	C	D
27.N.bacillum Ehr.	b-a	-	+
28. N.cryptocephala Kütz.	a-b	+	C
29.N.cryptocephala v. intermedia Grun.	b	+	+
30.N.cryptocephala v.veneta (Kütz.) Grun.	a-b	-	C
31.N.cincta (Ehr.) Kütz.	a-b	-	+
32.N.exiqua (Greg.) O.Mull.	b	C	D
33.N.kolbei Poretzky et Anissimova	b-a	C	C
34.N.Gregaris Donk.	b-a	-	D

Taxa / indicators	S	Phytoplankton	Periphyton
35.N.hungarica Grun.	b	-	+
36.N.microcephala Grun.	o-b	-	C
37.N.pupula Kütz.	b	+	+
38.N.protracta v.subcapitata Woronichin	b-a	C	D
39.Pinnularia.viridis (Nitzsch.) Ehr.	b	+	+
40. Gyrosigma scalproides (Rabenh.) Cl.	b	+	C
41.G.Spenceri (W.S.) Cl.	b	-	C
42.Tropidoneis Lepidoptera Grun.	b	-	+
43.Amphora veneta Kütz.	b-a	+	C
44.Amp.coffeaformis Ag.	b-a	-	+
45.Cymbella cistula (HEMP.) Grun.	b	+	C
46.C.obtusiuscula (Kütz.) Grun.	a-b	+	C
47.C.pusilla Grun.	a-b	-	+
48.C.tumida (Breb.) V.H.	b	-	+
49.Gomphonema olivaceum (Lyng.) Kütz.	b	+	D
50.G.olivaceum v.calcareum (Ehr.) Kütz.	b	-	C
51.G.parvulum (Kütz.) Grun.	b	-	C
52.Nitzschia amphibia Grun.	b-a	+	-
53.N.apiculata (Greg.) Grun.	a-b	+	+
54.N.capitellata Hust.	b	+	D
55.N.filiformis (W.Sm.) Hust.	b	-	C
56.N.holsatica Hust.	b	+	+
57.N.hungarica Grun.	a	-	+
58.N.obtusa W.Sm.	b	-	C
59.N.palea (Kütz.) Grun.	a	-	+
60. N.paleacea Grun.	b	-	C
61. N.tryblionella Hantzsch.	a-b	+	+

Taxa / indicators	S	Phytoplankton	Periphyton
62.N.tryblionella v.levidensis (W.Sm.) Grun.	a-b	-	C
63. N.vermicularis Hust.	b	+	+
64.Cymatopleura solea (Breb.) W.Sm.	b-a	+	+
CHRYSOPHYTA			
1.Dinopryon soliale Ehr.	o	C	-
2.D.divergens Imhof.	o	C	-
3.Chromulina sp.	b	+	-
CRYPTOPHYTA			
Cryptomonas sp. (curvata Ehr.)	b	+	+
DINOPHYTA			
1.Glenodinium borgei (Lemm.) Schiller	b-o	+	+
2.Gl.quadridens (Stein.) Snhiller	b-o	+	-
3.Gl.Penardii Lemm.	b	+	-
4.Gymnodinium aeruginosa	b	-	+
5.Peridinium caudatum (O.F.M.)	b	+	+
6.P.biceps Stein	b-o	+	+
7.P.biceps f.tabulatum (O.F.M.)	b-o	+	-
8.P.pusillum (Penard.) Lemm.	b	+	-
9.Ceratium hirundinella (O.Mull.) Schrank	o-b	+	-
XANTHOPHYTA			
1.Vaucheria geminate Klebs.	b	-	C
2.Tribonema sp.	b	C	D
CHLOROPHYTA			
1.Kirchneriella lunaris	b-o	+	-
2.Chlorococcum sp. (humicola?)	b	+	+
3.Ch.turgida	b	-	+
4.Chlorella sp.	b-a	+	+

Taxa / indicators	S	Phytoplankton	Periphyton
5.Oocystis natans Lemm.	**b**	**+**	**+**
6.Oocystis sp. (marssonii?)	**b**	**-**	**+**
7.Chlamidomonas sp.	**b**	**+**	**-**
8.Ch.ovale	**b**	**+**	**-**
9.Carteria Klebsi	**b-a**	**C**	**-**
10.Dunaliella sp.	**b-a**	**+**	**-**
11.Cosmarium formulosum Hofm.	**b**	**+**	**C**
12.C.granatum Ralfs.	**b**	**+**	**+**
13.C.ornatum	**b**	**-**	**+**
14.Scenedesmus quadricauda (Turp.) Breb.	**b**	**-**	**+**
15.Sc.perforatus Chodat	**b**	**-**	**+**
16.Tetraedron minimum Hansg.	**b**	**+**	**+**
17.Dictyosphaerium ehrenbergianum Naeg.	**b**	**+**	**-**
18.algae sp.	**b**	**C**	**-**
Total		**77**	**110**
Consumers:			
1.Amoeba proteus	**b-a**	**-**	**+**
2.Colurella uncinata	**b-a**	**+**	**+**
3.Chilodonella uncinata	**b-a**	**-**	**+**
4.Cephalodella gibba	**b**	**-**	**+**
5.Lecane ovalis	**b**	**+**	
6.Rotaria rotatoria	**a-b**	**+**	**+**
7.Nematoda gen.sp.	**a**	**+**	**C**
8.Chironomidae gen.sp.	**a**	**+**	**+**
Deconsumers:			
Bacterium sp.	**a**	**-**	**+**
Pelonema subtilissima	**a-b**	**-**	**-**

Taxa / indicators	S	Phytoplankton	Periphyton
Sphaerotilus dichotomus	**a-b**	**-**	**+**

Legend: S - saprobity of organisms; + - single occurrence; C - subdominants; D - dominants

Based on the results obtained on the indicators of summer periphyton, the following conclusions can be drawn:

dominant algological complex of phytoplankton and periphyton communities is most diversely represented, first of all, by producers: diatoms, blue-green and green algae. Dinophytic, golden, cryptophytic, and yellow-green algae were observed with a low abundance.

Aquatic biocenoses of the reservoir investigated area are mainly represented by o-b-, b-, b-a-mesosaprobic species of organisms.

The water quality corresponds mainly to class III (moderately polluted waters), which is associated with pollution and a slight increase in mineralization. The values of the biotic periphyton index (BPI) are mainly 6 points, IS - 1.90, ecological state - AB (satisfactory ecological state, characterized by metabolic and ecological progress of biocenoses).

8.4.4 Aquatic Sensitive Receptors

The terrestrial sensitive receptors are given in Table 111 and Table 93 and the details are explaned in Section 8.5.

Table 111: Aquatic Sensitive Receptors

Receptor	Sensitivity	Justification
Water Quality and Ecological Conditons	**Medium**	**The water quality corresponds to class III (moderately polluted waters), which is associated with pollution and a slight increase in mineralization. The characteristics of the ecological invariant states of biocenose is AB - satisfactory ecological state, characterized by metabolic and ecological progress of biocenoses.** **Zooplankton types are the common heat-loving species – indicators of moderately polluted waters equal β-o saprobe area (an area of weak and moderate pollution). Zooplanktone biomass level is which is characteristic of water with insufficient q-ty of biogenic substances and underdevelopment of zooplanktonic species.**

Receptor	Sensitivity	Justification
Ichthyofauna	**Medium**	**The species found in the sample are widespread, the dominant species are indicators of moderately polluted waters. One fish species is listed as vulnerable in the UzbekistanRed book. The current fish fauna of the water reservoir has been formed by that of the Surkhandarya river. Consequently, irrespective of the damage as a result of construction, all fish type can be recovered.**
Ecosystem Services	**Medium**	**There are ecosystem services used by the local communities such as, fishing, watering animals, usage as recreation and tourism area. The area is also used to water sources both wild and domestic animals.**

8.5 POTENTIAL IMPACTS, MITIGATION, MANAGEMENT & RESIDUAL IMPACT

This section asess the potential impacts on terrestrial ecology that may occur as a result of the Project construction and operational activities and identifies recommended measures that can be implemented in order to mitigate and manage such impacts.

8.5.1 Construction Phase

Loss of Habitat/Habitat Fragmentation

The impact is generally direct as habitat will be lost through construction activities and this could include direct destruction of flora or damage to fauna habitat. The natural vegetation at the Project site has been substantially altered by human activities, especially farming. Due to the high level of anthropogenic disturbance to the natural vegetation, limited flora diversity on the project site and the existence of similar habitats outside the area of influence and it is therefore not considered a sensitive area.

Inadequate storage and handling of hazardous materials, and inappropriate design and storage of wastes could result with contamination of soils and groundwater which may also attract pest species and potential for disease. Pests may also be attracted to site by the accumulation of wastes (particularly domestic food wastes) if these are not stored and disposed of appropriately.

Loss of Flora

The desk study indicates that mainly common species of flora are present in the project effected area. These are generally considered to be of low conservation value and of low sensitivity. Impacts on these locally important species are considered to be minor adverse in magnitude and the likely effects are assessed as negligible. However, additional monitoring is required as the flora fieldwork is not carried out during the appropriate vegetation period.

Disturbance of Nature Conservation Areas

The risk of designated conservation areas being affected during operation is considered to be negligible given the distance to the Project area. Project impacts on protected areas during operation are therefore not expected to cause any significant effect.

Disturbance of Fauna

Agricultural and ruderal areas create shelters, are breeding grounds, mammals find food in the area. The reservoir is an important source of water supply for fauna species. However, it is possible to say that the impact on these species will be low due to the fact that similar habitats cover very large areas in the region and the ease of movement of large and medium mammal species.

At the same time any small fauna species (such as small mammals and reptiles) present at the local areas may however be disturbed due to the temporary effects of noise and vibration during construction and also dust deposition around working areas affecting adjacent habitats. Movement of vehicles and heavy machinery within the Project area as well as the site clearance and excavation could potentially cause direct mortality of some fauna species. Although not identified on site, the likelihood of encountering reptiles during construction is still of concern. Therefore, movement of vehicles and heavy machinery could potentially affect reptiles that may not abandon their burrows during site clearance. In which case, there is a potential that using of construction equipment and vehicles can injure or kill such species in the project area.

Increased risk of local pollution events due to use of construction vehicles affecting adjacent habitats and local changes in air quality resulting from construction activities and increased vehicle movements through the are may occurred.

Construction activity should be carried out in accordance with the period of reptile activity. That is, it is advisable to carry out all construction work during the period when all reptiles came out of hibernation (hibernation). During this period, reptiles do not have permanent burrows and during construction they can leave this territory in advance. At the beginning of construction during the hibernation period, wintering chambers in the soil can be damaged and then the reptile is doomed to death.

The area contains many reptilian species and three of them (*Testudo horsfieldii*-Potential, *Phrynocephalus raddei boettgeri*-observed, *Eremias nigrocellata*-observed), are in the vulnerable category in the Uzbekistan Red List and the impacts has potential to occur several times and the severity is marginal. These impacts are considered direct and permanent.

Disturbance of Avifauna

The state of the habitats of the project area has already been significantly influenced by human activities, and at the moment it is unattractive for birds. On the other hand, Project area is located nearly 10 km from two international bird area. Therefore, Uchkizil can potentially also attract them due to the water surface, food and as a recreation area. Nesting biotope is absent on the open banks of the Uchkizil, therefore, it is not expected to be nesting of water birds in the project area but the region is of particular importance for the wintering. These impacts are considered direct and permanent.

Accidental Loss of Fauna

Movement of vehicles and heavy machinery within the Project site as well as the site clearance and excavation could potentially cause direct mortality of fauna species such as reptiles. Also, Access to the construction area and displacements from various field activities increase the risk of accidents for small species.

Introduction of Alien Species

Accidental introduction and dispersal of invasive species from construction activities may occur.

Damage to Aquatic Ecosystem/Loss of Habitat

The sensitivity of these species to pollution is not considered to be medium. But there is a risk that to be high with the cumulative effects. Especially in the event of a spillage, the effects may change from moderate to high.

Excavation works may result in a temporary disturbance to aquaitc fauna through noise and vibration originating from the excavation activities. Fish, frogs, and water snakes are likely to be the most sensitive receptors to the noise and vibration. The main response of the fish and other species to noise levels is typically avoidance. Therefore, during noise creating activity it is probable that these fauna species would move away from the immediate source of the noise.

During commissioning, the hydro testing and steam cleaning will require large volumes of water, which may not be available for re-use.

If the Project site is not properly graded and no erosion barriers are installed, then runoff composed of sediment and organic material may be washed into the reservoir and potentially compromise the water quality.

Barrier Effects on Fauna

As the project site is located in a small part of the reservoir, impacts on water supply for wildlife are expected to be medium.

Loss of Ecosystem Services

There are ecosystem services used by the local communities such as grazing and browsing by domestic animals, fishing and usage the area as recreational. However, such impact will be limited to the Project site.

Table 112: Impacts Significance of the Ecology during Construction Phase

Potential Impacts	Receptor	Severity	Probability	Significance of Impact (without Impact Mitigation Measures)	Mitigation and Management Measures	Significance of Residual Impact
Loss of Habitat/Habitat Fragmantation (Terrestrial)	**Flora**	**Negligible**	**Certain**	**Moderate (M)**	**All areas to be cleared should be precisely demarcated and work carried out only within those areas to decrease the disturbance.** **Minimise permanent and temporary land take for civil works, clearaminince restricted to work sites.** **Pre-clearance specific flora surveys shall be performed.** **Additional site survey shall be performed during the appropriate vegetation period (March to May and September) to identify in maximum the species composition of the studied area flora (including the composition of endemic, rare, and synanthropic species) to clarify the data on vegetation communities (dominants and subdominants, composition and abundance of plant species, projective cover, degree of anthropogenic disturbance).** **Hazardous materials used during the construction stage shall be adequately managed, in order to minimise the potential risk of spillage and therefore potential contamination of the ecosystem.** **Cleared areas no longer required for construction activities shall be rehabilitated by re-seeding with locally found grasses and shrubs increase soil stability.** **All vehicles and equipment to be restricted to within the project boundaries and only along the approved access road route.** **Access roads shall be defined before the beginning of the construction activities. Some of the public roads may need to be used for access. Driving out of the access roads by the construction vehicles taking part of the construction activities shall not be allowed.** **First stage of mitigation should ensure that the Project site is prepared in such a way as to discourage animals from using the Project area. Initial site preparation and clearance could result in the loss of nesting birds and any other breeding species and where possible the initial preparatory work will be undertaken during the non-breeding season.**	**Minor (L)**
	Fauna	**Marginal**	**Certain**	**High (H)**		**Modarate (M)**
	Avifauna	**Marginal**	**Very likely**	**Moderate (M)**		**Moderate (M)**
Disturbance of Nature Conservation Areas	**Important Bird Areas**	**Negligible**	**Unlikely**	**Minor (L)**	**All vehicles and equipment to be restricted to within the project boundaries and only along the approved access road route.** **Where additional sites are needed (eg storage area), the distance of potential sites to IBAs will be determined. Care shall be taken not to work within 5 km of these areas.**	**Minor (L)**

Potential Impacts	Receptor	Severity	Probability	Significance of Impact (without Impact Mitigation Measures)	Mitigation and Management Measures	Significance of Residual Impact
Disturbance of Fauna	**Small mammals and Reptiles**	**Marginal**	**Certain**	**High (H)**	**There will be no encroachment to land outside of the Project footprint, or defined laydown areas, site access road.** **The project area boundaries shall be fenced to avoid fauna from entering the active construction site where they may be injured.** **A pre-construction survey should be completed for works undertaken in the breeding season to check for animals (reptiles and active bird nests) and, if species of conservation importance are identified, appropriate measures will be taken.** **If possible, gradual vegetation clearance will be conducted, to enable fauna to move to other areas** **The collection or hunting of any animals must be strictly prohibited. A 'no tolerance' policy must be adopted with respect to construction and operations workers.** **To clarify the existing situation, it is necessary to conduct focal field studies, during the period of the highest activity of amphibians and reptiles (April, May, June), as a result of which complete lists of species.** **Additional surveys should be performed for wintering bird species and should be monitored during construction at intervals deemed appropriate by experts.** **Destructive searches for reptiles (including Central Asian tortoise) should be undertaken during site clearance under the supervision of a suitably experienced ecologist. Destructive searches for reptiles and amphibians involve the careful removal of turf and 100mm of topsoil in potentially suitable habitats.** **Staff should be briefed on risks of exposure to scorpions, spiders and snakes as well as the preventative measures. Workers in the field should wear protective clothing; long trousers, closed shoes and leather gloves. Information regarding nearest location of treatment for any bites and stings should be made available.** **Route directions and speeds limit will be placed along the access road into the project site**	**Minor (L)**
	Big and medium mammals and bats	**Negligible**	**Certain**	**Moderate (M)**		**Minor (L)**
	Birds	**Marginal**	**Very likely**	**Moderate (M)**	**Trees located on the Project site shall be inspected before they are cleared or translocated to ensure there are no nesting birds or roosting bats. Clearance of trees from the Project site shall not be conducted during the nesting season if it is established that there are birds on site.**	**Modarate (M)**
	Barrier Effects on Fauna	**Marginal**	**Very likely**	**Moderate (M)**	**Any bird eggs observed in any nests on the Project site will not be disturbed and any damage to the eggs shall be recorded.** **Where lizard burrows are encountered on the project site the contractor will make efforts to ensure that they vacate their burrows prior to site clearance and excavation works.**	**Moderate (M)**

Potential Impacts	Receptor	Severity	Probability	Significance of Impact (without Impact Mitigation Measures)	Mitigation and Management Measures	Significance of Residual Impact
					Any sightings of fauna must be reported to the Environmental Manager and action taken recorded. **If necessary, work site and access roads should be irrigated to minimize dust impact.** **Appropriate training should be provided to relevant personnel concerning noise, vibration and lighting control and management** **Noise emission will be limited as much as possible: speed limit for vehicles, maintenance programs of machinery, avoidance of emission of noise during the night, etc.** **Wastes created during the construction activities will be managed under an Environmental and Social Management Plan (ESMP), to limit the disturbance to fauna as a result of presence of wastes and spills.**	
Accidental Loss of Fauna	**Small mammals, Reptiles and Birds**	**Marginal**	**Very likely**	**Moderate (M)**	**Project staff require environmental toolbox talks during construction to raise awareness, limit conflict and reduce additional disturbance to fauna and avifauna.** **Drivers operating in the area must be well briefed and must be aware of the dangers that vehicles pose to the local fauna.** **Route directions and speeds limit shall be placed along the access road into the project site** **Speed of vehicles shall be limited, in order to limit emission of dust in nonpaved accessed roads and in order to limit the risk of accidents with fauna.** **Any snakes encountered at the site must not be handled or harmed by Project workers. Animals must be relocated by appointed personnel.** **Staff shall be briefed on risks of exposure to scorpions, spiders and snakes as well as the preventative measures. Workers in the field should wear protective clothing; long trousers, closed shoes and leather gloves. Information regarding nearest location of treatment for any bites and stings should be made available.**	**Minor (L)**

Potential Impacts	Receptor	Severity	Probability	Significance of Impact (without Impact Mitigation Measures)	Mitigation and Management Measures	Significance of Residual Impact
Introduction of Alien Species	**Change of Habitat**	**Marginal**	**Likely**	**Moderate (M)**	**Potential invasive flora species shall be identified, and action must be taken to clear these species if they occur in or around areas designated for bush clearance to prevent establishment after clearing.** **A monitoring plan shall be carried out to record alien species populations in the project area of influence and aimed at removing new populations and preventing them from spreading throughout the AoI. In addition, prompt revegetation (i.e. sowing of native herbaceous species and/or planting native shrubs/trees) on bare soil with natural or semi-natural vegetation will reduce the spread of alien species.** **No planting of alien species shall occur in the camps or any areas within the AoI, including landscaping of re-vegetated areas.**	**Minor (L)**
Damage to Aquatic Ecosystem/ Loss of Habitat	**Water Quality**	**Marginal**	**Likely**	**Moderate (M)**	**Wastes and any other product containing hazardous chemical substances (i.e. fuel) will not be stored in the proximity of reservoir features. Their management will be done according to the Environmental and Social Management Plan (ESMP) that will consider among their objectives the avoidance of any spill affecting to the aquatic ecosystems.** **Excavated materials will not be dumped into aquatic features, nor will they be stored in their proximity, to avoid any increase of the turbidity levels.** **Maintain buffer shall be performed between construction and water boides if it is practical.** **As far as possible, care should be taken not to cause any effect in the aquatic environment during the spawning period of the fish.** **Vegetation clearance works will avoid affecting the riparian vegetation, whenever possible, since it provides areas for spawning and sheltering of many aquatic organisms.**	**Moderate (M)**
	Fish	**Marginal**	**Likely**	**Moderate (M)**		

Potential Impacts	Receptor	Severity	Probability	Significance of Impact (without Impact Mitigation Measures)	Mitigation and Management Measures	Significance of Residual Impact
Loss of Ecosystem Services	**Fishing, grazing, usage of recreation and tourism area, watering animals**	**Critical**	**Very Likely**	**High (H)**	**There will be no encroachment to land outside of the Project footprint, or defined laydown areas, site access road.** **Minimise permanent and temporary land take for civil works, clearaminince restricted to work sites.** **Prior to project equipment and machinery transportation, a traffic survey/study shall be done and Warning signs along the motorway, to advice drivers about the risk of run over fauna. The survey includes necessary oversize haulage permits, local and international regulations along the path to the project area.** **The Emergency Response Plan shall be developed and the plan shall be include based on the results of the risk assessment (and in conformance with statutory requirements), design of spill prevention/containment structures around sensitive equipment, installation of appropriate spill clean-up equipment and development of response procedures.** **Fauna crossing points should be installed along the project, if it is possible for project requirements. This will increase the permeability of the construction and will reduce the barrier effect.** **The LRP will be implemented in order to mitigate any impacts on the impacted farmers.**	**Moderate (M)**

8.5.2 Operational Phase

Loss of Habitat/Habitat Fragmentation and Damage of Habitats

There are no sensitive habitats on the Project sites and Aol (Area of Influence) that would be affected during operation. The habitats that may be affected by accidental pollution are of minor or moderate conservation value. Project effects can be stabilated with monitorings and migations measures.

Inadequate storage and handling of hazardous materials, and inappropriate design and storage of wastes could result with contamination of soils and groundwater which may also attract pest species and potential for disease. Pests may also be attracted to site by the accumulation of wastes (particularly domestic food wastes) if these are not stored and disposed of appropriately.

Accidental Loss of Fauna

Depending on the intake design, water drawn in by the intake system may contain a variety of organisms from the reservoir. Some organisms are small enough to pass through the mesh screens into the intake. This process, called entrainment, may affect plankton and fish eggs and larvae (ichthyoplankton). Because of the abundance and short regeneration times of plankton, impacts of entrainment on these organisms have rarely been documented outside the immediate vicinity of the plant and are considered to be of little consequence. Therefore, entrainment impacts to phytoplankton and zooplankton are considered to have a relatively small significance. Aquatic organisms that are drawn into the intake and are too large to pass through the debris screens may be impinged against the screens. Mortality of fish that are impinged is high because they are eventually suffocated by being held against the screen mesh or are abraded, which can result in fatal infection. Depending on the design and location, impingement can affect large numbers of fish and is considered a medium negative impact. Impingement occurs when the intake through-screen velocity is too high for species, such as fish, to swim away and results in them being retained against the screens.

Disturbance of Fauna

Uchkizil can potentially also attract them due to the water surface, food and as a recreation area. Nesting biotope is absent on the open banks of the Uchkizil, therefore, it is not expected to be nesting of water birds in the project area but the region is of particular importance for the wintering. These impacts are considered direct and permanent. The severity of the impacts is marginal and the probability is very likely.

All stages of the process usually require a lot of water. Most of the water is sent to cool the condensers of steam turbines. If a closed water circulation is not used, wastewater is discharged into reservoirs, which causes serious chemical pollution. This leads to the oppression of aquatic organisms, the entire flora and fauna of the reservoir. Thermal pollution of water bodies even with a slight increase in temperature in the reservoir, all chemical reactions are accelerated, and oxygen deficiency increases. Over time, the reservoir can become waterlogged. This has a significant impact on the fauna - its composition changes, and species that need running water disappear.

Changes in noise, air quality and water quality are possible. With the implementation of mitigation measures defined in the ESMP, the effects will be at a medium level.

Table 113: Impacts Significance of the Ecology during Operation Phase

Potential Impacts	Receptor	Severity	Probability	Potential Impact Significance(Pre Mitigation)	Mitigation and Management Measures	Residual Impacts (Post Mitigation)
Loss of Habitat/Habitat Fragmantation and Damage of Habitats	Flora	Negligible	Unlikely	Minor (L)	During routine maintenance any invasive flora species shall be removed. Landscaping on site shall be incorporate indigenous plant species to minimise irrigation requirements and the need for fertilisers/pesticides. Intentional replanting of vegetation will enhance the biodiversity of the site as well as improve the visual aesthetics of the site. Hazardous materials and chemicals shall be stored in designated areas in accordance with the national requirements and standards and good practices guidelines so as to prevent any spillage on the site. Use of persistent biocides shall be prohibited. In terms of surface run-off drainage, the Environmental Management Plan shall include: all surface run-off of the approaches, pollution prevention, water discharges etc. Periodic water and air quality, and noise level monitoring shall be performed.	Minor (L)
	Fauna	Negligible	Unlikely	Minor (L)		Minor (L)
	Avifauna	Negligible	Unlikely	Minor (L)		Minor (L)
	Terrestrial Habitat	Negligible	Likely	Minor (L)		Minor (L)
	Aquatic Habitat	Marginal	Likely	Minor (L)		Minor (L)
Disturbance of Fauna	Birds	Negligible	Likely	Minor (L)	Monitoring studies shall be conducted to determine the use of the area by bird species that use the area as accommodation and feeding areas and to evaluate the effects. Appropriate training should be provided to relevant personnel concerning noise, vibration and lighting control and management. Noise emission will be limited as much as possible: speed limit for vehicles, maintenance programs of machinery, avoidance of emission of noise during the night, etc. Wastes created during the operation activities will be managed under an Environmental and Social Management Plan (ESMP), to limit the disturbance to fauna as a result of presence of wastes and spills.	Minor (L)
	Reptiles and Mammals	Negligible	Likely	Minor (L)		Minor (L)
Accidental Loss of Fauna	Plankton	Marginal	Very likely	Moderate (M)	In cases where a large amount of water is required from the reservoir, the water will be withdrawn from the region with low fish populations. Especially during the spawning period, water intakes will not be made from the shore. The surface of the deeper middle parts of the reservoir can be evaluated.	Minor (L)
	Fish	Marginal	Likely	Moderate (M)		Moderate (M)

8.6 CUMULATIVE IMPACTS

The current main negative anthropogenic factors are grazing, cutting down psammophilic shrubs for firewood, spontaneous expansion of the earth roads network, fishing, oil production, using of the southern reservoir as public beach, recreational activities. Any anthropogenic intervention, especially major construction, alters the environment and subject ecosystems to change. It is possible to reduce the degradation and pressure on vertebrate populations caused by the construction of modern infrastructure with proper and long-term planning of activities.

The Project area is predominantly rural and agricultural and any other future developments in the Project's area of influence are unknown at this point. Summary of Cumulative Impacts of Ecological Environment is presented in Table 114.

Table 114: Cumulative Effects on Ecological Environment

Terrestrial Ecology		
Impact	**Construction Phase**	**Operation Phase**
Cumulative Impact on Flora and Fauna	**The Project site habitat is classified two habitat types according to IFC Requirements. one of them is "Modified Habitat" due to agricultural practices and activities and the other type is Natural Habitats. The Project site is limited in flora diversity and there is no protected species i. Therefore, the effect on the flora is negligible with the implementation of mitigation and management measures that mentioned Table 112 and Table 113.** **The detailed potential effects on fauna are explained in Section 8.5.1** **Due to the similarities of the IFC Project site and the Project site, the impacts are expected to be similar during the construction phase of the Project.**	**During the operational phase, cumulative effects are considered negligible as there is no negative activity to the flora in the adjacent area.** **There is a possibility of the spread of invasive/foreign species in the area due to anthropogenic impacts not related to the project. The movement of project tools has the potential to have an impact that will facilitate this diffusion. The effect on the flora is negligible with the implementation of mitigation and management measures that mentioned Table 112 and Table 113.** **The detailed potential effects on fauna are explained in Section 8.5.2** **Due to the similarities of the IFC Project site and the Project site, the impacts are expected to be similar but to minor during the construction phase of the Project.**

Terrestrial Ecology		
Impact	**Construction Phase**	**Operation Phase**
		The cumulative effect of projected temperature and water changes could be important with climate change effects.
Cumulative Impacts on Aquatic Ecosystem	**Changes in noise, air quality and water quality are possible. with the implementation of mitigation measures defined in the project related management plans, the effects will be at a moderate level.**	**Thermal pollution of water bodies. Even with a slight increase in temperature in the reservoir, all chemical reactions are accelerated, and oxygen deficiency increases. Over time, the reservoir can become waterlogged. This has a significant impact on the fauna - its composition changes, and species that need running water disappear.**

8.7 MONITORING

The program for monitoring the flora and fauna of terrestrial and aquatic ecosystems should be carried out along the perimeter of the entire reservoir and within a radius of several kilometers from the Project itself. It should cover all groups of terrestrial and aquatic organisms.

Table 115 shows the most suitable time of the year for the site surveys.

Table 115: Preliminary deadlines of research for each of the biodiversity groups in the project area.

	January (10-20)	March (15-25)	April (10-20)	May (10-20)	July (10-20)	September (5-15)	October (1-10)	Total:
Botany		+	+	+		+		**15 field days**
Herpetology			+	+	+	+		**15 field days**
Ornithology	+	+	+		+	+		**25 field days**
Theriology	+		+		+		+	**20 field days**
Ichthyology	+	+		+			+	**20 field days**
Hydrobiology		+	+	+	+			**20 field days**

The deadlines for research were chosen taking into account the specificity of the biology of organisms inherent in each of the research groups. The most optimal deadlines were chosen to catch the peaks of the activity of certain organisms in the project area.

Monitoring is carried out by species from the list of species approved by the State Committee for Ecology for Republican.

Also, for a more detailed analysis of the territory, it is required to conduct the following research in the future:

- Explore in more detail the adjacent areas of the Kattakuma Desert and the Zang Canal;
- To register the presence of rare species, the most acceptable way is to use camera traps installed for a long time, however, given the existing anthropogenic pressure on the territory, there is a risk that the camera will be stolen. Consider the option of short-term use, either installing cameras with SIM cards, or with an agreement with local residents for their safety;
- Collect survey data on the presence / absence of rare species from the local population and fishermen.

9. SOIL, GEOLOGY AND GROUNDWATER

9.1 STANDARDS AND REGULATORY REQUIREMENTS

9.1.1 National Standards

The relevant legislation related to soil and groundwater protection, quality of soil, groundwater and geology in Uzbekistan are given below:

- Land Code of the RUz, No. 598-I dated April 30, 1998 (as amended on December 23, 2020);
- Law "On Subsoil" No. 444-II dated December 13, 2002 (as amended on April 21, 2021);
- Law "On Water and Water Use", No. 837-XII dated May 06, 1993 (as amended on April 21, 2021);
- Resolution of the Cabinet of Ministers "On Approval of the Regulations on the Order of Establishment of Water Protection Zones and Sanitary Protection Zones of Water Bodies in the Territory of the RUz" No. 981 dated December 11, 2019;
- Decree of the Cabinet of Ministries of the RUz Regulation on Measures for Ground Water Management, Enhancement of Ground Water Protection against Pollution and Depletion, No.179 dated April 18, 1992.
- SanPiN No.0272-09 "Sanitary rules and norms for compiling hygienic justifications for soil protection schemes from pollution".
- SanPiN No.0191-05 "Maximum permissible concentrations (MPC) and Approximate allowable concentrations (AAC) of exogenous harmful substances in the soil".
- SanPiN No.0212-06 "Sanitary rules and norms for the hygienic assessment of soil contamination of different types of land use".
- SHNK 1.02.07-15. Engineering surveys for construction Basic provisions.
- SHNK 1.02.09-15. Engineering and geological surveys for construction. Set of rules.
- KMK 2.01.01-94. Climatic and physical-geological data for design.
- KMK 2.01.03-96. Construction in seismic areas. Change No. 1.
- SHNK 4.02.01-04. Collection of elementary estimate norms for construction work. Collection Earthwork. Additions and amendments to the technical part.
- KMK 2.03.11-96. Protection of building structures from corrosion.
- GOST 5180-2015. Soils. Laboratory methods for determination of physical characteristics
- GOST 12071-2000. Soils, selection, packaging, transportation and storage of Measurement.
- GOST 18164-72. Drinking water. Method for determination of total solids content
- GOST 4389-72. Drinking water. Methods for determination of sulfate content
- GOST 4245-72. Drinking water. Methods for determination of chloride content
- GOST 4151-72. Drinking water. Method for determination of total hardness
- GOST 31957-2012. Water. Methods for determination of alkalinity and mass concentration of carbonates and hydrocarbonates
- GOST 9602-2005. Unified system of protection against corrosion and aging. Under-ground structures. General requirements for corrosion protection.

- N.N. Goryainov, F.M. Lyakhovitsky. Seismic methods in engineering geology. Moscow, "Nedra": 1979.

"Land Code" aims to regulate land relations in order to ensure that present and future generations have science-based, sustainable use and conservation of land, breeding and improvement of soil fertility, conservation and improvement of the environment and creating conditions for equitable development of all forms of management, the protection of individuals and legal entities' right for land, as well as strengthening the rule of law in this area.

Law on "Subsoil" aims to regulate relations arising from the possession, use and disposal of subsoil (mountain relations).

"SanPiN No.0272-09" provides the basic requirements for development of hygienic justification for the soil protection schemes against pollution, duties and functions of state sanitary supervision bodies in this area.

"SanPiN No.0191-05" defines MPC and AAC values of chemicals and pesticides polluting the soil. MPCs and AACs are designed to ensure that there is no negative direct or indirect impact on human health, its future generations and public health through soil contact.

"SanPiN No.0212-06" provides a unified methodology for hygienic assessment of soil pollution using a nomenclature of indicators of soil hygienic condition, which should be used both in the development of regulatory and technical documentation on the hygiene of soils, and in assessing the degree of its pollution.

9.1.2 Lender Requirements

IFC, PS3, Resource Efficiency and Pollution Prevention state that "The client will avoid the release of pollutants or, when avoidance is not feasible, minimize and/or control the intensity and mass flow of their release. This applies to the release of pollutants to air, water, and land due to routine, non-routine, and accidental circumstances with the potential for local, regional, and transboundary impacts. Where historical pollution such as land or ground water contamination exists, the client will seek to determine whether it is responsible for mitigation measures. If it is determined that the client is legally responsible, then these liabilities will be resolved in accordance with national law, or where this is silent, with GIIP."

There are no detailed numerical requirements to soil quality established by IFC's guidance documents. Therefore, the Dutch Standards will be used to compared with national standards to identify maximum allowable concentrations for contaminants in soil, sediment and groundwater.

Table 116: Soil Quality Parameters with National Standards

Parameter	Unit	National Standard (SanPiN No.0191-05)	Dutch Intervention Values 2013 (Soil Remediation Circular Jul, 2013)
Antimony	**mg/kg**	**4.5**	**22**
Arsenic	**mg/kg**	**2.0**	**76**
Barium			**-**
Cadmium	**mg/kg**		**13**
Chromium	**mg/kg**	**6.0**	
Chromium VI	**mg/kg**		**78**
Cobalt	**mg/kg**	**5.0**	**190**
Copper	**mg/kg**	**3.0**	**190**
Mercury (organic)	**mg/kg**	**2.1**	**4**
Lead	**mg/kg**	**32.0**	**530**
Molybdenum	**mg/kg**	**10.0**	**190**
Nickel	**mg/kg**	**4.0**	**100**
Selenium	**mg/kg**		**100**
Zinc	**mg/kg**	**23.0**	**720**
Cyanides	**mg/kg**		**20 (free)** **50 (complex)**
Benzene	**mg/kg**	**0.3**	**1.1**
Ethylbenzene	**mg/kg**		**110**
Toluene	**mg/kg**	**0.3**	**32**
Xylenes (sum)	**mg/kg**		**17**
Styrene (vinylbenzene)	**mg/kg**	**0.1**	**86**
Phenol	**mg/kg**		**14**
Vanadium	**mg/kg**	**150.0**	**250**

Parameter	Unit	National Standard (SanPiN No.0191-05)	Dutch Intervention Values 2013 (Soil Remediation Circular Jul, 2013)
Nitrates	**mg/kg**	**130.0**	**-**
Sulphates (H_2SO_4)	**mg/kg**	**160.0**	**-**
Total Petroleum Hydrocarbons (Mineral Oil)	**mg/kg**		**5,000**
PAHs (total)	**mg/kg**		**40**
Ammonia Nitrogen	**mg/kg**		**1.5**

9.1.3 Other Requirements

- ASTM D 1586/ D1586M-18: Standard Test Method for Standard Penetration Test (SPT) and Split-Barrel Sampling of Soils

9.2 BASELINE DATA

9.2.1 Survey Methodology

Territory of Uzbekistan forms part of the Turan Platform. Its multiply folded basement, which includes sedimentary, metamorphic and igneous rocks, belongs to the Uralo-Mongolian Late Paleozoic orogenic belt. Major ancient continental blocks are the Kazakh and Karakum-Tajik microcontinents separated by the Turkestanian paleo-oceanic structure. The latter originated by rifting during Late Proterozoic and closed progressively from the Ordovician through the Early Triassic. The last collision of both microcontinents followed the formation of a large nappe pile intruded by granite in S of Uzbekistan and the formation of a volcanic-plutonic belt in the N. Mesozoic and Cenozoic terrestrial and shallow-marine platform sediment unconformably overlie the orogenic belt. A Late-Neogene-Quaternary secondary orogeny formed the present appearance of the territory.

The platform consists of weakly deformed sedimentary rocks of Jurassic to Recent age. The SE part of the Turan Platform underwent secondary orogenic process the same as in the Alpine fold beIt (Pamir). As a result of this secondary tectonic activity, a new orogenic belt – The Tien Shan Mountains – appeared. This special geological position of the country has two advantages from the angle of regional geology; on one hand, through new tectonic activity the basement of the platform was exposed, which made it possible to investigate its composition and structure, and on the other hand, the existing geological relations within the basement were not affected by renewed movements, as frequently is the case in the high mountain parts of Tien Shon. These phases of deformations leaded to development of the current geological and tectonic settings which several active faults cross the region and control the seismicity as well as geological settings of the study area. These active faults are present at the north and southeast of the study area.

9.2.2 Geomorphological Structure and Hydrographic Network

The study area is located in the Termez district of the Surkhandarya region, south of the Republic of Uzbekistan. This area is at the north of the Amudarya River and at the northeastern coast of Uchkizil lake. The main units covering the area are the Quaternary Upper Section (QIII), Quaternary Holocene (Qh), Upper Pliocene (N2 -2) and Upper Miocene-Pliocene (N1-2) formation. However, the QIII unite dominantly covers the majority of the area and the study area is within this unit (see Figure 67). This unit is a sequence of various Alluvial, fluvial deposits which the main lithological unit is sand.

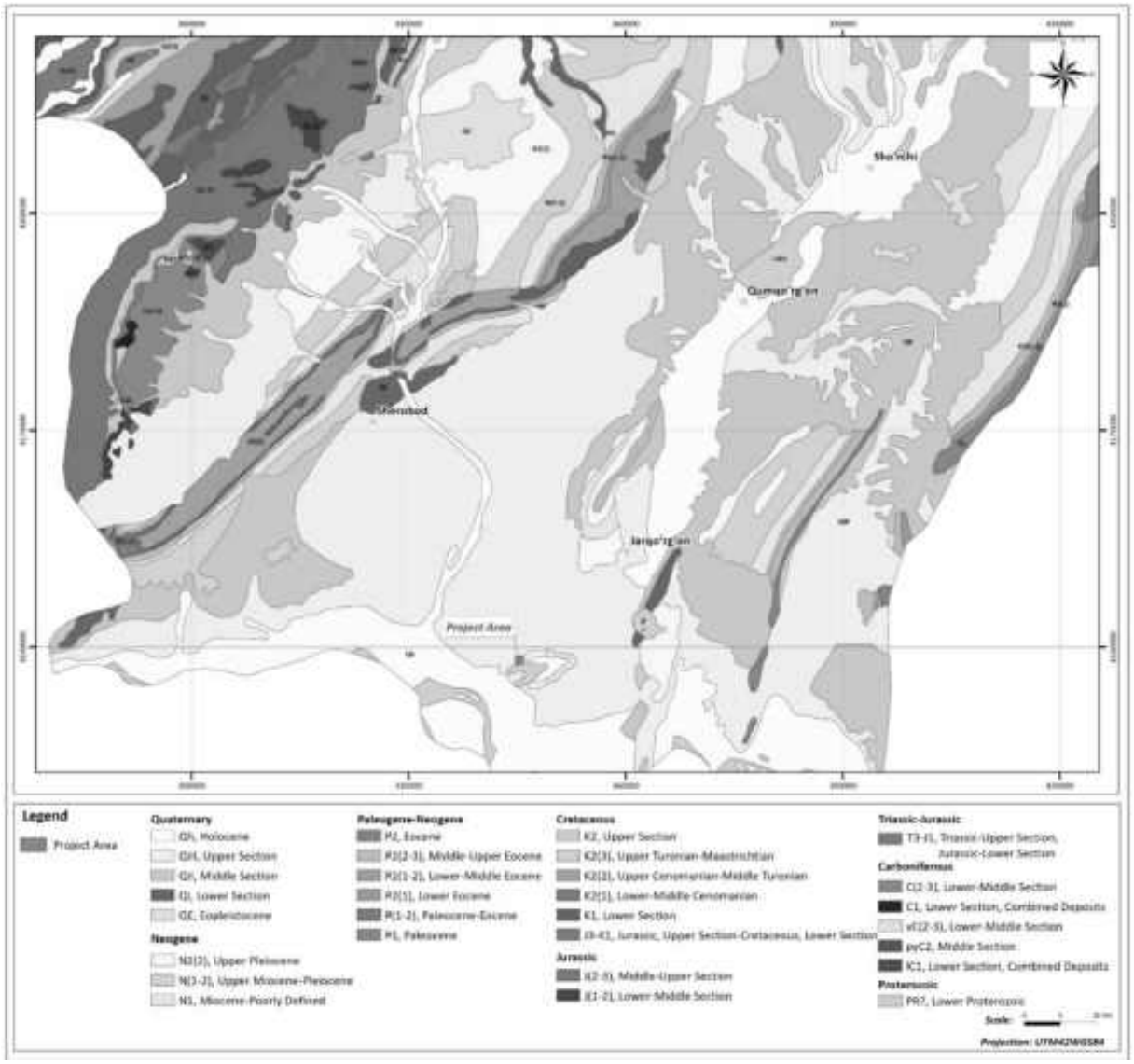


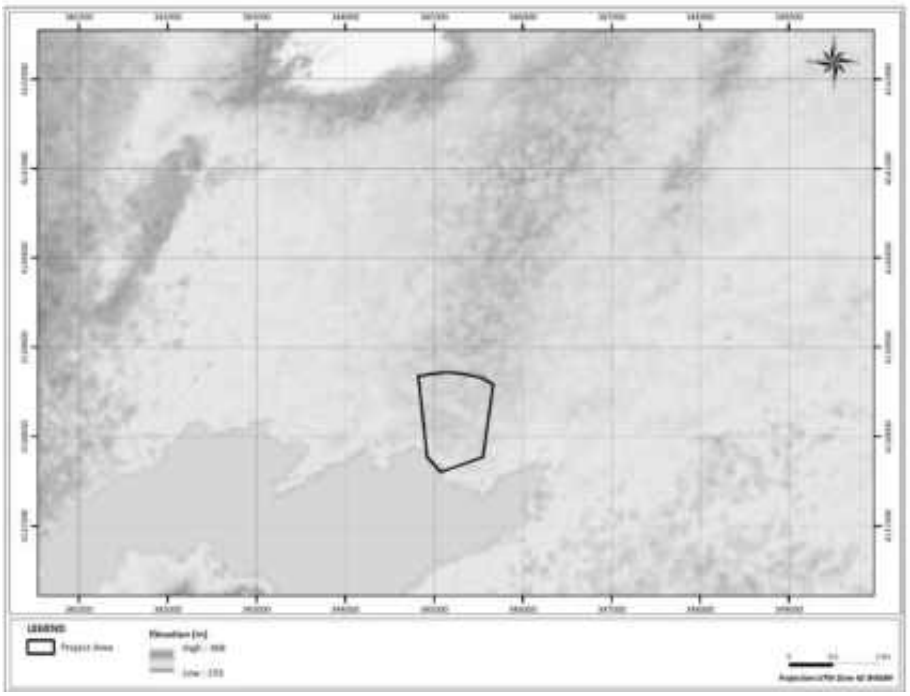
Figure 67: Geological map of the region

9.2.3 Local Geology

In the study area, the surface is covered with the Quaternary deposits and the top soil with vegetation is dominantly covering the most of the parts. However, from place to place, Aeolian sand dunes also can be observed (see Figure 67). Towards south, the study area is limited to the Uchkizil lake On the other hand, considering the morphology of the study area, no surficial feature is apparent and the area is almost flat with a very gentle undulation and very gentle slope towards south. This morphology changes at the coastal zone in which, the elevation drops more than 20 meters (see Figure 68).

In order to assess the subsurface geological structure of the study area and understanding the lateral and vertical variations of the lithological units, 4 boreholes within the study area were drilled. These boreholes are clustered at the center of the area as illustrated in Figure 69 and all have the maximum depth of 30 m. these boreholes were used to obtain the core Measurement as well as disturbed soil Measurement from the subsurface which, in one hand are used in determination of the geological units and on the other hand, are used in various laboratory tests.

The lithological units of all boreholes are almost similar with slight variation. The top soil is a common unit that is present in all boreholes and contains vegetation and has the thickness between 20 cm to 40 cm. below this unit there is a sand layer which in BH-7 is classified as Aeolian sand but this aeolian sand is not present in other boreholes. This sand layer has 1 m - 1.5 m of thickness. Further down, a relatively thick layer of granular Gypsum with thickness varying between 7-9 m underlain by a relatively thinner layer of sand (2.5 - 4 m of thickness). Below these layers, there is a relatively thin layer of clay (between 90 cm and 1.7 m of thickness) and the lower unit which is encountered in the drilling program is a thick sandstone layer with thickness of about 16 m - 17 m. In addition, dividing the lithological units into two major groups seems to be logical, the loose top layer of sand and sandy materials with thickness of about 14 m and hard sandstone layer with thickness of about 16 m.



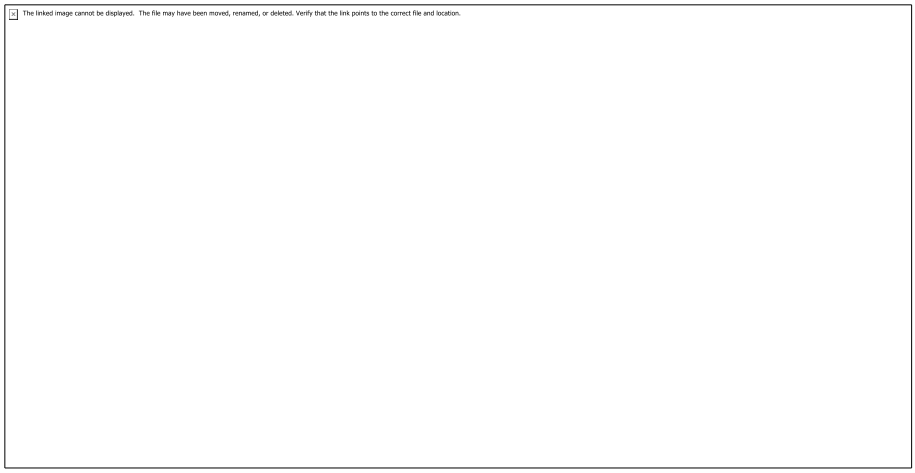


Figure 68: Topography of the region (top) and (bottom) a view from the Uchkizil lake

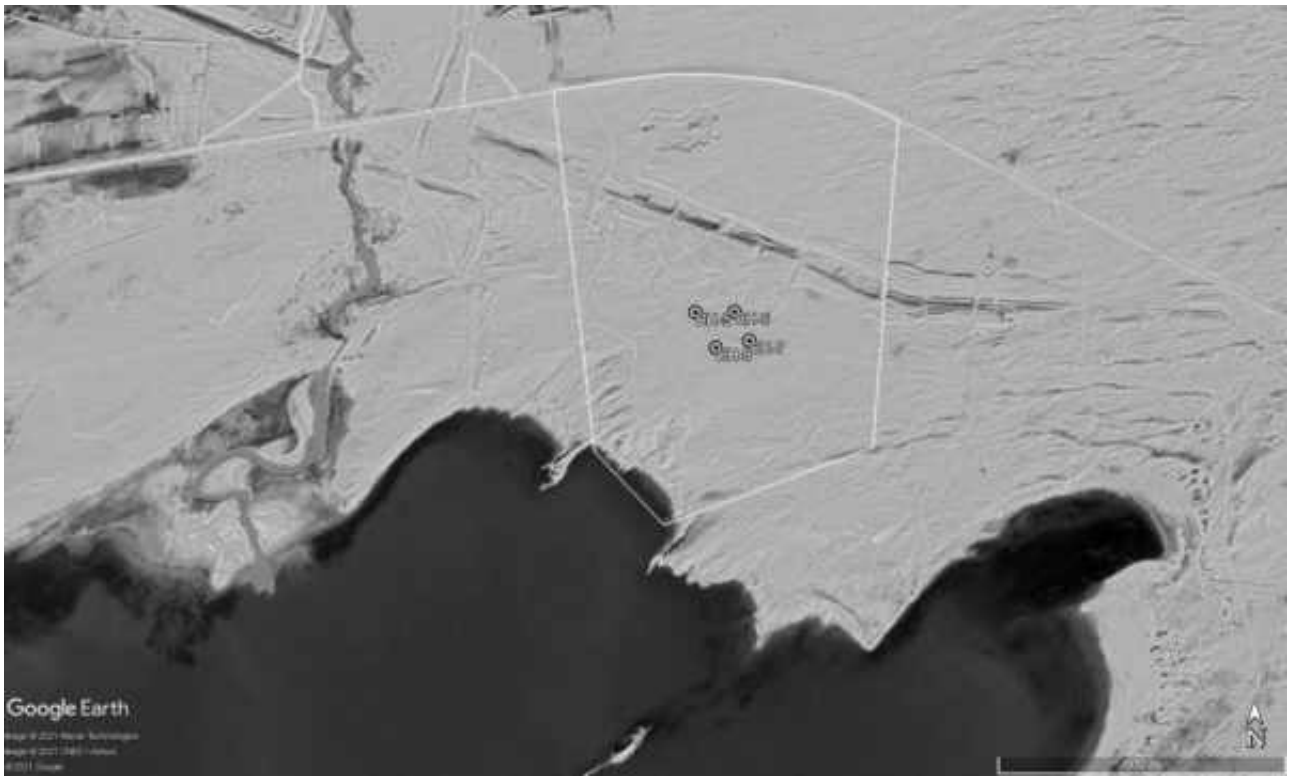


Figure 69: Location map of the boreholes. The yellow polygon represents the study area.

9.2.4 Geotechnical investigations

To assess the properties of the materials which are present in the area, several geotechnical tests were conducted. These tests include downhole seismic survey (Goryainov and. Lyakhovitsky 1979) in two boreholes which was yielded the one dimensional velocity structure of the area, and performing in-situ and laboratory test. The in-situ tests include the Standard Penetration Test (SPT) and various laboratory tests to determine the physical properties as well as the grain size of the soils which are present in the area.

It must be noted that the various engineering surveys which were carried out are in accordance with the requirements of KMK 2.01.01, KMK 2.01.03, SHNK 1.02.07, SHNK 1.02.09 and SHNK 4.02.01 standards. However, in some tests and data processing, ASTM standards also were benefited.

The results of the downhole seismic logging confirm the general classification of the lithological units into two layers. These results show two distinct layers with very different velocity structures. The top layer has primary wave velocity (Vp) between 480 m/s and 620 m/s with the average of 535 m/3 and shear wave velocity (Vs) between 250 m/s and 280 m/s with the average of 265 m/s. the second layer, on the other hand, has significantly higher velocities with Vp ranging between 2240 m/s and 2760 m/s with the average value of 2510 m/s and Vs values ranging between 850 m/s and 1120 m/s with the average value of 980 m/s.

In addition, the obtained Vs values were used to calculate the harmonic average of shear wave velocity for top 30 m (Vs30), the calculated Vs30 values for BH-6 and BH-8 are 550 m/s and 574 m/s respectively. In this regard the site will fall into class C (Dense soil and soft rock) according to NEHRP, National Earthquake Hazard Reduction Program

In total 41 SPT tests were carried out according to ASTM-D 1586 in 4 boreholes, at the depths varying from 1.5 m to 16.5 m. the result reveal that, at the depths of more than 11 m-12 m the SPT N values (more details can be seen in "the Project Surkhandarya, Interpretive Geotechnical Report") pass the value of 50 and it can be inferred that the materials which are present at this depth have high strength.

On the other hand, soil laboratory measurements were performed on the Measurement obtained from the different depths and units in each boreholes and the results show that the upper soil layers have the average particle density of 2.74 gr/cm^3, Average dry density of 1.59 gr/cm^3 and average bulk density of 1.97 gr/cm^3 whereas the lower sandstone layer has the particle density of 2.67 gr/cm^3, average dry and bulk densities of 2.33 gr/cm^3 and 2.38 gr/cm^3 respectively. All parameters were obtained in accordance to GOST 5180-2015.

The ground water level (GWL) also was measured in all boreholes and the results show that the GWL is below 12.7 m depth for all boreholes. Hence, it can be inferred that, the surficial soil layers which have lower SPT values and low elastic wave velocities, located above the GWL and are unsaturated.

Additionally, the water Measurement were taken to perform the chemical analysis on the collected Measurement according to GOST 12071-2014. A standard chemical analysis was performed on groundwater Measurement in accordance with GOST 18164-72; GOST 4389-72; GOST 4245-72; GOST 4151-72; GOST 31957-2012.

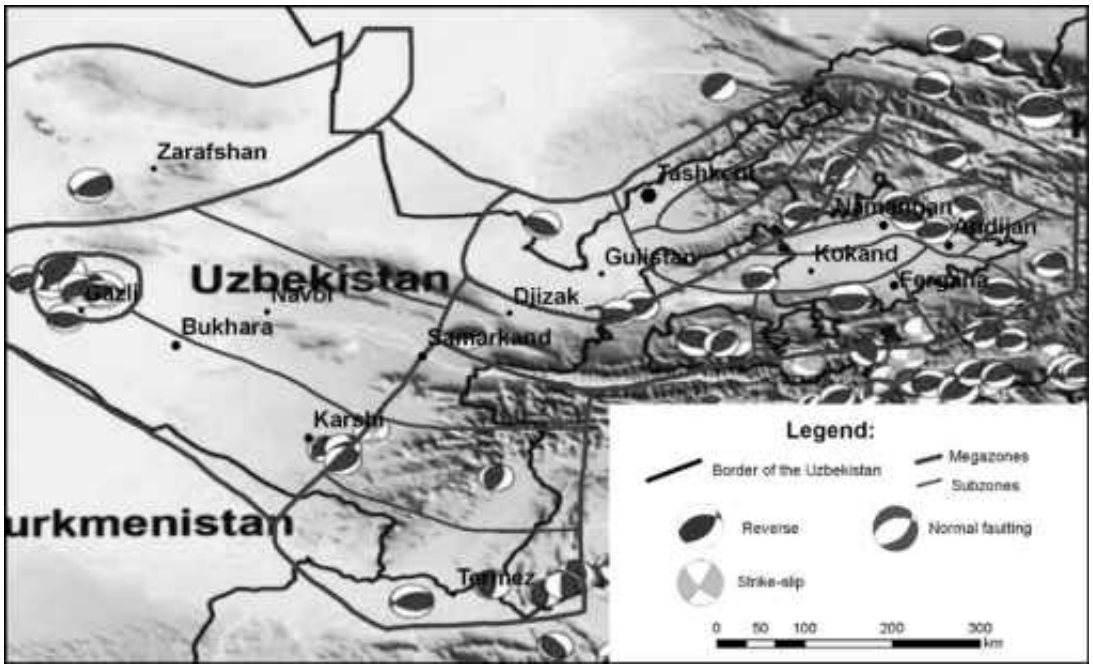
The content of SO4 ions "varies from 1670.0 to 2890.0 mg / l, with an average content of 2250 mg / l, Cl 'ions - varies from 730.0 mg / l to 4158.0 mg / l, with an average content of 1680 mg / l. Hence, with respect to GOST 9602, the water can be considered as corrosive and corrosion resistance cements must be used during the construction.in order to protect the construction from the negative effects of corrosion in accordance to KMK 2.03.11-96.

9.2.5 Hazardous phenomena

9.2.5.1 Earthquake Hazards

In Uzbekistan and surrounding regions, there have been several earthquakes with magnitude ML > 7 in historical and modern times (see Figure 70). Therefore, maintenance of seismic safety is vital. The seismicity of the study area is controlled by several active faults as presented in Figure 70. Additionally, the seismic activity maps. The solution maps reveal that the dominant faulting in the region is Reverse in the mega seismic zone of the southern Uzbekistan. The study area is roughly 50

km away from the closest active fault and therefor is prone to effects of the seismic activity. According to research undertaken by the Institute of Seismology under the Academy of Science of the Republic of Uzbekistan, the seismic hazard zone map of Uzbekistan is presented in Figure 71. According to the generated map, the study area is located in seismic zone of 7.



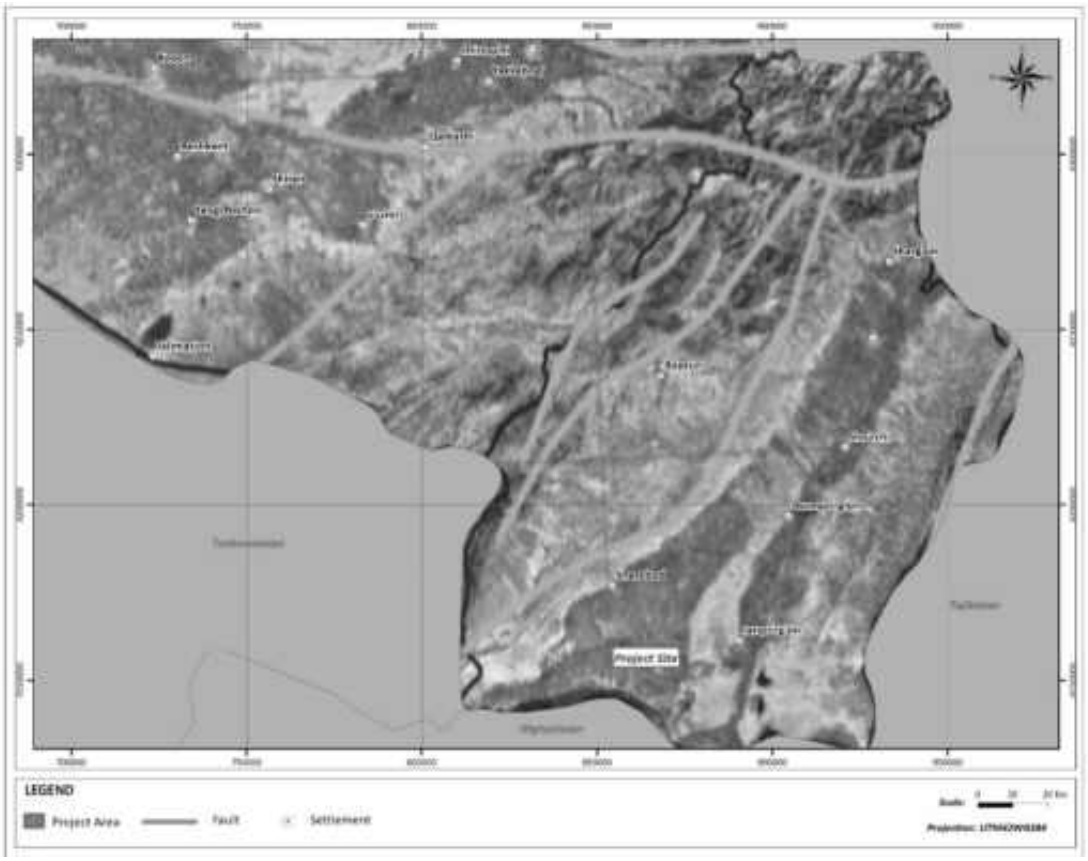


Figure 70: Focal mechanism solutions of Large earthquakes occurred from 1976 to 2013 (top) and Map of Active faults in the region (bottom)

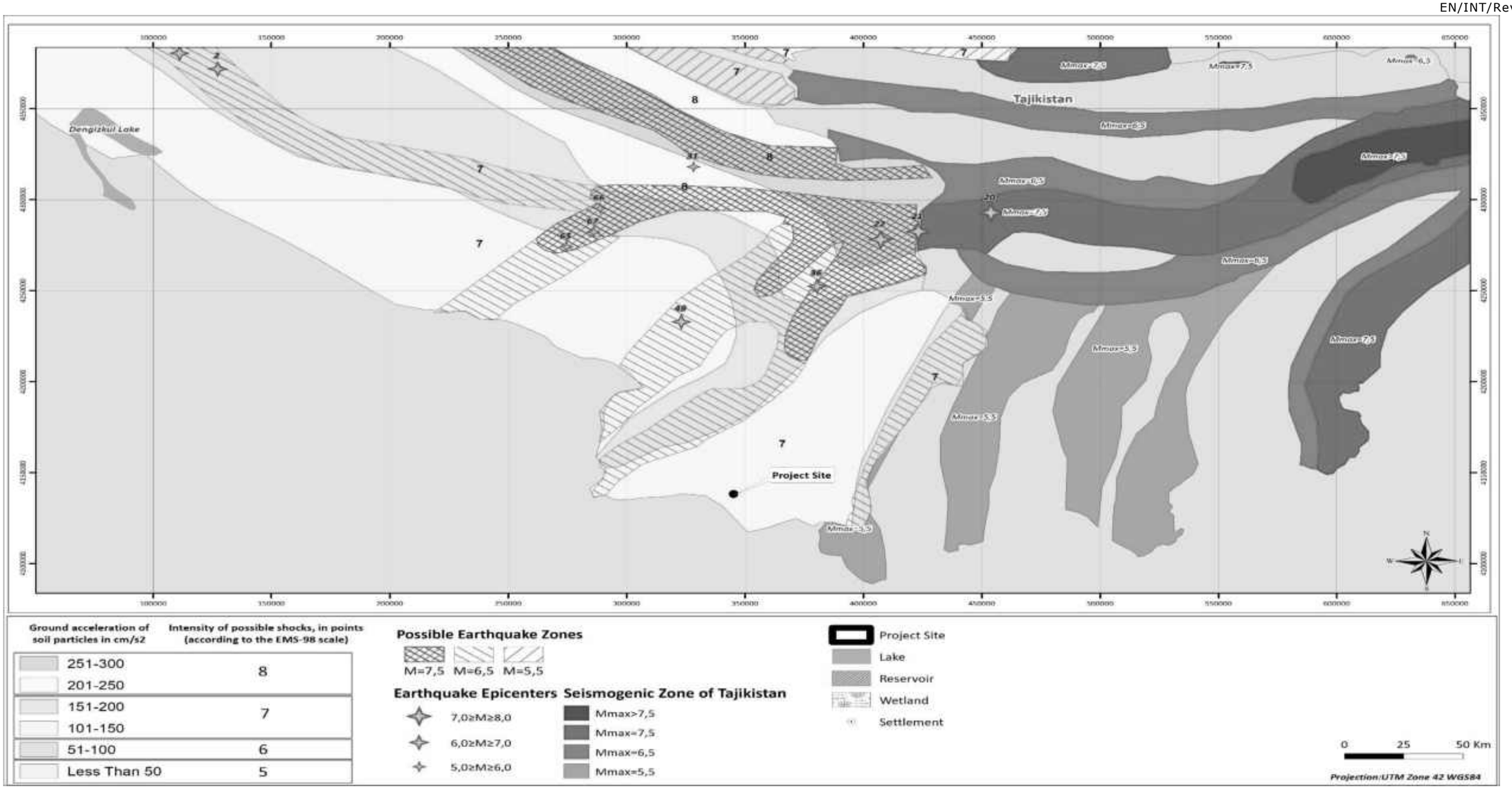


Figure 71: Seismicity Zone Map

On the other hand, while the dominant surficial material in the area is sand with the thickness of about 12 m, liquefaction can be another hazardous phenomena, however, while the surficial sand layer is above the water level, and lower sandstone has high strength the possibility of liquefaction is low. But, by changing in the current setting including the water level (which might change in different seasons) the possibility of the liquefaction must be assessed.

9.2.6 Sand Dune Migration and Aeolian sand treansportation

While the Aeolian sand is present in the study area and there are sand dunes in various locations of the area, the sand dune migration as well as the sand transportation can induce hazard on the future structures. Also considering that the wind is one of the major transportation factor in the area as discussed in details in "The Project Surkhandarya, Interpretive Geotechnical Report" and there are various dominant directions of wind blow as shown in the wind rose diagram (see Figure 72), the effects of Aeolian sand should be considered and minimized by using engineering solutions.

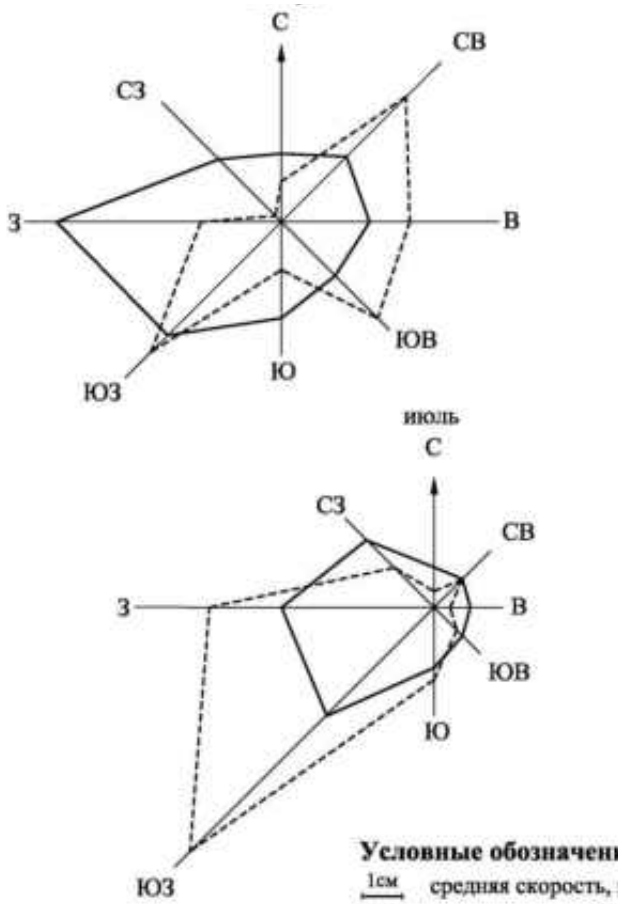


Figure 72: Wind rose diagram maps. The dominant wind directions are shown with dashed lines for cold season (top) and warm season (bottom)

9.2.7 Groundwater

Groundwater and interstratal waters in the foothills are formed due to atmospheric precipitation and the inflow of groundwater from the mountains, occur at a depth of 3-10 m in river valleys, and at a depth of 50 m in the mountainous part. In the mountains, in some places they pinch out in the form of springs.

In hydrogeological terms, the following aquifers are distinguished in the study area:

- Aquifer complex of Oligocene deposits: sandstones, interbedded with clays and siltstones;
- Aquifer complex of chalk deposits: interbedded strata of sandstones, clays, less often limestones, sands, conglomerates, siltstones;
- Aquifer complex of Jurassic deposits: sandstones, gypsum, siltstones, clays, limestones, conglomerates.[56].

9.2.7.1 Groundwater Quality Survey

Groundwater sampling activities was conducted in order to determine the baseline groundwater conditions in the Project area. Groundwater sample was taken from 1 point (UW-01) between July 9 and July 16, 2021 (see Table 117). Groundwater sampling stations are presented in Figure 73.

Table 117: Groundwater Quality Sampling Station Coordinates

Monitoring Station	Station Location	Coordinates (deg/min/sec)
UW-01	**SSG Kattakum, Yangi Hayot Street, 24**	**N = 37°22’50,30"** **E = 67°13’34,62"**

Figure 73: Locations of the Groundwater Quality Sampling Station (UW-01)

Sampling and analysis were conducted (see Figure 74) by an accredited laboratory which is Yuksak Musaffo Tabiat" LLC Company in accordance with the established state standards as specified by the corresponding regulatory, methodological and instructive documents.

Figure 74: Sampling of groundwater at observation station UW-01

Groundwater sampling was carried out in accordance with GOST 31861-2012 "Water. General requirements for sampling". The list of methods used to detect the substances in soil and bottom sediments is presented in Table 120. Assessment of the qualitative composition of groundwater was carried out in accordance with O'z DSt 950: 2011 "Drinking water. Hygiene requirements and quality control".

The results of groundwater quality studies are presented in Table 118. Accordingly;

- The pH is within the normal range at 8.13.
- Mineralization in groundwater samples that were analyzed as 1.69 g/dm^3.
- The concentrations of the following parameters exceed the MPC:
    - Chloride (1.37 times of MPC),
    - Cadmium (5.8 times of MPC).
    - Sulphates, aluminium, iron, manganese, copper, nickel, lead and zinc concentrations are below the MPC
- Suspended soild concentrations are analysed as 194 mg/dm^3,
- Nitrite nitrogen concentrations are analysed as 0.009 mg/dm^3
- COD concentrations are found as 26.4 mg/dm^{3,}
- BOD concentrations are found as 2.37 mg/dm^3.

Table 118: Groundwater Measurement Analysis Result

Parameters	Unit	Groundwater Sampling Result
pH		**8.13**
Suspended substances	**mg/dm³**	**194**
Ammonium nitrogen	**mg/dm³**	**<0.2**
Nitrite nitrogen	**mg/dm³**	**0.009**
Nitrate nitrogen	**mg/dm³**	**<0.09**
Chlorides	**mg/dm³**	**343.86**
Sulfates	**mg/dm³**	**338.8**
Phosphates	**mg/dm³**	**0.08**
Mineralization	**mg/dm³**	**1,694**
COD	**mg/dm³**	**26.4**
BOD_5	**mg/dm³**	**2.37**
Cyanides	**mg/dm³**	**<0.03**
Hydrogen sulfide	**mg/dm³**	**<1.0**
Aluminum	**mg/dm³**	**0.011**
Barium	**mg/dm³**	**<1.0**
Vanadium	**mg/dm³**	**<0.005**
Cadmium	**mg/dm³**	**0.0058**
Potassium	**mg/dm³**	**49.71**
Sodium	**mg/dm³**	**73.90**
Iron	**mg/dm³**	**0.101**
Manganese	**mg/dm³**	**0.0237**
Copper	**mg/dm³**	**0.00535**
Nickel	**mg/dm³**	**0.0115**
Mercury	**mg/dm³**	**<0.000005**
Lead	**mg/dm³**	**0.0186**
Chromium (+3)	**mg/dm³**	**0.000036**

Parameters	Unit	Groundwater Sampling Result
Chromium (+6)	**mg/dm³**	**<0.0005**
Zinc	**mg/dm³**	**0.00998**
	Over limit of MPC	

9.2.8 Soil

The soils of the Surkhandarya region are located in a continental climate, with intense solar radiation, aridity and at various absolute elevations from high mountains to foothills and sloping valleys. This creates conditions for the manifestation of a wide zoning. The following types of soils are identified in Sukhrandarya region:

- Belt of light brown soils (highlands).
- Belt of brown soils (medium-altitude mountains with a highly dissected relief).
- Belt of dark gray soils (foothills and low mountains).
- A belt of typical gray soils (low mountains and sloping piedmont plains).
- Belt of light gray soils (foothills and piedmont wide-wavy plain).
- Semi-fixed and non-fixed sands.

Analysis of the areal distribution of soil types shows that 47% of the area falls on typical gray soils - 1579.82 km². In second place are light gray soils - 849.8 km2 (25% of the area). The third and fourth places are occupied by dark gray soils (495.3 km², 15% of the area) and brown soils (424.2 km², 12% of the area).

At the Site there are typical sierozem soils of medium and light loamy, medium washed out, saline, in places crushed, overlying the proluvium and eluvium of tertiary saline rocks. Poor pastures, selectively rainfed crops are developed on these soils. Typical serozems are characterized mainly by medium and light loams, with well-built skeletal cartilaginous filler of bedrocks.

The formation of the soil cover of the Project area under consideration is largely influenced by climatic conditions, the original underlying sediments of a variegated composition and heterogeneous structure with interbedded sands, loams, and clays, which are characterized by semi desert factors of soil formation, with the influence of saline groundwater.

The soil cover on the high terraces is represented by light gray soils in combination with old-irrigated gray soils. Old-irrigated soils were formed with periodic participation of groundwater. In terms of texture, loamy soil varieties prevail, formed on loamy-pebble and loamy-sandy deposits. Salinization is observed in some places. The content of carbonates increased to 6-9%. In the case of drainage, which ensures a constant outflow of groundwater, salinization is not threatening.

The landscape of the Project area is characterized by an exposed bedrock surface.

To the north of the construction site, to the east and west, the soil layer is represented by dark gray soils, eroded, loamy and rubble loamy. The soils are formed on skeletal-fine earthy diluvium and eluvium, subject to water erosion, moderately washed away, the humus content is low (1-1.5%).

Like other intermontane valleys of Central Asia, the Surkhan-Sherabad valley, where the gas-steam power plant is planned to be located, is a densely populated ancient agricultural oasis. Most of the

valley is occupied by cultural landscapes (mainly agricultural and residential landscape). Areas of natural landscapes preserved in the central part of the valley on the Kattakum sandy massif and on the Houdaktau Upland are intensively used by the local population for grazing, including the project area.

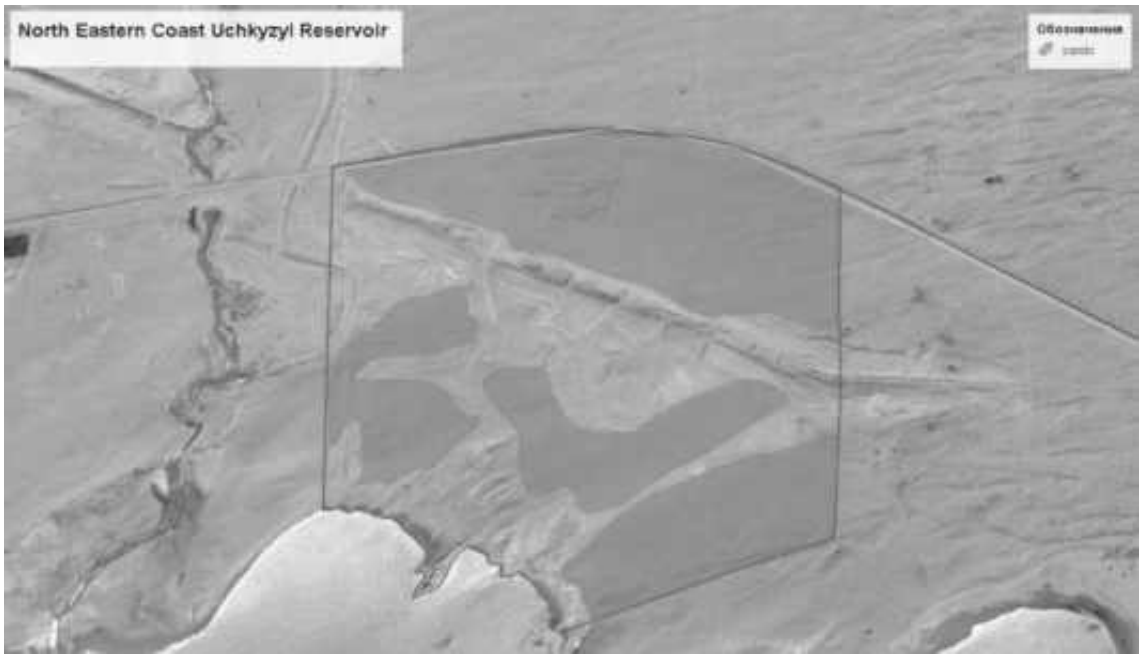


Figure 75:The project area, with an area of 103 hectares, occupies a section of the Kattakum sandy desert (55% of the territory), the rest of the territory is clayey and loamy

In general, there are degraded areas of anthropogenic origin in the project area. There are quarries for the extraction of clay for the production of bricks and the extraction of sand. All this led to a strong degradation of the substrate on the territory. At least 26.82 hectares (or 26% of the site) of the territory have traces of anthropogenic impact associated with damage to the soil cover.

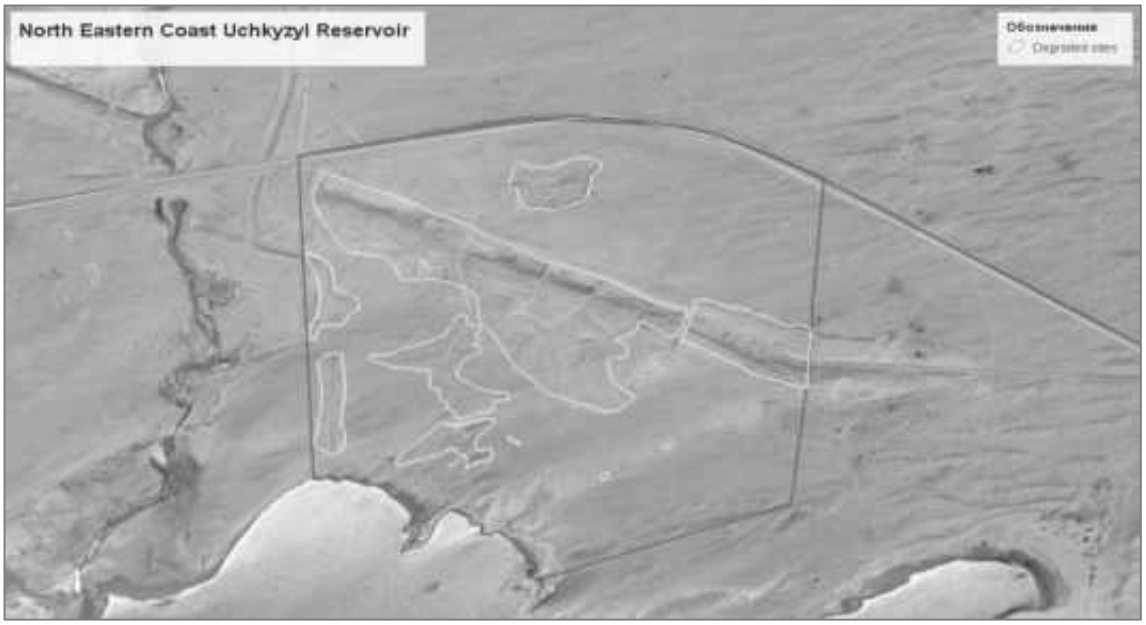


Figure 76:At least 26% of the territory has been degraded due to the extraction of clay for the production of bricks. These areas are highlighted by yellow polygons. The project area, occupies an area of the sandy Kattakum desert (55% of the territory), the rest of the territory is clayey and loamy

9.2.8.1 Soil Quality Survey

Soil sampling activities were conducted in order to determine the baseline soil quality conditions in the project area. Soil Measurement were taken at 3 local points (S-01, S-02, S-03) and the background observation point (S- 04) between July 9 and July 16, 2021 (see Table 119 and Figure 77.). Soil sampling stations are presented in Figure 77.

Soil samples are selected to represent the Project area and its surroundings. S-02 and S-03 stations are selected from agricultural areas; S-01 is selected within the Project area. S-04 is the natural soil.

Table 119: Soil Quality Sampling Station Coordinates

Number of Monitoring Station	Station Location	Coordinates(deg/min/s)
S-01	**700 meters south of the Angor-Hairaton road**	**N = 37°22’39,3"** **E = 67°15’02,4"**
S-02	**500 meters north of the Angor-Hairaton road**	**N = 37°23’20,6"** **E = 67°14’21,8"**
S-03	**600 meters from the 4P23 motor road**	**N = 37°21’05,3"** **E = 67°14’59,7"**
S-04 (background observation point)	**800 meters from the sanatorium of Uzbek Railways**	**N = 37°21’13,2"** **E = 67°12’40,2"**

Figure 77: Locations of the Soil Quality Sampling Stations

Sampling and analysis were conducted) by an accredited laboratory which is Yuksak Musaffo Tabiat" LLC Company in accordance with the established state standards as specified by the corresponding regulatory, methodological and instructive documents.

Soil sampling was carried out using a sampler or manually in accordance with GOST 17.2.3.01-83 "Nature protection. Soils. General requirements for sampling". The list of methods used to detect the substances in soil and bottom sediments is presented in Table 120.

Table 120: The list of methods used to detect the substances in soil and bottom sediments

The component being defined	The name of the measurement procedure (MVI)
pH	**GOST 26423-85 Soils Methods for determination of electrical conductivity, pH and dense residue of water extract**
Chlorides in water extract	**GOST 26425-85 Soil Methods for determination of chloride ion**
Sulfates in water extract	**GOST 26426-85 Soils Methods for determination of sulfate ion**
Calcium in water extract	**GOST 26428-85 Soils Methods for determination of calcium and magnesium in water extract**
Magnesium in water extract	**GOST 26428-85 Soils Methods for determination of calcium and magnesium in water extract**
Nitrates	**O ' z O ' U 0595: 2013 "Procedure for measuring the mass fraction of nitrates in soil by the photocolorimetric method"**

The component being defined	The name of the measurement procedure (MVI)
Petroleum products	**O ' z O ' U 0750: 2017 Methodology for measuring the mass fraction of petroleum products in soil and soil Measurement by the fluorimetric method on the fluid analyzer "Fluorat-02"**
Lead	**O ʹz O ʹU 0482: 2009 "Methodology for measuring the mass fraction of lead in water and soil by the atomic absorption method"**
Cadmium	**O ʹz O ʹU 0502: 2010 "Methodology for measuring the mass fraction of cadmium in water and soil by the atomic absorption method"**
Ferrum	**O ' z O ' U 0475: 2009 "Procedure for measuring the mass fraction of iron in soil by the atomic absorption method"**
Copper	**O ʹz O ʹU 0807: 2020 "Methodology for measuring the mass fraction of copper, lead, zinc and cadmium water-soluble, mobile and acid-soluble phori in soil Measurement by the atomic absorption method"**
Zinc	**O ʹz O ʹU 0807: 2020 "Methodology for measuring the mass fraction of copper, lead, zinc and cadmium water-soluble, mobile and acid-soluble phori in soil Measurement by the atomic absorption method"**
Chrome $^{3+}$	**O ʹz O ʹU 0510: 2010 "Methodology for measuring the mass fraction of chromium in soil by the atomic absorption method"**
Chrome $^{6+}$	**O ʹz O ʹU 07.0142: 2000 MVI of chromium mass fraction in soil Measurement by photocolorimetric method**
Nickel	**O ʹz O ʹU 290: 2006), "Procedure for measuring the mass fraction of copper, zinc, nickel, manganese in powder Measurement of rocks and soils by the atomic absorption method"**
Manganese	**O ʹz O ʹU 290: 2006), "Procedure for measuring the mass fraction of copper, zinc, nickel, manganese in powder Measurement of rocks and soils by the atomic absorption method"**
Mercury	**O ʹz O ʹU 0422: 2009 "Methodology for measuring the mass fraction of mercury in water and soil by the atomic absorption method"**
Selenium	**O ʹz O ʹU 0485: 2010 "Methodology for measuring the mass fraction of selenium in water and soil by the atomic absorption method"**

The component being defined	The name of the measurement procedure (MVI)
Arsenic	**O ʹz O ʹU 0521: 2011 "Methodology for measuring the mass fraction of arsenic in water and soil by the atomic absorption method"**
Sodium	**M-MVI-80-2008 "Methodology for measuring the mass fraction of elements in Measurement of soils, grounds and bottom sediments by atomic emission and atomic absorption spectrometry"**
Potassium	**M-MVI-80-2008 "Methodology for measuring the mass fraction of elements in Measurement of soils, grounds and bottom sediments by atomic emission and atomic absorption spectrometry"**

Measurement of the local site (S-01, S-02, S-03) were taken by the "envelope" method 20x20 m from 4 corner points from a depth of 0-0.3 m (humus horizon) and 0.3-0.8 m (soil), and were quartered and mixed in the field. Soil Measurement were taken in special bags for sampling (see Figure 78).

Figure 78: Soil sampling from the territory of the planned construction of the Project at the observation station

The results of soil quality studies are presented in Table 121. The state of the soil was assessed by such indicators as chlorides, sulfates, nitrates, potassium, sodium, oil products, and heavy metal (lead, cadmium, copper, zinc, trivalent chromium and hexavalent chromium, nickel, cobalt, mercury, selenium and arsenic) concentrations.

Table 121: Soil Samples Analysis Result

	Parameters	Unit	Soil Sampling Result			
			S - 04 (Background)	S - 01	S - 02	S - 03
Chemical Analysis	pH		7.8	7.45	7.52	7.45
	Chlorides	%	0.0029	0.0042	0.006	0.006
	Sulfates	%	0.168	0.024	0.021	0.02
	Calcium	%	0.01	0.018	0.025	0.014
	Magnesium	%	0.008	0.015	0.017	0.012
	Sodium	mg/kg	46.5	53.1	69	55
	Nitrates	mg/kg	12	15.2	14	22.5
	Humus	mg/kg	0.72	0.57	0.62	0.68
	Petroleum products	mg/kg	0.082	0.09	0.06	0.138
Heavy Metals	Arsenic	mg/kg	0.107	n/d	0.515	0.981
	Lead	mg/kg	9.748	41.724	5.64	6.050
	Cadmium	mg/kg	2.028	1.172	1.076	1.260
	Iron	mg/kg	10.332	11.811	10.185	12.092
	Copper	mg/kg	10.074	11.056	7.938	8.942
	Zinc	mg/kg	52.720	37.100	36.600	35.000
	Chrome (3+)	mg/kg	6.644	9.532	6.640	6.990
	Chrome (6+)	mg/kg	0.98	1.35	1.04	1.25
	Nickel	mg/kg	19.028	16.512	13.454	13.460
	Cobalt	mg/kg	6.040	4.644	3.804	4.204
	Aluminum	mg/kg	3.37	3.21	2.94	2.56
	Mercury	mg/kg	n/d	0.00137	n/d	n/d
	Selenium	mg/kg	0.129	0.155	0.271	0.179

The assessment of soil contamination was carried out by comparing the concentrations of pollutants from the analysis of the monitored area with the corresponding soil indicators of the background site. The initial (S- 04 background) state of soils was determined on undisturbed lands.

In accordance with the analysis result;

- Soil samples are slightly alkaline, pH from 7.45 to 7.80 and contains humus in the range 0.57-0.72%.
- The concentrations of the following parameters exceed the MPC:
  - Sulfates (1.3 – 1.5 times of MPC),
  - Lead at S-01 (1.3 times of MPC)
- S-04 is considered as representative for background concentration because S-04 sampling area is undisturbed natural area. In accordance with following parameters are observed at S-01, S-02 and S-03 stations higher than analysis result of S-04 station (background concentration);
  - Chlorides (1.5-2.5 times higher than background),
  - Calcium and magnesium (1.2-1.8 times higher than background),
  - Petroleum products at S-03 (1.7 times higher than background),
  - Chromium (3+) at S-02 (1.4 times higher than background),
  - Chromium (6+) at S-02 (1.4 times higher than background) and at S-03 (1.3 times higher than background),
  - Selenium (1.2-2.1 times higher than background)
  - The content of heavy metals cadmium, copper, zinc, nickel, cobalt does not exceed background values.
- Mercury is present only in sample S-01 in the amount of 0.00137 mg/kg, which is below the MPC (2.1 mg/kg),

Arsenic is present in samples S-02, S-03 and S-04 (background) in amounts below the MPC and is absent in sample S-01,

9.2.8.2 Sediment Quality Survey

In addition to soil quality survey, sediment sampling activities were conducted in order to determine the baseline sediment quality conditions of the Uchkizil lake and the river to the west of the project area. Sediment Measurement were taken at 2 local points (SD-01 and SD-02,) between July 9 and July 16, 2021 (see Table 122). Sediment sampling stations are presented in Figure 79.

Table 122: Sediment Quality Sampling Station Coordinates

Number of Monitoring Station	Station Location	Coordinates (deg/min/s)
BS-01	**Uchkizil Reservoir**	**N = 37°22’26,7"** **E = 67°14’48,2"**
BS-02	**Zang Canal**	**N = 37°22’40,2"** **E = 67°14’32,0"**

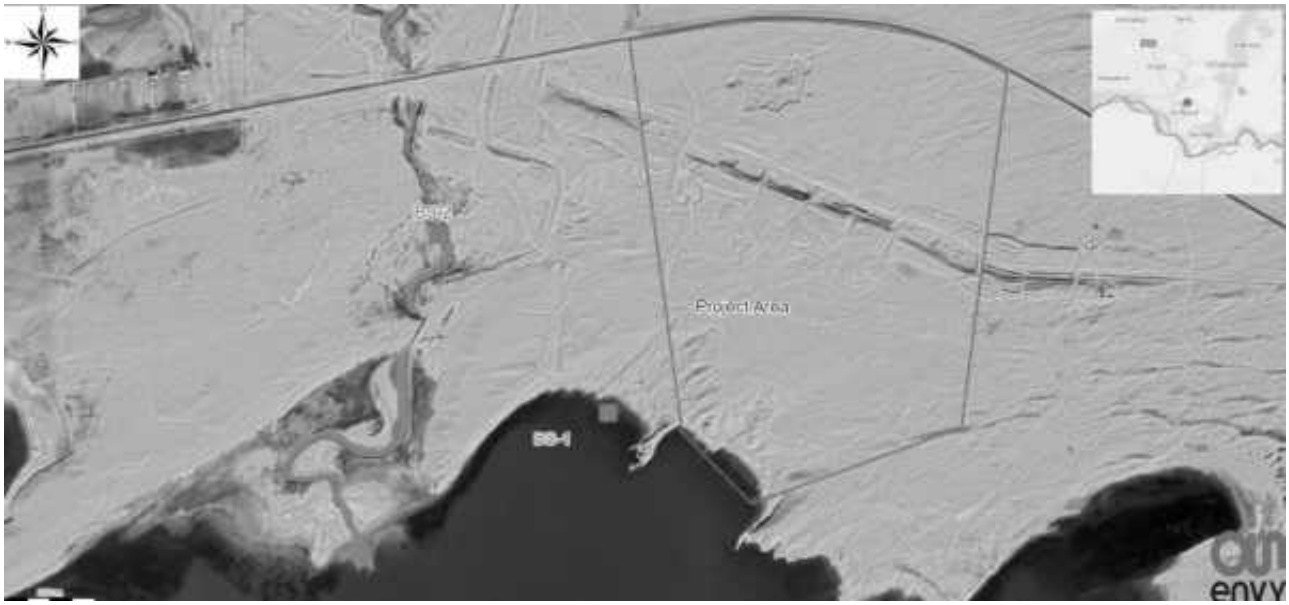


Figure 79: Locations of the Sediment Quality Sampling Stations

Sampling of bottom sediments was carried out in accordance with GOST 17.1.5.01-80 "Nature protection. Hydrosphere. General Requirements for Sampling of Bottom Sediments of Water Bodies for Analysis for Contamination". The list of methods used to detect the substances in soil and bottom sediments is presented in Table 120.

Figure 80: Sampling of bottom sediments

Bottom sediments were collected for determination of baseline pollution from the surface layer

The state of bottom sediments of the Uchkizil lake was assessed by such ingredients as pH, humus, chlorides, sulfates, nitrates, calcium, magnesium, potassium, sodium, heavy metals (lead, cadmium, iron, copper, zinc, manganese, trivalent chromium, nickel, mercury, arsenic). The results of bottom sediment studies are presented in Table 123.

Bottom sediments have a slightly alkaline reaction, pH from 7.95 to 8.58 and contain humus in an amount of 0.53-0.74%. The results of chemical analyzes showed that the content of sulfates is 1.2-1.3 times higher than the MPC. The content of heavy metals of lead, manganese, mercury and arsenic does not exceed the MPC standards

Table 123: Bottom Sediment Measurement Analysis Result

	Parameters	Unit	Bottom Sediment Sampling Result	
			BS - 01	BS - 02
Chemical Analysis	pH		7.95	8.58
	Humus	%	0.53	0.74
	Chlorides	%	0.0042	0.0049
	Sulfates	%	0.019	0.021
	Calcium	%	0.01	0.011
	Magnesium	%	0.0072	0.0084
	Sodium	mg/kg	244.625	79.375
	Potassium	mg/kg	55.250	26.615
	Nitrates	mg/kg	7.5	10.8
Heavy Metals	Lead	mg/kg	17.708	7.278
	Cadmium	mg/kg	1.178	1.810
	Iron	mg/kg	14.674	14.315
	Copper	mg/kg	16.39	16.870
	Zinc	mg/kg	60,120	47,840
	Chrome (3+)	mg/kg	538.040	433.400
	Nickel	mg/kg	7.568	14.221
	Mercury	mg/kg	23.604	25.252
	Arsenic	mg/kg	0.0193	0.00337

9.3 POTENTIAL IMPACTS, MITIGATION, MANAGEMENT & RESIDUAL IMPACT

The most significant impact on soil, sediment and groundwater will be caused during the construction phase of the Project; therefore, the construction works will be planned to minimize the adverse impacts to the possible extent. Moreover, the construction technique is also significant in reducing the time taken to construct the Project and consequently, the environmental disturbance.

Environmentally, the major activity that should be considered regarding the construction activities is the excavation. Following commencement of the construction activities, a detailed excavation plan must be developed that provides excavation and backfill for the entire site. The plan should include requirements for equipment methods, soil stabilization, dewatering, rock removal, if any, and backfill. It should also include the economic disposal of spoil materials.

The materials arising from excavation will be used for backfilling, road construction, land levelling and elevation adjustment to the extent possible.

For the purpose of final storage of surplus excavation materials stemming from excavation works, which cannot be used within the scope of the project, a surplus material storage area will be selected. For storage of the surplus excavation material, storage will be made in a stepwise manner to prevent landslide and pouring of materials. Bevel angles of steps will be arranged in an inclined manner to assure the stability of materials to the extent possible. Surplus material will be stored according to the structure of the material and mitigated against wind and rain erosion.

Due to rainfall in the region, the potential for soil erosion at the worksites will largely be confined to episodic intense rainfall events resulting in surface water run-off. In this respect, necessary precautionary actions will be taken such as rainwater collection channels and pools.

On-site refueling of the heavy-duty earthmovers will be carried out with mobile tankers, and in case of potential fuel leaks, leakages, fuel spills and spillages during refueling, refueling vehicles will be fitted with adsorbent materials compatible with characteristics of the fuel, and during refueling, soil surface over the connection points will be covered with a leak-proof cover to prevent contamination.

Site contamination will be prevented with appropriately designed storage options and adoption of strict fueling and spill control procedures, as well as appropriate spill response measures. Floors of hazardous material storage areas will be leak-proof and equipped with a drainage system. Moreover, appropriate storm water management procedures will be applied to ensure that contaminants are not mobilized into the wider environment. Domestic and industrial wastewater during the site preparation & construction phases will be treated in accordance with the standards specified in the Uzbekistan legislation.

There is a risk of contamination groundwater where fuel or lubricant spillage occurs. Therefore, adsorbent materials with adequate amount and characteristics will be made available for oil leakage that may be caused by earthmovers and vehicles during excavation, filling, transportation operations carried out in the field so that any possible contamination of the soil.

The adoption of good on-site working and storage practices and the implementation of suitable control measures, on-site training, and the emergency preparedness will ensure that the potential contamination is avoided.

9.3.1 Construction Phase

In the process of organizing production, the impact on soils is due to the processes of removal, movement, compaction of soils during the construction of foundations and installation of equipment. In the process of soil compaction, their physical and mechanical properties will change. The nature of the impact is local, irreversible. The impact is weak.

Soil contamination during construction work is possible with the spill of oil products used as fuel for mobile vehicles and construction equipment. However, the pollution will be minor and localized. Due to poor solubility, oil products will have a low migration capacity and will not pose a hazard to groundwater. The likelihood of a fire occurring due to fuel spills is also low. In general, during the construction period, soils and groundwater contaminated with oil products will have a minor risk to the environment and personnel safety.

The presence and use of such dangerous and hazardous chemicals increase the probability of accidental spills or releases of minor quantities of these materials into the receiving hydrological environments. Further, site preparation activities and associated construction of infrastructure can result in increased sediment loads in reservoir.

In order to further minimize the impact on the environment of soils contaminated with oil products, it is recommended to collect contaminated soil layers in a specially provided container with subsequent disposal.

The potential impacts on the soil, bedrock and groundwater during the site preparation and construction phases and measures to be applied are presented in Table 124. As seen from the table, the impacts of the activities on soil, bedrock and groundwater will vary between minor and moderate assuming that good soil and hazardous waste management are applied on site.

Table 124: Impacts Significance of the Soil, Sediment and Groundwater and Mitigation Measures during Construction Phase

Potential Impacts	Receptor	Severity	Probability	Significance of Impact (without Impact Mitigation Measures)	Mitigation and Management Measures	Significance of Residual Impact
Temporary disturbance on soil, and ground water from excavation works	**Soil Quality, Groundwater Quality in neighboring farms**	**Negligible**	**Certain**	**Moderate (M)**	**The impact of existing access routes across the site from and to the different communities and farms will be assessed and an alternative route provided before the commencement of construction activities.** **The alternative routes provided by the company will be marked in local languages and easy-to-read signs to prevent local communities from wandering into construction areas.** **Project activities will be only done in the project area, not beyond the border to avoid any increase in the footprint of the project.**	**Minor (L)**
Risks of contamination on soil, and ground water	**Soil Quality, Groundwater Quality in neighboring farms**	**Marginal**	**Unlikely**	**Moderate (M)**	**Any leaks/damage to the soil and groundwater will be prevented through appropriately designed storage options.** **Strict fueling and spill control procedures will develop as well as emergency clean-up procedures.** **The quantities of hazardous substances will limit at site to reduce the risk of spillage.** **Areas where spillage of soil contaminants occurs will be excavated (to the depth of contamination) and suitably rehabilitated. If any other minor spillage occurs, the spillage will be cleaned immediately and the contaminated area will be rehabilitated. All contaminated material will be suitably disposed of.**	**Minor (L)**
Accidents	**Soil Quality, Groundwater Quality in Neighboring farms**	**Marginal**	**Unlikely**	**Moderate (M)**	**The Contractor will develop a "Training Plan" for the personnel on fueling and spill control procedures as in line with the Environmental & Social Management System.** **The contaminated soil and treat as hazardous waste will remove, promptly.**	**Minor (L)**

9.3.2 Operational Phase

The key contamination regarding the soil, bedrock, and groundwater is associated with the potential leakage and spills during the plant operations and the storage of hazardous materials in the plant.

Site contamination will be prevented with appropriately designed storage options and the adoption of strict spill control procedures, as well as appropriate spill response measures. Floors of hazardous material storage areas will be leak-proof and equipped with a drainage system. Moreover, appropriate stormwater management procedures will be applied to ensure that contaminants are not mobilized into the wider environment. Domestic and industrial wastewater during the site preparation & construction phases will be treated in accordance with the standards specified in the Uzbekistan legislation.

The areas, where the maintenance-repairs of vehicles will be made and all the areas that have the risk to pollute groundwater and soil due to any spillage and scattering from tanks of chemicals, grease, etc. will be covered with an impermeable floor. Therefore, adsorbent materials with adequate amounts and characteristics will be made available for oil leakage.

The adoption of good on-site working and storage practices and the implementation of suitable control measures, on-site training, and emergency preparedness will ensure that the potential contamination is avoided.

The potential impacts on the soil, sediment and groundwater during the operation phase and measures to be applied are presented in Table 125. As seen from the table, the impacts of the activities on soil, bedrock and groundwater will be minor assuming that good hazardous waste and chemical management are applied at the plant.

Table 125: Impacts Significance of the Soil, Sediment and Groundwater and Mitigation Measures during Operation Phase

Potential Impacts	Receptor	Severity	Probability	Significance of Impact (without Impact Mitigation Measures)	Mitigation and Management Measures	Significance of Residual Impact
Risks of contamination on soil, and ground water	**Soil Quality, Groundwater Quality in neighboring farms**	**Marginal**	**Unlikely**	**Moderate (M)**	**Any leaks/damage to the soil and groundwater will be prevented through appropriately designed storage options.** **Strict fueling and spill control procedures will develop as well as emergency clean-up procedures.** **The quantities of hazardous substances will limit at site to reduce the risk of spillage**	**Minor (L)**
Accidents	**Soil Quality, Groundwater Quality in neighboring farms**	**Marginal**	**Unlikely**	**Moderate (M)**	**The Contractor will develop a "Training Plan" for the personnel on fueling and spill control procedures as in line with the Environmental & Social Management System.** **The contaminated soil and treat as hazardous waste will remove, promptly.**	**Minor (L)**

9.4 CUMULATIVE IMPACTS

All potential impacts on soil, sediment and groundwater during the construction and operation phase are presented in Section 9.3. The summary of cumulative impacts on soil, sediment and groundwater is presented in Table 126.

Table 126: Cumulative Impacts on Soil, Sediment and Groundwater

Environmental and Social Aspects	Construction Phase	Operation Phase
Cumulative Impacts	**There are no known development projects in the vicinity of the Project Area.** **If any simultaneous activity is planned in the region, there will be very limited expected cumulative effects since impacts will be localized and limited within each Project areas.** **Also, in the event of a major leak/spill could the groundwater is highly likely to became contaminated.**	**There are currently no plans for any project activity in the vicinity of Site.** **However, should this change in the future, it could pose potential contamination risks to soil, groundwater and also the sediment of the Zang Canal and Uchkizil Lake due to effluents.**

9.5 MONITORING

The monitoring requirements for soil, sediment and groundwater for the construction, commissioning and operation phases of the Project are presented in brief in Table 127.

Table 127: Summary of Soil, Sediment, Groundwater Monitoring

Monitoring Activity	Parameters	Duration	Location
Construction Phase			
Soil and Sediment Quality	**Baseline section of the this ESIA, contains the analysis parameters (chemical and heavy metals) of the soil and sediment.**	**Annually**	**Monitoring should be conducted at predetermined sampling site.**
Contaminated Land	**Any soils around the sites that appear to be contaminated by leaked oil, hydrocarbons and other potentially hazardous or chemical pollution sources**	**Daily Visual Check**	**All the project area and access road to Project area.**
Groundwater Quality	**Baseline section of the this ESIA, contains the analysis parameters of the groundwater (chemical and heavy metals).**	**Quarterly**	**Monitoring should be conducted on location where baseline studies have been carried out. If necessary, new location will be selected.**
Commissioning & Operation			
Soil and Sediment Quality	**Any soils around the sites that appear to be contaminated by leaked oil, hydrocarbons and other potentially hazardous or chemical pollution sources.**	**Daily Visual Check**	**All the project area and access road to Project area.**
	Baseline section of the this ESIA, contains the analysis parameters (chemical and heavy metals) of the soil and sediment.	**Annually**	**Monitoring should be conducted at predetermined sampling site.**
Groundwater Quality	**Baseline section of the this ESIA, contains the analysis parameters of the groundwater.**	**Quarterly**	**Monitoring should be conducted on location where baseline studies have been carried out. If necessary, new location will be selected.**

10. SOLID WASTE & WASTEWATER MANAGEMENT

10.1 STANDARDS AND REGULATORY REQUIREMENTS

10.1.1 National Requirements

The project will comply with the Law on Waste No.362-II (dated, 5 April 2002 and modified 4 January 2011) that regulates solid waste treatment procedures and defines the authority of various institutions involved in solid waste management. The law also provides rules for the transport of solid waste. Regulation Document on Order of endorsement and approval of projects of wastes disposal and limits for its disposal (RH 84.3.22:2006) shall also apply.

The project will comply with the provisions approved by the SCEEP, the Ministry of Health No. 2438 dated 20 March 2013, for hazardous waste specifically for placement of hazardous chemicals and hazardous materials in special landfills, their protection, transport and disposal.

Hazardous wastes that are transported must undergo environmental certification and be transported by special vehicles for disposal. The SCEEP and the Ministry of Health also provide approvals i.e., 'proper performance of work" for hazardous materials generated. The transportation and disposal of hazardous waste is under the purview of the State organization "Qishloqxujalikkimyo" (Agricultural Chemicals). Transportation of such materials should be carried out in accordance with the Resolution of the Cabinet of Ministers of the Republic of Uzbekistan No. 35 (dated February 16, 2011) "On rules of transportation of hazardous materials in the territory of Uzbekistan".

10.1.2 Lenders Requirements

Basel Convention on The Control of Transboundary Movements of Hazardous Wastes and Their Disposal

SOLID WASTE

IFC

IFC EHS Guidelines covers Hazardous Materials Management. The waste management guidelines state that facilities that generate and store wastes should practice the following:

- Establish waste management priorities at the outset of activities;
- Identify EHS risks and impacts and consider waste generation and its
- consequences;
- Establish a waste management hierarchy that considers prevention, reduction,
- reuse, recovery, recycling, removal and finally disposal of wastes;
- Avoid or minimize the generation of waste materials, as far as practicable;
- Identify where waste generation cannot be avoided but can be minimized or
- where opportunities exist for, recovering and reusing waste; and
- Where waste cannot be recovered or reused, identify means of treating,

- destroying, and disposing of it in an environmentally sound manner.

WASTE WATER

IFC

The World Bank General EHS Guidelines (2007) establish general requirements for direct or indirect discharge of process wastewater, wastewater from utility operations or storm water to the environment.

'Projects with the potential to generate process wastewater, sanitary (domestic) sewage, or storm water should incorporate the necessary precautions to avoid, minimize, and control adverse impacts to human health, safety, or the environment'.

However, wastewater effluent pollutant limits are only established for sanitary wastewater for discharge to the sanitary sewer systems. Water effluent guidelines in industrial wastewater for discharge to surface waters are established for the power sector in World Bank EHS Guidelines for Thermal Power Plants (2008) and have been presented in the Standards and Regulatory Requirements.

10.2 LOCAL CONDITIONS AND OBSERVATIONS

Solid and liquid wastes may have certain characteristics depending on their chemical, physical and biological properties. Different types of waste require different management and disposal techniques depending on the potential risk the material poses to human health or the environment. In order to categorize the different risks to these receptors, it is often useful to divide the streams into different categories that effectively correspond to the level of management and disposal required for each. Industrial or domestic wastewater streams can contribute to a number of environmental problems if they are not properly handled, stored and/or managed. These include direct contamination of water bodies, which can lead to serious environmental and public health problems.

10.2.1 Waste Management at the Project Area

The Contractor should subcontract a licensed and reputable waste management company for the collection, transport and disposal of waste produced at site. Wastes at the sites and the project facilities shall be segregated and collected at the temporary waste storage areas. There should be waste collection and segregation area in the project area depending on the number of project personnel and the anticipated volume of waste.

The waste storage area shall have separate storage segments for prime recyclables (scrap metals, tyres, plastic, wooden material), and separate segment for other hazardous waste including waste oils, oil filters etc. Special care should be taken to ensure that liquid wastes are kept in a segment with secondary containment. Proper waste segregation will be maintained at all times. Environmental labelling including visual communication elements shall be applied to the area/on the containers where appropriate.

Solid waste generated during the project is expected to come from various activities such as accommodation, canteens, vehicle maintenance, clinics and construction works. The possible wastes generated can be found in the list of Table 128.

Table 128: List of waste types

Waste Type	Phase	Amount	Source, Characterization, and Management
Medical Wastes	**Construction + Operation**	**0.03 t/year**	**The construction camp is expected to has a clinic expected to generate medical waste All medical wastes will be treated as hazardous waste, collected, transported, and removed separately from domestic wastes. Medical wastes will be collected in specially coded containers in the clinic and also they will be stored in the designated area in a safe place.**
Domestic Wastes **(Solid wastes)**	**Construction + Operation**	**1296 tones /year**	**The construction camp will provide accommodation and other basic needs for workers throughout the project stages. Domestic solid waste will be collected in closed containers. The domestic solid waste generated at the construction sites will have to be taken to the waste area daily by the site responsible. These solid wastes should be taken to the nearest landfill approved by the municipality**
Waste Oils	**Construction + Operation**	**28.5 tones /year**	**The maintenance process of the vehicles to be used during project phases will be carried within the facilities located in the project area.** **Waste oil shall be collected in a closed temporary waste storage area with a leak-proof floor and covered with a shelter constructed nearest location to the maintenance facility and/or also in a waste storage area. The oil collected would be given to a licensed waste oil recovery company. Additionally, waste vegetative oil will occur in the cafeterias of the campsites within the scope of the project. These wastes will be collected and stored separately from other wastes and stored in segregated segments in the waste storage area until disposal by a waste contractor.** **These segments differ from others with a structure (secondary containment) to avoid spilling and leakage, soil pollution accordingly.**
Oil filters	**Construction + Operation**	**0.2 tones /year**	**The maintenance process of the vehicles to be used during Project phases will be carried out within the facilities located in the Project area. Waste oil filters shall be collected in waste bins with secondary containment and transferred to the waste storage area for final disposal by a third-party sub-contractor. Air filters also will be collected in waste air filter bins and then transferred to the waste storage area for final disposal by a third-party sub-contractor.**
Waste Tyres	**Construction + Operation**	**1.22 tones /year**	**The maintenance process of the vehicles to be used during Project phases will be carried within the facilities located in the project area. If there is a**

Waste Type	Phase	Amount	Source, Characterization, and Management
			need to change the tires of these vehicles and machines, the end-of-life tires that come out would be sent to tires distribution companies or to authorized third-party companies. Until disposal, waste will be stored in the waste storage area in the designated segment.
Batteries, **Accumulators,** **Tonners, Cartridges**	**Construction + Operation**	**0.675 tones /year**	**Waste batteries will be stored in collection points located in office areas and will be delivered to third-party subcontractors. Waste accumulators (vehicle batteries) will be stored in the temporary storage areas until final disposal. Tonners and cartridges will be stored in separated bins in storage areas.**
Recyclable Wastes (Paper, Plastics, Cardboard, Metal Scraps)	**Construction + Operation**	**87.5 tones /year**	**Paper and card wastes from offices and domestic type sources at the main construction camp will be segregated, if practicable and sent for recycling by third party contractor. Separately collected recyclable wastes will be taken to the waste storage areas and be ready for transfer to recyclers.** **Recyclable wastes mainly resulting from construction activities (metal scraps, plastics, pipes etc.) will be collected in designated areas in construction sites and transferred to the waste storage area located in project area. Recyclable wastes will be stored in waste storage area until taken by third party subcontractors.**
Spoiled soil	**Construction**	**NA**	**The spoil soil shall be dumped in dumping areas located along the Project site.**
Domestic Sewage	**Construction** **Operation**	**32 m^3 /day** **8 m^3 /day**	**This includes wastes from the bathrooms, toilets etc. This waste shall be collected and treated in the wastewater treatment plant at the time.**
Concrete Batch plants	**Construction**		**Concrete wash out pits will be used to allow sediments to settle and water will be re-used for dust control activities. If water is not able to re-use, acidic chemicals will be added to balance pH into the range for discharge standards and will be discharged to the environment. Daily pH Control shall be undertaken to ensure compliance to discharge standards.**
Residual sludge from waste water treatment	**Costruction +Operation**	**20 tones /year**	**Different chemicals will be added to water for corrosion prevention, so probably this kind of waste can be classified as a hazardous waste. Also existence of heavy metals in wastewater with significant concentrations can strengthen this hypothesis.**

Waste can exhibit certain characteristics according to the process stream from which it is generated and any pre-treatment processes that are undertaken. Different types of waste require different management and disposal techniques according to the potential risk that the material poses to human health or the environment. For this Project, waste has been classified into three (3) main categories below.

Table 129: Waste characterization

Waste Classification	Description
Domestic Waste	**Household, commercial, agricultural, governmental, industrial and institutional wastes, which have chemical and physical characteristics similar to those of household such as garbage, paper, cardboard, plastic, cans, etc. Disposal of such waste can generally be routed to municipal recycling or disposal facilities**
Industrial waste	**Non-hazardous wastes that have physical and chemical characteristics that are different from domestic wastes such as construction waste, glass, scrap metal, wood, used containers, tyres etc. This waste generally poses little risk to the environment and can be disposed to normal municipal facilities after waste minimisation options are exhausted and before obtaining approval**
Hazardous waste	**Simply defined, a hazardous waste is a waste with properties that make it dangerous or capable of having a harmful effect on human health or the environment. Hazardous waste is generated from many sources, ranging from industrial manufacturing process wastes to batteries and may come in many forms, including liquids, solids gases, and sludges. Hazardous wastes has flammable, corrosive, reactive, toxic, or radioactive properties according to EPA.**

10.2.2 Waste Management Hierarchy

Waste hierarchy is a tool used in the evaluation of processes that protect the environment alongside resource and energy consumption to most favorable to least favorable actions. The hierarchy establishes preferred program priorities based on sustainability. To be sustainable, waste management cannot be solved only with technical end-of-pipe solutions and an integrated approach is necessary.

The waste management hierarchy indicates an order of preference for action to reduce and manage waste, and is usually presented diagrammatically in the form of a pyramid. The hierarchy captures the progression of a material or product through successive stages of waste management, and represents the latter part of the life-cycle for each product.

The aim of the waste hierarchy is to extract the maximum practical benefits from products and to generate the minimum amount of waste. The proper application of the waste hierarchy can have several benefits. It can help prevent emissions of greenhouse gases, reduces pollutants, save energy, conserves resources, create jobs and stimulate the development of green technologies. Waste hierarchy which reflects mitigation orders can be seen in Figure 81.

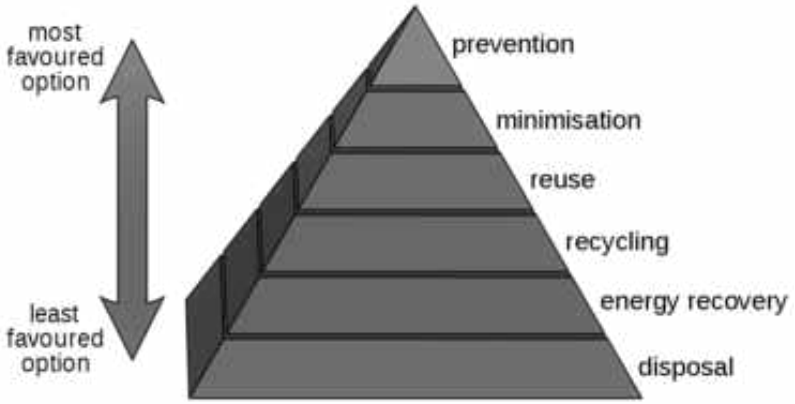


Figure 81: Waste Hierarchy

10.2.2.1 Minimisation

A waste minimization philosophy will be implemented for the construction work. Whenever feasible, project personnel shall review the potential to reduce the volumes of wastes generated during construction. This may be accomplished by applying source reduction techniques to minimize waste (e.g., do not over - excavate contaminated soil). The following source reduction strategies and practices shall be followed:

- Review major waste streams for potential for source reduction. A plan should be developed for at least one waste stream to reduce the total annual volume of that waste.
- Waste shall only be treated by using acceptable technologies.
- Materials shall be purchased in quantities that can be used within a short period of time and inventories shall be rotated to minimize out - of - date inventory.
- Whenever possible, materials used in large quantities should be purchased in reusable or returnable containers to minimize packaging waste
- Alternative materials or products should be used that are non - hazardous or less hazardous
- Waste will be properly stored to avoid accidental releases to the soil, water or air
- Collection and segregation of waste according to its type, whether it is re-usable, recyclable, non-hazardous or hazardous waste.

10.2.2.2 Waste Re-use

Reuse of waste means any operation by which products or components that are not waste are used again for the same purpose for which they were conceived. Reuse of materials that are in good condition should be consider (e.g. Used clothes, wood pallets)

10.2.2.3 Waste Recycling

Recycling is the process of converting waste materials into new materials and objects. Recycling can prevent the waste of potentially useful materials and reduce the consumption of fresh raw materials, thereby reducing: energy usage, air pollution (from incineration), and water pollution (from landfilling).

10.2.2.4 Segregation and Sorting

All waste produced at site should be sorted out, if possible, at the place where they were produced. Waste must be proper transported to the Management Areas to be segregated and sorted. During the Transport all mitigation measures will be taken to prevent environmental problems.

10.2.2.5 Disposal

Before the amount of waste stored in the waste storage area reaches the maximum temporary storage capacity, the disposal/reuse process must start. Send the disposal to an authorized operator.

The Project Management will subcontract the waste management companies in charge of collecting, transporting and disposing of the waste produced at site.

10.2.3 Hazardous Waste

Simply defined, hazardous waste is a waste with properties that make it dangerous or capable of having a harmful effect on human health or the environment. Hazardous waste is generated from many sources, ranging from industrial manufacturing process wastes to batteries, and may come in many forms, including liquids, solids gases, and sludges. Any waste with flammable, corrosive, reactive, toxic, or radioactive properties expected as hazardous waste

Cradle to Grave principle for hazardous wastes can be seen in Figure 82.

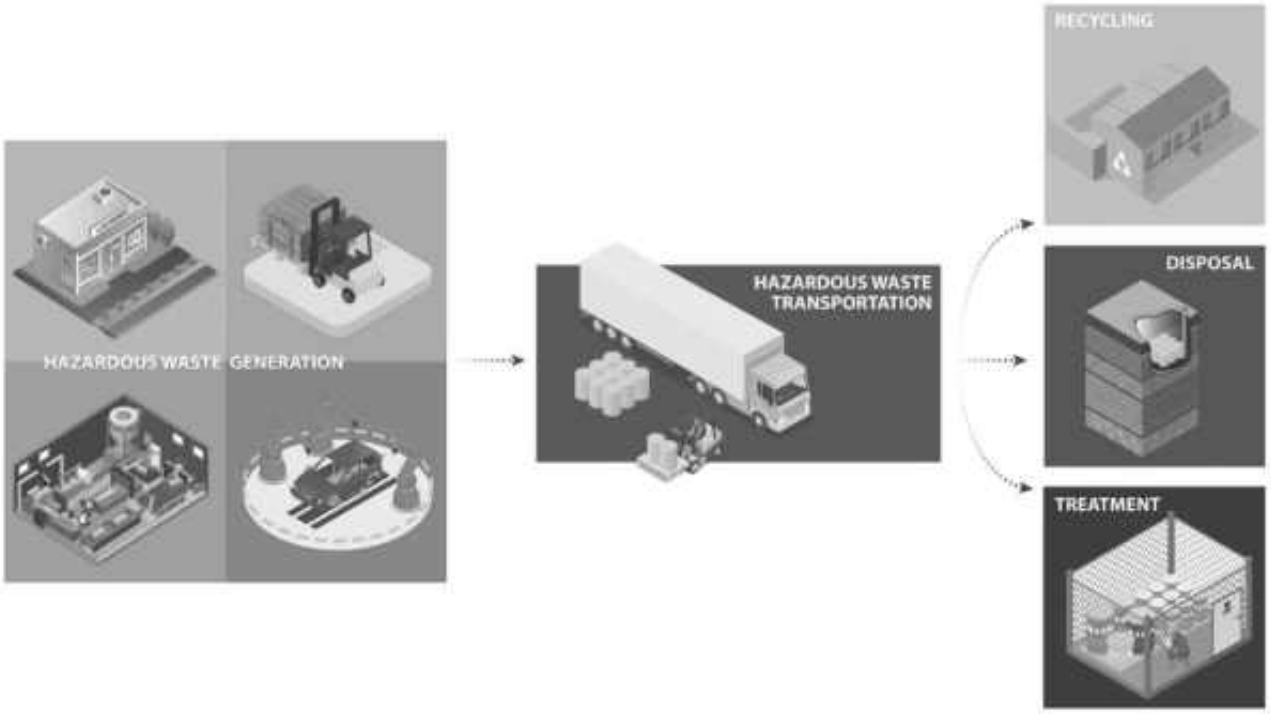


Figure 82: Cradle to Grave Principle for Hazardous Wastes

10.2.3.1 Hazardous Waste Generation

All hazardous waste sources must be determined if the waste is hazardous and the project must oversee the ultimate fate of the waste. Furthermore, the project must ensure and fully document that the hazardous waste that they produce is properly identified, managed, and treated prior to recycling or disposal.

10.2.3.2 Hazardous Waste Transportation

After the project produces hazardous waste, authorized transporters may transport the waste to a facility that can recycle, treat, store or dispose of the waste. Since such transporters are moving regulated wastes on public roads, highways, rails, and waterways according to Uzbekistan regulations.

10.2.3.3 Hazardous Waste Recycling, Treatment, Storage, and Disposal

Many hazardous wastes can be recycled safely and effectively, while other wastes will be treated and disposed of in landfills or incinerators.

Recycling hazardous waste has a variety of benefits including reducing the consumption of raw materials and the volume of waste materials that must be treated and disposed of. However, improper storage of those materials might cause spills, leaks, fires, and contamination of soil and drinking water.

Treatment Storage and Disposal Facilities might provide temporary storage and final treatment or disposal for hazardous wastes. Since they manage large volumes of waste and conduct activities that may present a higher degree of risk, Treatment Storage and Disposal Facilities are stringently regulated by government organizations. The Treatment Storage and Disposal Facilities requirements establish generic facility management standards, specific provisions governing hazardous waste management units, and additional precautions designed to protect soil, groundwater, and air resources.

10.3 POTENTIAL IMPACTS, MITIGATION, MANAGEMENT & RESIDUAL IMPACT

10.3.1 Construction Phase

10.3.1.1 Non-Hazardous Waste

During construction, waste will be generated during earthworks, construction of the fences, paths and buildings.

Typical construction wastes include concrete, asphalt, scrap steel, glass, plastic, wood, packaging materials and domestic waste from construction workers (i.e. relating to food consumption). Concrete may be found in two forms on the construction site; structural elements containing reinforced concrete, while foundations (such as surface level concrete slabs) have mass non-reinforced concrete.

Non-Hazardous waste generated from construction activities at the Project site will include the following:

- The project shall develop and implement a Project-specific Waste Management Plan in line with committed mitigation measures in this ESIA report and the provisions of the ESMP.
- Domestic solid wastes to be segregated and identified from the other waste streams into separate waste containers/skips clearly to facilitate recycling.
- Waste containers/skips should be clearly labelled and placed in designated waste storage locations. Labels will be waterproof, securely attached, and written in English and other languages as required such as Uzbek and Russian.
- For litter (food waste, domestic waste), an adequate number of covered bins should be strategically placed throughout the site at locations where construction workers and staff consume food. These will be regularly collected and taken to the main waste storage area.
- Food waste must be stored within a sealed metal or plastic skip or bin to prevent pests from gaining access.
- On-going training should be provided to all staff on the importance of the need to avoid littering.
- Heavy waste may be contained within an open skip, provided that segregation occurs effectively enough to remove all lightweight material that could be blown away.
- Waste generated during construction will only be transported off-site for disposal by an appropriately licensed waste contractor.
- Only licensed waste transporters and waste management facilities will be engaged.
- Develop and maintain a waste inventory to document and track domestic solid wastes generated, segregated, reused and consignments
- Completed waste manifests are required to show the chain of custody of the waste generated on-site, its transportation and treatment/disposal. All records will be maintained on-site.
- Mandatory training program for employees to increase their awareness of waste management protocols including proper handling and storage of waste, and emergency response and contingency plans.
- Contractor will identify the closest recycling companies in Uchkizil, Navshahar, Kaftarhana or Talashkan in order to promote the recycling of waste especially packaging materials, wood and metal waste etc.
- Disposal of any type of waste to the canal or lake is strictly prohibited

10.3.1.2 Hazardous Wastes

Hazardous waste generated from construction activities at the Project site will include the following;

- Develop and maintain a hazardous waste inventory to document and track hazardous wastes generated, segregated, reused and consignments.
- Segregate and identify hazardous waste from the other waste streams into separate signed and labelled waste containers/skips.
- Store hazardous waste in allocated impervious hard standing areas in sealed containers stored with impermeable bases, sufficient containment and separation capacity, sun/rain shelter, separate drainage system, good ventilation and equipped with spill kits & spill response procedures. This area must be placed away from any sources of ignition.

- The hazardous waste storage area should be constructed away from the drainage system. A rain shelter will also be provided to avoid any potential instance of runoff or leakage of runoff.
- Waste containers should be marked with appropriate warning labels to accurately describe their contents and detailed safety precautions. Labels will be waterproof, securely attached, and written in English and other languages as required such as Russian and Uzbek. Wherever possible, chemicals will be kept in their original container.
- Keep hazardous waste storage areas away from any ignition sources or fire hazards.
- Disposal of hazardous waste to the canal or Lake is strictly prohibited.
- Used face masks shall be stored in designated bins and disposed off as medical waste.
- Any generated medical waste (i.e. form on-site clinics) shall be stored in appropriate medical waste containers.
- All medical waste shall only be handled by trained personnel.
- Removal of any medical or hazardouswaste from the site for appropriate treatment, disposal/incineration shall only be conducted by a licensed contractor.

10.3.1.3 Excavation Soil and Contaminated Soils

- In-situ testing of soil to ensure it is not contaminated and can be reused or disposed of into land.
- Training –Contractor staff to be able to identify signs of potential contamination (smell of hydrocarbon, staining).

Contaminated soil management plan should be prepared regarding what to do in case of soil contamination. When contamination is found, precautions should be taken according to the contaminated soil management plan and necessary actions should be taken for disposal.

10.3.1.4 Sanitary Wastewater

Wastewater generated from construction activities at the project site will include the following:

- Contractor to develop and implement a Project Specific Waste Water Management Plan and waste water treatment plant operation procedure following committed mitigations measures in this ESIA report and provisions of the ESMP.
- Sanitary wastewater tanks to be properly maintained and inspected to ensure tanks do not overflow.
- Site inspections will be carried out regularly by the EPC contractor to ensure that all wastewater generated is properly managed, and no leakages or spill occur. In the event of a spill or overflow, immediate action will be taken per spill containment procedures and clean up procedures.
- Engage a municipality approved waste contractor for the periodic removal of the tanks.
- Sanitary wastewater tanks should be placed in allocated impervious hard standing areas with bonding capacity to hold 110% volume of the maximum volume stored.
- In common with the IFC EHS Guidelines, an effort will be made in training construction personnel to minimise water consumption for ablutions and to ensure an understanding of water resource and wastewater issues.

10.3.1.5 Process Wastewater During Test and Commisioning Phase

Contractor will develop the following procedures before the start of the commissioning stage.

- Hydrotesting Procedure
- Acid Cleaning Procedure; and
- Boiler Steam Blowing Procedure

Table 130: Impacts Significance of the waste management during - Construction Phase

Potential Impacts	Receptor	Severity	Probability	Potential Impact Significance(Pre Mitigation)	Mitigation and Management Measures	Residual Impacts (Post Mitigation)
Non-Hazardous Wastes	**Uchkizil Reservoir, aquatic life, flora, and fauna**	**Marginal**	**Very Likely**	**Moderate (M)**	**The project must prepare and implement a waste management plan in line with commitments given in ESIA, ESMP, and local EIA. All the mitigation measures defined in the above-mentioned plans shall be covered in the procedure.** **Domestic solid wastes must be segregated and segregated from the other waste streams into separate waste containers/bins clearly to facilitate recycling.** **Waste containers/bins should be labeled in the local language and English and placed in designated waste storage locations. Labels must be waterproof, securely attached, and written in English and other languages as required such as Uzbek and Russian.** **An adequate number of dust bins, the waste containers should be placed along the construction site for litter (food waste, domestic waste) to avoid project personnel to litter. The wastes from the containers will be regularly collected and taken to the waste storage area.** **Food waste must be stored in sealed metal or plastic containers to avoid pests and avian species accumulated in the waste area.** **On-going training shall be conducted on the project personnel. including staff to avoid littering and impacts of wastes on the environment. Plastic pollution awareness training should be developed too.** **All wastes generated during the construction phase has to be transported off the site only for disposal by licensed waste contractors** **If possible wood waste produced from construction activities and packaging of cargoes shall be donated to the nearby schools or public/community houses for firewood if not contaminated and safe to do.** **Only licensed waste transporters and waste management facilities will be engaged.** **The Contractor will maintain copies of the waste management licenses on site.** **Develop and maintain a waste inventory to document and track domestic solid wastes generated, segregated, reused, and consignments** **Completed waste transportations and disposals are required to show the chain of custody of the waste generated on-site, its transportation, and treatment/disposal. All records will be stored on HSE teams.** **Mandatory training program for employees to increase their awareness of waste management protocols including proper handling, segregation, and storage of waste, and emergency response and contingency plans.** **The contractor will identify the closest recycling companies in Uchkizil, Navshahar, Kaftarhana, or Talashkan in order to promote the recycling of waste especially packaging materials, wood, and metal waste, etc.** **Disposal of any kind of waste to the canal or lake is strictly prohibited**	**Minor (L)**

Potential Impacts	Receptor	Severity	Probability	Potential Impact Significance(Pre Mitigation)	Mitigation and Management Measures	Residual Impacts (Post Mitigation)
Hazardous Wastes	**Uchkizil Reservoir, Aquatic life, flora, and fauna**	**Critical**	**Very Likely**	**High (H)**	**A hazardous waste inventory shall be developed which includes hazardous waste generation sources, segregation, reuse, and consignments** **Hazardous wastes must be collected in separate containers than nonhazardous waste. Hazardous waste bins should be signed and labeled.** **Hazardous wastes must be stored on an impermeable surface that has bunds nearby to avoid and spillage to contaminate the soil. In the temporary waste storage area sufficient containment, separation, sun/rain shelter must be provided. The hazardous waste storage must have spill kits and fire extinguishers ready at all times.** **The hazardous waste storage area should be constructed away from the drainage system. A rain shelter will also be provided to avoid any potential instances of runoff or leakage of runoff.** **Hazardous waste bins should be labeled to describe their content. The label should be in Uzbek, English, and Russian and should be securely attached and be waterproof. Wherever possible, chemicals will be kept in their original container.** **Hazardous waste storage areas must be away from fire sources to avoid fire risk.** **Disposal of hazardous waste to the canal or lake is strictly prohibited.** **Used face masks shall be stored in designated bins and disposed of off-as medical waste.** **Any kind of medical waste (i.e. from on-site clinics) must be stored in appropriate medical waste containers.** **All medical waste shall only be handled by trained personnel.** **Removal of any medical or hazardous waste from the site for appropriate treatment, disposal/incineration shall only be conducted by a licensed contractor**	**Moderate (M)**
Excavation Soil and Contaminated Soils	**Uchkizil Reservoir, Aquatic life, flora, and fauna**	**Marginal**	**Very Likely**	**Moderate (M)**	**In-situ testing of soil to ensure it is not contaminated and can be reused or disposed of into land.** **Appropriate training should be conducted on the chemical handling personnel and staff. After training, the personnel should be able to identify signs of a potential contamination incident. A contaminated soil management plan should be developed in order to appropriate handling treatment and disposal of contaminated soil.**	**Moderate (M)**

Potential Impacts	Receptor	Severity	Probability	Potential Impact Significance(Pre Mitigation)	Mitigation and Management Measures	Residual Impacts (Post Mitigation)
Sanitary Wastewater	**Uchkizil Reservoir, Aquatic life, flora, and fauna**	**Critical**	**Very Likely**	**High (H)**	**The contractor should develop and implement a Project Specific Wastewater Management Plan. The wastewater management plan should cover every mitigation measure defined in this ESIA and other associated documents such as ESMP, ESAP, etc.** **.** **Wastewater tanks should be free of leakage and overflow at all times. Regular checks should be done to ensure there is no overflow or leakage.** **Site inspections should be carried out regularly by the contractor to ensure that all wastewater generated is properly managed, and no leakages or spills occur. In the event of a spill or overflow, immediate action will be taken per spill containment procedures and clean-up procedures.** **For the removal of wastewaters, the municipality-approved waste contractor should be hired.** **Sanitary wastewater tanks should be placed on impermeable surfaces. The area should has secondary containment (bunds) and secondary containment should be %110 of the tank volume.** **In common with the IFC EHS Guidelines, an effort will be made in training construction personnel to minimise water consumption for ablutions and to ensure an understanding of water resource and wastewater issues.**	**Moderate (M)**
Process Wastewater During Test and Commissioning Phase	**Uchkizil Reservoir, Aquatic life, flora, and fauna**	**Negligible**	**Certain**	**Moderate (M)**	**The contractor must develop procedures for the following processes prior to the start of the test and commissioning phase;** **Hydrotesting Procedure** **Acid Cleaning Procedure; and** **Boiler Steam Blowing Procedure** **The procedures should include the disposal of wastewaters.**	**Minor (L)**

10.3.2 Operation Phase

10.3.2.1 Non-hazardous Wastes

The operation of the proposed Project will generate small amounts of non-hazardous domestic waste from the operation of the administration facilities and from activities of the employees.

This waste can be classified as both recyclable and non-recyclable. Recyclable waste includes paper, tin cans, plastics, cartons, rubber, and glass, while non-recyclables will consist mainly of food residues and other organic waste. Other solid non-hazardous waste generated during operation will be landscaping waste and uncontaminated replacement parts and packaging.

Non-Hazardous waste generated from construction activities at the Project site will include the following:

- Waste and Management Plan in line with committed mitigation measures in this ESIA report and the provisions of the ESMP.
- Domestic solid wastes to be segregated and identified from the other waste streams into separate waste containers/skips clearly to facilitate recycling.
- Waste containers/skips should be clearly labelled and placed in designated waste storage locations. Labels will be waterproof, securely attached, and written in English and other languages as required such as Russian and Uzbek.
- For litter (food waste, domestic waste), an adequate number of covered bins should be strategically placed throughout the site at locations where construction workers and staff consume food. These will be regularly collected and taken to the main waste storage area.
- Food waste must be stored within a sealed metal or plastic skip or bin, to prevent pests from gaining access.
- Heavy waste may be contained within an open skip, provided that segregation occurs effectively enough to remove all lightweight material that could be blown away.
- Paper cardboard, metal cans, plastic, glass to be collected for recycling by a Uchkizil, Navshahar, Kaftarhana or Talashkan approved waste contractor.
- Waste generated during construction will only be transported off-site for disposal by an appropriately licensed waste contractor.
- Only licensed waste transporters and waste management facilities will be engaged.
- Develop and maintain a waste inventory to document and track domestic solid wastes generated, segregated, reused and consignments
- Completed waste manifests are required to show the chain of custody of the waste generated on-site, its transportation and treatment/disposal. All records will be maintained on-site.

10.3.2.2 Hazardous Wastes

This fraction of waste can potentially cause significant adverse impacts on human health and the environment if improperly managed. Examples of likely hazardous waste streams that may arise during the operation of the Project include the following:

- Develop and maintain a hazardous waste inventory to document and track hazardous wastes generated, segregated, reused and consignments.

- Segregate and identify hazardous waste from the other waste streams into separate waste containers/skips signed and labelled.
- Store hazardous waste in allocated impervious hard standing areas in sealed containers stored with impermeable bases, sufficient containment and separation capacity, sun/rain shelter, separate drainage system, good ventilation and equipped with spill kits & spill response procedures. This area must be placed away from any sources of ignition.
- Waste containers will be marked with appropriate warning labels to accurately describe their contents and detailed safety precautions. Labels will be waterproof, securely attached, and written in English and other languages as required such as Uzbek and Russian. Wherever possible, chemicals will be kept in their original container.
- Used face masks shall be stored in designated bins and disposed of as medical waste.

10.3.2.3 Sanitary Wastewater

Wastewater generated from construction activities at the project site will include the following:

- Sanitary wastewater will be treated at the onsite and must meet the discharge standards before being discharged into the reservoir or for landscaping.
- Periodic testing of the treated waste water shall be conducted and the results logged.

10.3.2.4 Process Wastewater

- Conduct regular checking and monitoring of water quality and discharges from:
    - Water treatment plant
    - Sewage Treatment Plant;
    - Cooling water system;
    - RO plant; and
    - Storm water system
- Sludge from treatment systems will be disposed in accordance with IFC/WB and Uzbek regulations.
- Maintain storm-water handling systems and routinely monitor effluents.

Provisions for the containment of the first flush of storm water will be considered to ensure that the initial runoff from rainfall events does not lead to contamination of the receiving canal waters. Impacts relating to storm water contamination can also be reduced via good housekeeping practices on site during operation. Such good practices include road sweeping, effective clean-up of liquid spills, appropriate covering of stockpiles & equipment and good waste management practices.

Table 131: Impacts Significance of the waste management during Operation Phase

Potential Impacts	Receptor	Severity	Probability	Potential Impact Significance(Pre Mitigation)	Mitigation and Management Measures	Residual Impacts (Post Mitigation)
Non- hazardous wastes	**Uchkizil Reservoir, Aquatic life, flora, and fauna**	**Critical**	**Likely**	**Moderate (M)**	**The project must prepare and implement a waste management plan in line with commitments given in ESIA, ESMP and local EIA. All the mitigation measures defined in the above-mentioned plans shall be covered in the procedure.** **Domestic solid wastes must be segregated and segregated from the other waste streams into separate waste containers/bins clearly to facilitate recycling.** **Waste containers/bins should be labelled in local language and in English and placed in designated waste storage locations. Labels must be waterproof, securely attached, and written in English and other languages as required such as Uzbek and Russian.** **Food waste must be stored in sealed metal or plastic containers to avoid pests and avian species accumulated in the waste area.** **A training shall be conducted on the project personnel, including staff to avoid littering and impacts of wastes to the environment. Plastic pollution awareness training should be developed too.** **All wastes generated during the operation phase has to be transported off the site only for disposal by licensed waste contractors** **Only licensed waste transporters and waste management facilities will be engaged.** **The Contractor will maintain copies of the waste management licenses in the HSE office** **Develop and maintain a waste inventory to document and track domestic solid wastes generated, segregated, reused, and consignments** **Completed waste transportations and disposals are required to show the chain of custody of the waste generated on-site, its transportation, and treatment/disposal. All records will be stored on HSE teams.** **Mandatory training program for employees to increase their awareness of waste management protocols including proper handling, segregation and storage of waste, and emergency response and contingency plans.** **The contractor will identify the closest recycling companies in Uchkizil, Navshahar, Kaftarhana, or Talashkan in order to promote the recycling of waste especially packaging materials, wood, and metal waste, etc.** **Disposal of any type of waste to the canal or lake is strictly prohibited.**	**Minor (L)**

Potential Impacts	Receptor	Severity	Probability	Potential Impact Significance(Pre Mitigation)	Mitigation and Management Measures	Residual Impacts (Post Mitigation)
Hazardous Waste	**Uchkizil Reservoir, Aquatic life, flora, and fauna**	**Critical**	**Very Likely**	**High (H)**	**A hazardous waste inventory shall be developed which includes hazardous waste generation sources, segregation, reuse, and consignments** **Hazardous wastes must be collected in separate containers than non-hazardous waste. Hazardous waste bins should be signed and labeled.** **To avoid any further spillage and soil contamination, prior to disposal, hazardous wastes must be stored on an impermeable surface. In the temporary waste storage area sufficient containment, separation, sun/rain shelter must be provided. The hazardous waste storage must have spill kits and fire extinguishers ready at all times.** **The hazardous waste storage area should be constructed away from the drainage system. A rain shelter will also be provided to avoid any potential instances of runoff or leakage of runoff.** **Hazardous waste bins should be labeled to describe their content. The label should be in Uzbek, English, and Russian and should be securely attached and be waterproof. Wherever possible, chemicals will be kept in their original container.** **Hazardous waste storage areas must be away from fire sources to avoid fire risk.** **Disposal of hazardous waste to the canal or lake is strictly prohibited.** **Waste face masks shall be stored in designated bins and disposed of off-as medical waste.** **Any kind of medical waste (i.e. form on-site clinics) must be stored in appropriate medical waste containers.** **All medical waste shall only be handled by trained personnel.** **Subsequent to removal of medical wastes from the site, disposal or incineration process shall only be conducted by licensed contractors.**	**Moderate (M)**
Sanitary Wastewater	**Uchkizil Reservoir, Aquatic life, flora and fauna**	**Critical**	**Likely**	**Moderate (M)**	**The effluent of the sanitary wastewater treatment plant must meet the criteria defined in the permit obtained from Uzbekistan authorities.** **Regular waste water analysis should be done at least quarterly to ensure that the treatment plant working properly.**	**Minor (L)**

Potential Impacts	Receptor	Severity	Probability	Potential Impact Significance(Pre Mitigation)	Mitigation and Management Measures	Residual Impacts (Post Mitigation)
Process Wastewater	**Uchkizil Reservoir, Aquatic life, flora and fauna**	**Critical**	**Likely**	**Moderate (M)**	**The project should conduct regular checks and should monitor water quality and discharges from the following structures:** **Water treatment plant** **Sewage Treatment Plant;** **Cooling water system;** **RO plant; and** **Storm water system** **Sludge from treatment systems will be disposed of according to requirements defined in IFC/WB and Uzbek regulations.** **Storm water handling systems should be regularly checked.** **Measures should be taken containment of initial stormwater runoff to ensure that initial storm event runoff does not result in pollution of the receiving water body. Stormwater pollution impacts can also be reduced through good on-site housekeeping practices during operations. These good practices include sweeping roads, effectively cleaning up spills, adequately covering stockpiles and equipment, and good waste management.**	**Minor (L)**

10.4 CUMULATIVE IMPACTS

The purpose of a cumulative impact assessment is to determine how the potential impacts of a proposed development might combine cumulatively, with the potential impacts of other projects or human activities as well as natural stressors such as droughts or extreme climatic events. Summary of Cumulative Impacts of Solid waste and waste water is presented in Table 132.

Table 132: Summary of Cumulative Impacts of Solid Waste and Waste Water

Environmental and Social Aspects	Construction	Operation
Solid Waste and Waste Water		
Cumulative Impacts	**Methane generation from biodegradable organic waste will occur from landfill disposal which is a greenhouse gas and cause a cumulative impact together with the other Projects.**	**Methane generation from biodegradable organic waste will occur from landfill disposal which is a greenhouse gas and cause a cumulative impact together with the other Projects.**

11. TRAFFIC AND TRANSPORTATION

11.1 STANDARDS AND REGULATORY REQUIREMENTS

11.1.1 National Requirements

The relevant law related with traffic and transportation in Uzbekistan is given below:

- Law "On Traffic Safety", No: 818-I, dated August 19,1999, as amended on 29.12.2015)

"*Law on Traffic Safety*", law came into force defining a priority of protection of citizens lives and health, their rights and interests, as well as the environment and the basic principles of traffic safety provision.

11.1.2 Lenders Requirements

The traffic and transport issues will be assessed in line with IFC PS1 (Assessment and Management of Environmental and Social Risks and Impacts) and PS4 (Community Health, Safety and Security).

11.2 OBSERVATION AND BASELINE CONDITION

11.2.1 General view

Uzbekistan has the highest road density in Central Asia, with 41 km of roads per 100 km² area. The total size of the road network is 185,000 km, of which 42,700 km are common-use public roads. Common use roads are functionally divided into international roads - 3,981 km, national roads - 14,100 km, and regional roads - 24,614 km. For the most part, Uzbekistan has achieved basic road connectivity and only a few remote regions lack all-weather road access. About 95% of the network is paved and less than 5% is gravel and earth surfaced. At the end of 2017, nearly two-thirds of the common-use roads were assessed as being in good or excellent condition. This assessment is based on biannual visual inspections, which are highly subjective and may not be based on a consistently applied metric. Much road deterioration is due to aging infrastructure, which needs both structural and safety upgrades. Lastly, Uzbekistan has 83 cars per 1,000 people in 2018.

At the province level, the transport infrastructure of Surkhandarya is fairly developed. The length of railways crossing the territory of the region is 372.5 km. There are more than 10 railway stations in the region. Railway route (or line) Taguzar - Boysun – Kumkurgan connects the south of Uzbekistan with the center of the country and Kazakhstan. There is the main passageway running between Termez and Tashkent. There is 2,844 km of automobile roads in the region, including international and national. There is also Termez Cargo Center is large logistical terminal, located in the Termez district of the region in close proximity to the border with Afghanistan. This terminal provides transport and logistical services, including customs checks, loading and offloading, goods storage at warehouses of the terminal, as well as the processing of transit cargo for intermodal transportation (rail - truck) to and from Afghanistan highways.

Transportation part of two districts is going to describe the sector by analyzing public-private vehicles share, public transport provision, number of private vehicles per 1,000 populations and the conditions of roads.

According to the Khokimiyat of Angor district, there are 2,149 vehicles in 2020 to serve the local population, including private vehicles and vehicles of legal entities and/or enterprises. Of these, 75% of transport is private, 25% belongs to enterprises. There are 7,657 vehicles in the Termez district to serve the local population. Of these, 90% of transport is private, and 10% belongs to enterprise (see Figure 128).

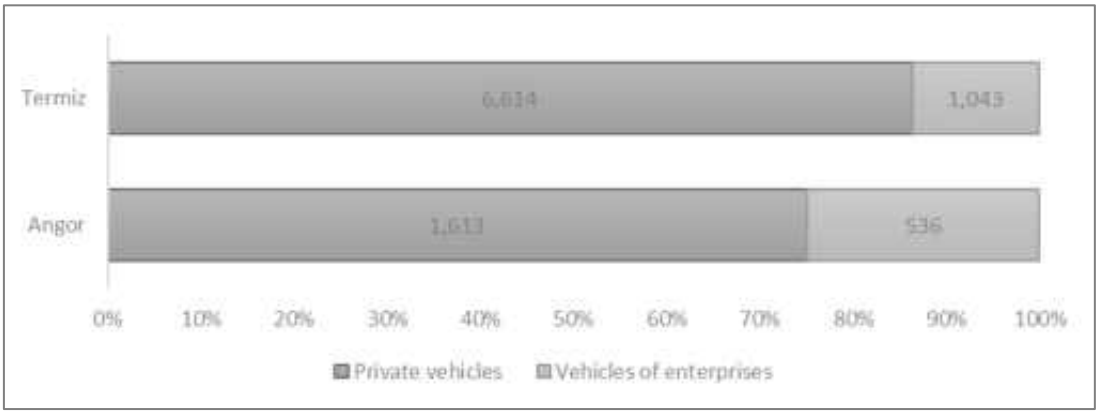


Figure 83: Private vehicles and vehicles of enterprises distribution in Termez and Angor districts

Another indicator is the number of people per vehicle which is used as a public transport (taxi, bus, minibus). The public transport system in both Termez and Angor districts is operated by private organizations. According to the data of the Khokimiyat of Angor region, there are 11 working enterprises with a total of 368 vehicles to serve the local population. Most of them are light vehicles (taxi services with a maximum capacity of 7 passengers) in the amount of 348 units. Also, there are 6 buses and 2 minibuses. Overall, there are 366 people per unit of transport, with the calculation of the total population of the district being 134,700 people.

In Termez district, there are only 2 engaged enterprises with a total of 48 transport vehicles to serve the local population. Most of them are automobiles (taxi services) in the amount of 40 units. The number of buses is 8 units of minibuses. This complicates the maintenance of transport by most of the population, since there are 1,650 people per unit of transport, with the calculation of the total population of the district being 79,200 thousand people.

However, the number of people per private car could explain the significant difference between the ratios of public transport. In Angor per 1,000 people own 11 private cars, while in Termez, it is 83. Therefore, people in Termez depend less on public transports in their daily needs, while the Angor population mostly depend on public vehicles.

Another important public asset to know about the social condition is road infrastructure. Society relies on a good road system as the basis to access jobs, health care, education and social connections. The total length of internal roads in Angor district is 604.3 km of which only 28 km of the road was repaired in 2020 and 379.6 km of the road requires further repair. In the Termez district, the total length of internal roads is 716.2 km, of which only 9.5 km of the road were repaired in 2020 and 274 km of the road requires further repair. It can be concluded that in Angor 30% while in Termez 60% of internal roads require repair. As a conclusion, the roads which need repair prevails the roads with good conditions. Public transport is more used by Angor population than Termez. Understandably, population in Angor owns fewer private cars comparing to Termez even though its population is more than Termez for 60%.

Figure 84: Total condition of roads in Termez and Angor districts in 2020

11.2.2 Project Site Observations

The main highways connecting the city of Termez with other settlements of Uzbekistan and Tajikistan are M41 "Termez - Jarkurgan - Denau - Dushanbe" and M39 "the Big Uzbek Highway".

The M39 Highway connecting Tashkent and Termez, is a 4-laned road in some 300 km of its length, although poorly maintained and without carriageway separation in most of its length. M39 Highway has state significance of the I technical category, has an asphalt concrete surface with a roadbed width of 18 m and a carriageway width of 12 m. The project location is access to M39 at a distance of 500 meters and to M41 at a distance of 14.5 km.

In addition to the above roads, there are regional roads, of which the 4P100 road, which has the IV technical category, with a roadbed width of 9-10 m and a carriageway width of 6-7 m.

The closest road nearby the project area is Babamurk Sarmez – Kaftarkhana Road. These two villages are not very populous. The traffic load between the two cities is not expected to be high.

Furthermore, there is the main railway line Kagan-Termez-Dushanbe at a distance of 7 km from the south of the Project Area. Railway passenger and cargo transportation is carried out by the Termez I station at a distance of 14 km from the south of the Project Area.

Moreover, Termez International Airport is the nearest airport at a distance of 10.7 km from the southeast of the Project area which access by M39 highway from the project area. Main transportation network around the Project presented in Figure 85.

Also, the Amudarya is used for river transport (at a distance of 10 km), which is based in a large port near the southern borders of Termez city.

Figure 85: Transportation Network Around the Project

In the Surkhandarya region, grazing livestock is common. After agriculture, livestock is the second most important livelihood in the valley. Irrigated farm owners also grows cattle. The boundaries of the territory of the Project are surrounded by uncultivated and unused lands in agriculture from the north, west, and east. On the west of the project area at a distance of 450-550 meters the "Zang" canal flows that flow into Lake Uchkizil from the south. Project area is currently being used for pastureland for the grazing of livestock by community. Pastures also watering their animals in Uchkizil Lake.

11.3 SENSITIVE RECEPTORS

The potential sensitive receptors are local livestock farmers, Residents of Uchkizil, Kaftarkhana, Kattakum, and other villages road users, drivers in local roads and highways.

11.4 POTENTIAL IMPACTS, MITIGATION, MANAGEMENT & RESIDUAL IMPACT

11.4.1 Construction Phase

The majority of the components needed for the construction of the facility cannot be assembled in the project area. So that sophisticated pieces of equipment of the project shall be transported to the construction site in its built form. These sophisticated pieces of equipment are very likely to be transported to the site by special vehicles and oversize or haul containers. It is expected that a significant portion of the materials will arrive by road, but that an amount of equipment may also require shipping, prior to final delivery by road and/or railway.

Where materials and equipment are shipped, they will go via different international airports/highways/railways and will then require road hauling to the site via the national/international highway and/or railway network. The exact route the construction vehicles will take to reach the site is not known, however, all vehicles will eventually need to use the local road to the north of the Project site in order to enter via the site access point. The Contractor will be required to get necessary permits from relevant national and international authorities and obey the restrictions identified in the permits to transport equipment and machinery across borders.

Construction activities are expected to result in an increase in Heavy-Duty Vehicle movement within the project region. The volume of the heavy-duty movement will be dependent on phases of construction and the demand for natural resources. The main factors that will affect the number of vehicles on the roads will be related to material usage manpower needs and waste generation.

The existing road north of the site is used by local communities to access between Babamurk- Samrez and Kaftarkhana villages. The construction activities will increase traffic load temporarily. The project's northern border which is neighbor to the road will be the most vulnerable part in terms of accident risk. As a result of the Project's development has the potential to result in road traffic accidents affecting humans and livestock.

The potential impacts caused by traffic and transportation during the construction phase and mitigation measures are presented in Table 133. Mitigation measures will further reduce the impacts and therefore residual impacts will be minor or moderate on the environment.

Table 133: Impacts Significance of the Traffic and Transportation during - Construction Phase

Potential Impacts	Receptor	Severity	Probability	Potential Impact Significance (Pre Mitigation)	Mitigation and Management Measures	Residual Impacts (Post Mitigation)
Loss of trials/tracks within the project site	**Local livestock farmers**	**Negligible**	**Certain**	**Moderate (M)**	**The impact of existing access routes across the site from and to the different communities and farms will be assessed and an alternative route provided before the commencement of construction activities.** **The alternative routes provided by the company will be marked in local languages and easy-to-read signs to prevent local communities from wandering into construction areas.** **Project activities will be only done in the project area, not beyond the border to avoid any increase in the footprint of the project.**	**Minor (L)**
Safety of Residents of nearby villages and farmers	**Residents of Uchkizil, Kaftarkhana, and other villages which uses the Uchkizil Lake for watering their animals**	**Critical**	**Very Likely**	**High (H)**	**All activities related to traffic and transportation within the scope of the Project will be carried out in accordance with the provisions of the Law "On Traffic Safety".** **Prior to project equipment and machinery transportation, a traffic survey/study shall be done which includes necessary oversize haulage permits, local and international regulations along the path from origin to the project area.** **A Traffic Management Plan shall be developed. The plan must confirm the designated access routes, site entrance points, speed limits, waiting, parking areas and map out accident and traffic hotspots for project access vehicles etc. Construction traffic management to limit impacts on local communities, personnel and other road users should be outlined in the plan.**	**Moderate (M)**
Increase in vehicle flow on the local roads and M39 Highway	**Road users, drivers in local roads and highways**	**Negligible**	**Certain**	**Moderate (M)**	**Necessary information and baseline data should be obtained from the local police force prior to development of traffic management plan.** **Proper signage on service road and project access road shall be ensure all the time** **Buses will be used to transport laborers and carpooling among staff encouraged (social distancing due to COVID-19 should be considered).** **Route directions and speeds limit will be placed along the access road into the project site.** **Delivery of construction materials will be coordinated to reduce congestion on local roads and to reduce the waiting time for the drivers.** **Where applicable the Contractor will obtain the relevant permits to transport heavy loads and oversize cargos into the project site and adhere to the requirements outlined in the permit (i.e. delivery routes and timings).** **Where applicable, the Contractor will notify the local communities on delivery of wide/heavy loads and how it could potentially impact their road use.** **Heavy duty vehicle's drivers will be competent and legally authorized to operate such vehicles in the Uzbekistan and across borders where applicable.** **No construction vehicles will be allowed to use the access roads leading to communities near the Project site and will remain within the designated routes.** **The contractor will train its personnel on traffic safety. If possible Uchkizil traffic police will prepare and conduct the training.** **Every traffic accident and incidents will be recorded and investigated. Corrective actions will be followed and implemented. The local police department will be involved in the process.** **A grievance mechanism will be established to allow local communities to make complaints relating to Project drivers.** **In case any livestock injured or dies by project vehicles, compensation will be done. Prices of livestock will be identified by local market and community leaders.** **Transportation of any unauthorized personnel or goods by project drivers will be banned and will be announced on project notice board.**	**Minor (L)**

11.4.2 Operational Phase

During the operation phase, impacts to transportation infrastructure will not be as high as the construction phase. Operation of the Project will not require continuous delivery of materials or other equipment. Chemical delivery, waste transportation, and occasional maintenance will be the main cause of traffic during the operation. None of these are expected to create significant negative impacts on the local roads. Staff movements will also contribute to minimal additional vehicle flows on the local roads and internal site roads.

There are potential safety risks associated with the transport of chemicals during the operation phase, other hazardous materials, and the removal of hazardous wastes. Risks derived from hazmat transport are spillages (to land, drains, waterways) chemical fumes, fire, or direct exposure to local communities (or other road users). The resulting magnitude of impacts will depend on the type of exposure and sensitivity of receptors but can potentially be of high significance.

Although such risks will primarily be under the responsibility of suppliers and service providers, it will be necessary for the project to engage with the selected suppliers to ensure that processes are in place for effective responses to be made in the event of emergencies and to attempt to reduce the likelihood of such events from occurring.

All potential impacts caused by traffic and transportation during the operation phase and mitigation measures are presented in Table 133. Mitigation measures will further reduce the impacts and therefore residual impacts will be minor or moderate on the environment.

11.5 CUMULATIVE IMPACTS

The purpose of a cumulative impact assessment of traffic and transportation is to determine how the potential impacts of the proposed project might combine cumulatively, with the potential impacts of other projects. All potential impacts caused by traffic and transportation during the construction and operation phase are presented in Section 11.4. The summary of cumulative impacts of traffic and transportation is presented in Table 134.

Table 134: Summary of Cumulative Impacts of Traffic and Transportation

Environmental and Social Aspects	Construction Phase	Operation
Cumulative Impacts	**There are no known development projects in the vicinity of the Project Area.** **In the case of another project and/or development in the same region at the same period, it is expected that the traffic increase on the local roads and the related safety problems will increase during the arrival of the construction materials and workers to the site.**	**If there exists a new development that will contribute to the traffic in the near region. Therefore, the Traffic Management Plan will be revised accordingly. Additionally, the transportation of hazardous materials and the commuter hours of the employees will be revised within this scope.**

11.6 MONITORING

Standard daily monitoring of on-road incidents or any complaint from the local communities will be conducted in accordance with national requirements.

12. ARCHAEOLOGY and CULTURAL HERITAGE

12.1 STANDARDS AND REGULATORY REQUIREMENTS

12.1.1 National Requirements

The main legislation related to protection of archaeology and cultural heritage in Uzbekistan are given below:

- Law "On the Protection and Use of Objects of Archaeological Heritage", No. 229 dated October 13, 2009, (as amended on April 18, 2018),
- Law "On the Protection and Use of Cultural Heritage" No. 269 dated August 30, 2001 (as amended on April 18, 2018),
- Decree of the Cabinet of Ministries of the RUz "On measures on further development protection and usage the cultural heritages" No.269. dated 29 July,2002

The purpose of *Law "On the Protection and Use of Objects of Archaeological Heritage"*, shall be to regulate relations in the sphere of protection and use of the objects of archaeological heritage. Objects of archaeological heritage shall be considered those inserted in State register of objects of cultural heritage. The state shall have exclusive right of ownership of the objects of archaeological heritage. State protection, conservation and management of the objects of archaeological heritage shall be carried out in accordance with the legislation on protection and conservation of the objects of cultural heritage. Objects of archaeological heritage shall be subject to compulsory state registration.

Law "On the Protection and Use of Cultural Heritage" regulate the protection and use of cultural and archaeological objects; but these relate more explicitly to State measures for preservation, excavation, and use of objects of cultural heritage. The Law on the Protection and Use of Cultural Heritage is directed primarily at preservation and management of important elements of the built environment, but also addresses protection of historical, archaeological, aesthetic, ethnological, or anthropological territories, as well as natural landscapes connected with historical event. Official permission from the Ministry of Culture of the RUz should be received prior to starting rehabilitation works.

According to *Resolution of the Cabinet of Ministries of the RUz "On measures on further development protection and usage, the historical heritages"* for artifacts/findings nonregistered yet which could be evaluated as cultural heritage, a full procedure on registration needs to be implemented.

12.1.2 Lender Requirements

IFC, PS8, Cultural Heritage state that "the importance of cultural heritage for current and future generations. Consistent with the Convention Concerning the Protection of the World Cultural and Natural Heritage, this Performance Standard aims to ensure that clients protect cultural heritage in the course of their project activities. In addition, the requirements of this Performance Standard on a

project's use of cultural heritage are based in part on standards set by the Convention on Biological Diversity."

According to Performance Standard 8, cultural heritage means "tangible cultural heritage types such as movable or immovable object, property, area, building or group of structures of archaeological (prehistoric), paleontological, historical, cultural, artistic and religious value, sacred settlement, Intangible cultural types that bear sacred values such as rocks, lakes and waterfalls, which are recommended to be used for commercial purposes such as cultural knowledge, innovation and practices that reveal unique natural features or tangible objects and traditional lifestyles of communities ".

For tangible cultural heritage items, applicable laws that fulfill the legislative obligations of the country where the project is located must be followed. With this law, cultural heritages must be determined and protected by the practices accepted in the world for the protection, finding, research and certification of cultural heritages by authorized institutions.

It seeks to protect the adverse impacts of project activities and support their preservation and promote equitable sharing of benefits from the use of cultural heritage. Therefore, the project will be assessed in line with (Assessment and Management of Environmental and Social Risks and Impacts) and PS8 (Cultural Heritage).

12.2 OBSERVATIONS AND BASELINE CONDITIONS

As depending on the desktop studies and field survey, no archaeological, cultural heritage and historical monuments were identified or encountered within the borders and immediate surroundings of the Project Area.

On 13th July 2021, UzAssystem sent a request letter to the Ministry of Culture of the RUz requesting information regarding any archaeological or cultural sites near or within the proposed Project Site. In official response of Ministry dated 28 June 2021 (see Attachment D), the archaeological and cultural sites in the region were listed and it was observed that there were no officially known archaeological or cultural artifacts/findings in the project area or its immediate surroundings.

12.2.1 Sensitive Receptor

There are not officially known archaeological or cultural artifacts/findings in the project site or its immediate surroundings. Therefore, the only potential receptors are unknown buried artifacts/findings.

12.3 POTENTIAL IMPACTS, MITIGATION, MANAGEMENT & RESIDUAL IMPACT

12.3.1 Construction Phase

Although there are no observed archaeological remains or cultural heritage that will affect or be affected by the future Project activities, there is still some probability that archaeological or cultural artifacts/findings can be unearthed at any time during the construction period. For that reason, a "Chance Find Procedure" will be prepared for the area to be reserved for construction activities. This procedure should be prepared and applied during the site preparation and construction periods of the Project by construction contractors.

The main intention of the procedure is to point out that it is beholden of all parties on the construction site to cease all works immediately and inform the relevant authorities, and the proposed steps will be taken under the supervision of the authorities.

The training of the project workers will include the "project requirements, protection of cultural and archaeological heritage, laws and legislations related with the archaeological and historical monuments and chance find procedure". Such kind of training should be included within the "Induction Trainings" of the construction contractors.

The impacts of the Project activities on the buried archaeological and cultural artifacts/findings and measures to be applied during site preparation and construction phases are presented in *Table 135*.

As seen from the table, the impact of the future Project activities on the cultural environment will be minor, upon implementation of the "Chance Find Procedure" during site preparation and construction activities, because, there are no archaeological and historical remains at the site.

12.3.2 Operational Phase

Although there are no archaeological remains or cultural heritage that will affect or be affected by the future Project operation activities. If buried archaeological or cultural artifacts/findings were found in the Project Area, they would have been disturbed and removed during the construction phase. If all necessary mitigation measures are implemented, no permanent impact is expected on the environment. Therefore, it is foreseen that the impact of the operation on cultural heritage will be insignificant.

12.4 MONITORING

Standard daily and regular monitoring will be conducted for buried archaeological or cultural artifacts/findings in compliance with the "Chance Find Procedure" during the site preparation and construction periods.

Table 135: Significance Impacts on Archaeological and Cultural Artifacts/Findings during the Construction Phase of the Project; and Mitigation and Management Measures

Potential Impacts	Receptor	Severity	Probability	Potential Impact Significance(Pre Mitigation)	Mitigation and Management Measures	Residual Impacts (Post Mitigation)
Damage on buried archaeological and cultural artifacts/findings	**Archaeological and cultural artifacts/findings**	**Marginal**	**Likely**	**Moderate (M)**	**The Contractor will develop a "Chance Find Procedure" as in line with the Environmental & Social Management System.** **The Contractor will develop "Cultural Environment Management Plan (including regular monitoring)" to be applied during site preparation and construction works in line with the Environmental & Social Management System.** **The Contractor will develop a "Training Program" for the workers regarding the archaeological and historical monuments as in line with the Environmental & Social Management System.** **Contractors and/or subcontractors and other personnel at the construction site will be informed/trained about the archaeological site and historical artifacts/findings before the construction, excavation and land arrangement works are started. This briefing will ensure the personnel to be informed when findings are found.** **The work (Excavation and others) shall be suspended immediately, a local administration (khokimiyat) shall be informed, and the works shall be continued under the supervision of an organization that will be appointed by the authorities.**	**Minor (L)**

13. LANDSCAPE AND VISUAL AMENITY

13.1 STANDARDS AND REGULATORY REQUIREMENTS

There are no well-recognized legislations on visual impact assessment (VIA) studies across the world and RUz, either. However, there are some guidelines established and widely used. One of which is and the most commonly used one is the "Scottish Natural Heritage Environmental Impact Assessment Handbook". The VIA work within the scope of this project was performed in parallel to "Guidelines for Landscape and Visual Impact Assessment 3rd Edition"[57].

13.2 OBSERVATIONS AND BASELINE CONDITIONS

In the European Landscape Convention definition, 'Landscape' means an area, as perceived by people, whose visual features and character are the result of the action and interaction of natural and/or human factors. All landscapes combine natural components (such as geology, soils and watercourses) and human influences (such as settlement and land use) with cultural perceptions (such as history, social associations and aesthetic values).

Visual impact can be defined as any alteration in landforms, water bodies, or vegetation, or any introduction of structures or other man-made visual elements, that negatively or positively affect the visual characteristics or quality of a landscape and the visual experience of people viewing the landscape through the introduction of visual contrasts (opposition of different forms, lines, colors, textures in a landscape) in the basic elements of form, line, color, and texture. They cover the impacts on specific views and on the general visual amenity experienced by people and the potential visual impact is primarily originated from changes in visual characteristics in the view field.

Baseline conditions represent the existing scenic conditions of the Project area independent from the Project. The first step in any landscape or visual impact assessment is to identify the existing landscape and visual source in the vicinity of the Project that is the baseline visual conditions.

The Project area is located in the very south of the RUz close to the border between Uzbekistan and Afghanistan (the distance to the State border is 14 km) in the Surkhandarya intermountain area (Surkhan-Sherabad valley), inclined from north to south, to the floodplain of the Amudarya river. Like other intermountain valleys of Central Asia, the Surkhan-Sherabad Valley is a densely populated ancient agricultural oasis. Most of the valley is occupied by cultural landscapes (mainly agricultural landscape and residential landscape). Based on the field studies and satellite views, the areas of natural landscapes preserved in the central part of the valley on the Kattakum sandy massif and on the Khaudaktau Upland are intensively used by the local population for grazing, including the project area.

The Project area covers approximately 75 ha unused in agriculture lands with an average elevation of +337 m above the sea level. The Project area is adjacent to the north bank of the Uchkizil reservoir, which is +318 m above the sea level. The nearest town is Uchkizil with the population of 3,500, which is located 2 km in the south of the area. Uchkizil town is surrounded by fertile agricultural lands as well as mining, oil and gas industry enterprises.

The potential sensitive receptor is the community is identified as Kattakum Village, which is located 1 km in the west of the site. The project area is part of the water protection zone of the Uchkizil lake and the coastal strip of the Uchkizil lake, and also borders the protected coastal strip of the Zang canal which discharges to the Uchkizil reservoir, is located between the Project area and Kaftarkhana).

There are no green spaces (woody and herbaceous vegetation) on the construction site of the Project. Arboreal plantations (from decorative – thuja, pine, mulberry, from fruit-flavored, and stone fruits - apple, apricot, walnut, almond), as well as grapes are found on the territory of the nearest village "Uchkizil". In 1.2 km to the north-west of the planned Project territory there is a waste recycling enterprise - "Biotechnoeco" Ltd.

The nearest protected area is at a distance of 11 km ("Khaudaktau"). There are places for recreation on the shore of Lake Uchkizil, including the Termez Marvaridi recreation area and a sanatorium.

13.2.1 Sensitive Receptors

The nearest town is Uchkizil with a population of 3,500 which is located 2 km in the south of the area. Uchkizil town is surrounded by fertile agricultural lands as well as mining, oil, and gas industry enterprises. The potential sensitive receptor in the community is identified as Kattakum village, which is located 1 km west of the site, Uchkizil and Kaftarkhana Towns.

13.3 POTENTIAL IMPACTS, MITIGATION, MANAGEMENT & RESIDUAL IMPACT

13.3.1 Construction Phase

The sensitivity of landscape or in other words, the sensitivity of high valued landscapes depends on its inherent quality, condition, and its ability to adjust changes. The sensitivity of the ones who are exposed to visual impact is based on their location and viewing opportunity. The potential sizes of the impacts on visual amenity and on the elements composing landscape depend on the nature and intensity of changes derived from development.

The assessment of landscape sensitivity was conducted by examination of the locations for permanent facilities. Therefore, visual impacts and landscape impacts are closely connected with predicted changes in terrain, soil, and vegetative cover.

In that regard, the project sites are assessed in terms of their landscape and visual aspects to determine the areas with high landscape value that can be impacted by the project activities at the project site and its close vicinity.

However, there is no element at the project site, which is planned to be constructed at the uncultivated (see Figure 86) flat land surrounded by Uchkizil and Kaftarkhana Towns town and agricultural areas (see Figure 87), and its close vicinity that can be considered as natural landscape element except Uchkizil lake (see Figure 88). Moreover, there is no natural vegetation that can be considered as visual landscape element at the project site. There are only bushes suitable for desert vegetation near the facility.

The landscape and visual impacts will be potentially resulted from the elements listed below:

- Possible changes in elements and the physical structure of landscape, and the impacts on the general landscape characteristic due to construction and operation activities at the project site;
- The impacts of landscape and visual changes on people due to construction and operation activities.

Construction activity is highly visible activity. The elements of construction may cause a significant change in the landscape in which they are conducted. On the other hand, all of these are temporary activities. The activities will become significant for a couple of months at any location.

It is not possible that the project may continue after the construction period including construction camps and construction activities at any location. Design and implement an appropriate landscaping programme will help in re-vegetation of part of the

The potential impacts on landscape and visual amenity during the construction phase and mitigation measures are presented in Table 136. Mitigation measures will further reduce the impacts and therefore residual impacts will be moderate on the environment.

Figure 86: General view of the site for the construction of the CCPP

Figure 87: View of the agricultural lands on the northern side of the CCPP

Figure 88: View of Lake Uchkizil from the southern side of the CCPP

For the terrain that will be affected by the construction activities, the interfered topography shall be reinstated as it was to the extent possible. The first activity to be performed during the landscaping studies is leveling. Subsequent to leveling, the topsoil will be spread over the terrain by establishing underground and above-ground drainage systems at required locations. Basically, the land topography will be reinstated as compliance to the natural structure of the terrain, climate of the region and the soil characteristics at the areas where construction activities are conducted and the permanent facilities are built. The most significant stage after the spreading of the topsoil is the planting process. The planting process will be carried out by the species that are specific to the area (natural plant species if possible). The detection of the species that is specific for the area, using the right planting methods, execution of good design and monitoring and maintenance programs will enhance the success of the landscaping studies.

All details about landscaping activities will be presented in the landscape project to be prepared for the project till the end of the construction phase.

Table 136: Significance Impacts on Landscape and Visual Amenity during the Construction Phase of the Project; and Mitigation and Management Measures

Potential Impacts	Receptor	Severity	Probability	Potential Impact Significance (Pre Mitigation)	Mitigation and Management Measures	Residual Impacts (Post Mitigation)
Change in existing Landscape	**Residential and commercial areas in, Kattakum Village, Kaftarkhana & Uchkizil Towns**	**Marginal**	**Certain**	**High (H)**	**Top soil management measures will be implemented.** **Slope design and erosion control will minimize short and long term erosion. Re-vegetation with native species will be applied as much as possible.** **Fences adjacent to the neighboring properties will be kept in good condition throughout the Project life.** **At the end of construction, the campsite will be decommissioned and any waste from these facilities or construction materials will be properly disposed of.**	**Moderate (M)**
Disturbance on visual view on receptors	**Residential and commercial areas in, Kattakum Village, Kaftarkhana & Uchkizil Towns**	**Marginal**	**Certain**	**High (H)**	**Minimize the extent to which Project activities will be visible from various view locations;** **Minimize the visual contrast between the main infrastructure elements associated with the Project and the surrounding landscape in which they will be seen.** **The number of lights during nighttime works will be kept to a minimum, insofar as is consistent with maintaining operations and health and safety requirements. Light spill will be contained to the greatest extent possible e.g. by using directional lighting wherever possible. If required based on feedback of affected people an additional shielding might need to be installed.** **Regular monitoring of the affected people's feedback with regards to visual impacts will be provided.**	**Moderate (M)**

13.3.2 Operational Phase

The objective of the landscape studies during the operation phase is to provide the visual screening of the landscape damaged during the project activities and to create an environment that has scenic value and is consistent with the natural structure.

The map showing the visibility of the study area of the Project is given in *Figure 89* which is determined as a 10 km circular area drawn from the center of the Project area. The detected 10 km study area is based upon the Project description, site visits, and good practice guidance. This map is created based on the height of the stack, which is the highest component of the planned Project. As can be seen from the figure, the planned facility stack can be seen from many regions (including from Turkmenistan and Afghanistan) due to the fact that there are not many obstacles around the project area and due to its topography. Other structures, such as power blocks, cooling towers and associated electrical transmission lines, will also be visible, although not as much as the stack's visibility (see Figure 90- Figure 93).

Although relatively long distances may exist between potential view locations and infrastructure within the Project area, the color contrast and reflectivity of materials and finishes will be taken into account when selecting construction materials with the aim of minimizing any potential visual impacts.

In that regard, the topsoil stripped during the excavation works will be used for landscaping activities during the operation phase, with the intention to constitute a vegetative cover, primarily at the location where it was stripped and in the vicinity.

The maintenance process is a significant phase, during when the application area should be controlled periodically; the plants that are damaged and cannot grow should be replaced. When required, maintenance works such as irrigation, fertilization, pruning, disinfection, protection against external impacts, should be carried out.

The visual screening of the newly constructed facilities will be accomplished through landscape applications. The project area will provide ongoing screening for a number of surrounding view locations resulting in a reduction or complete mitigation of visual impact.

The re-establishment of vegetation cover across disturbed areas were not conflicting with longer-term operational infrastructure will help to increase the visual absorption capability of the landscape within the Project area and reduce the overall visibility of the Project infrastructure.

The potential nighttime lighting may issue of direct light spill from floodlights or other lighting elements toward surrounding rural residential dwellings and roads. It will be minimized through compliance with UK CIBSE Lighting Guidance (or international equivalent) to avoid unnecessary light spill into dark areas.

During colder and drier periods, there may also be a visual impact linked to steam plumes from the cooling towers, which will tend to rise vertically from the cooling blocks.

There will also be a visual impact linked to steam plumes from the cooling towers during colder and drier periods.

All potential impacts on landscape and visual amenity during the operation phase and mitigation measures are presented in Table 137. Mitigation measures will further reduce the impacts and therefore residual impacts will be moderate on the environment.

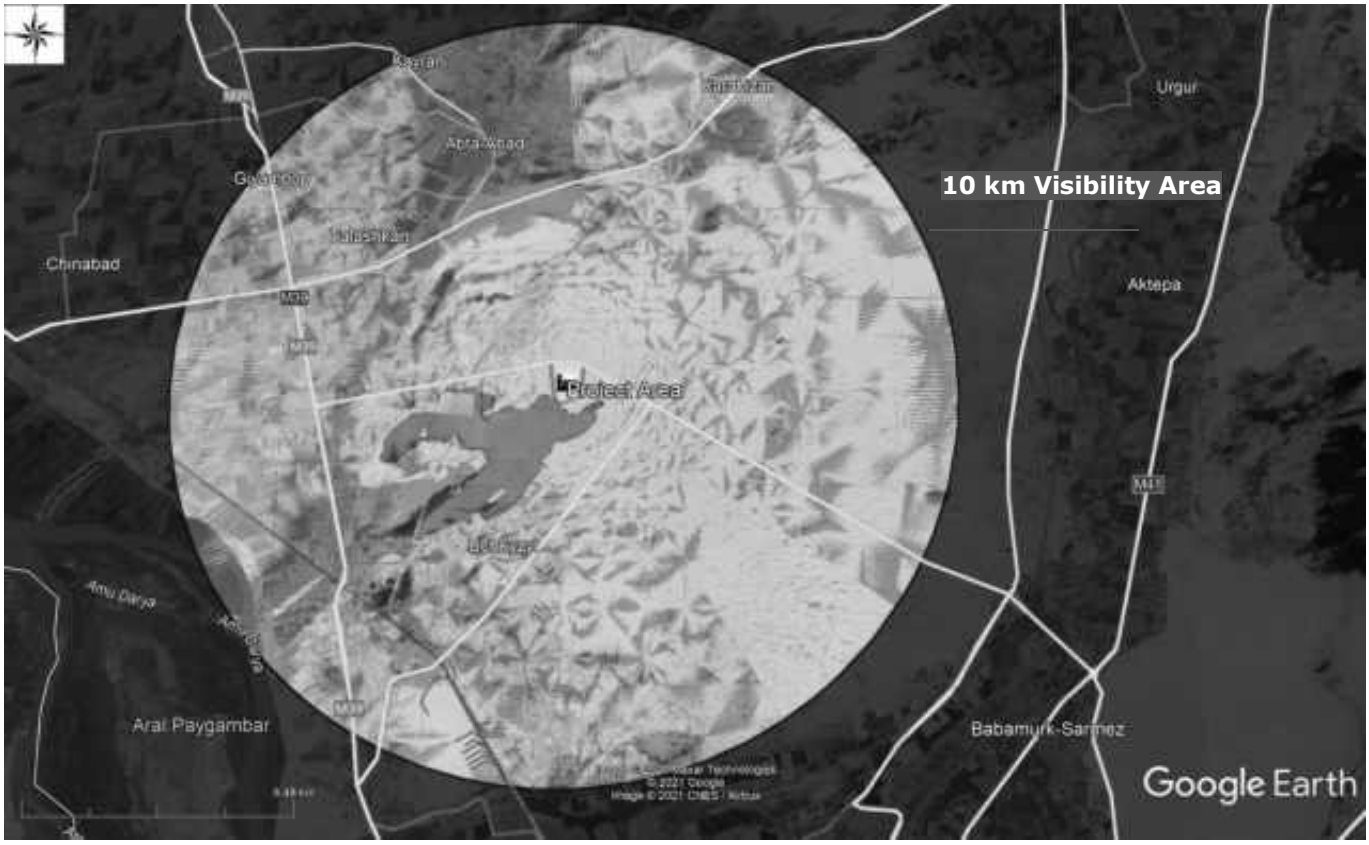


Figure 89: Project Area visibility within the 10 km radius area (Project Area can be seen from the green shaded areas)

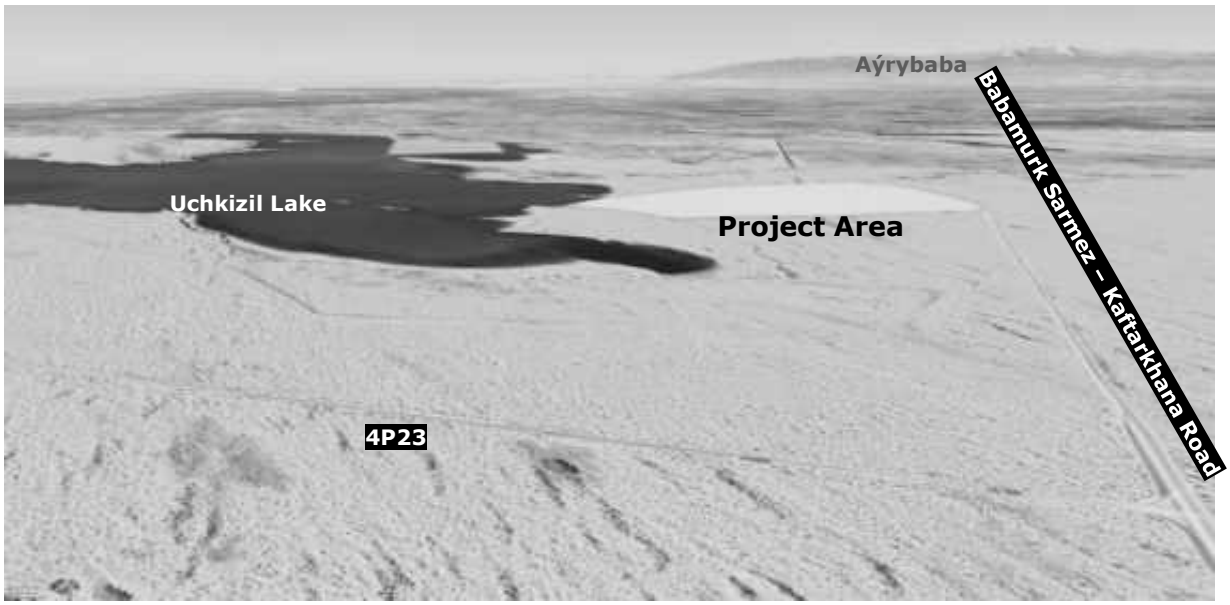


Figure 90: View of the Project Area from the east direction

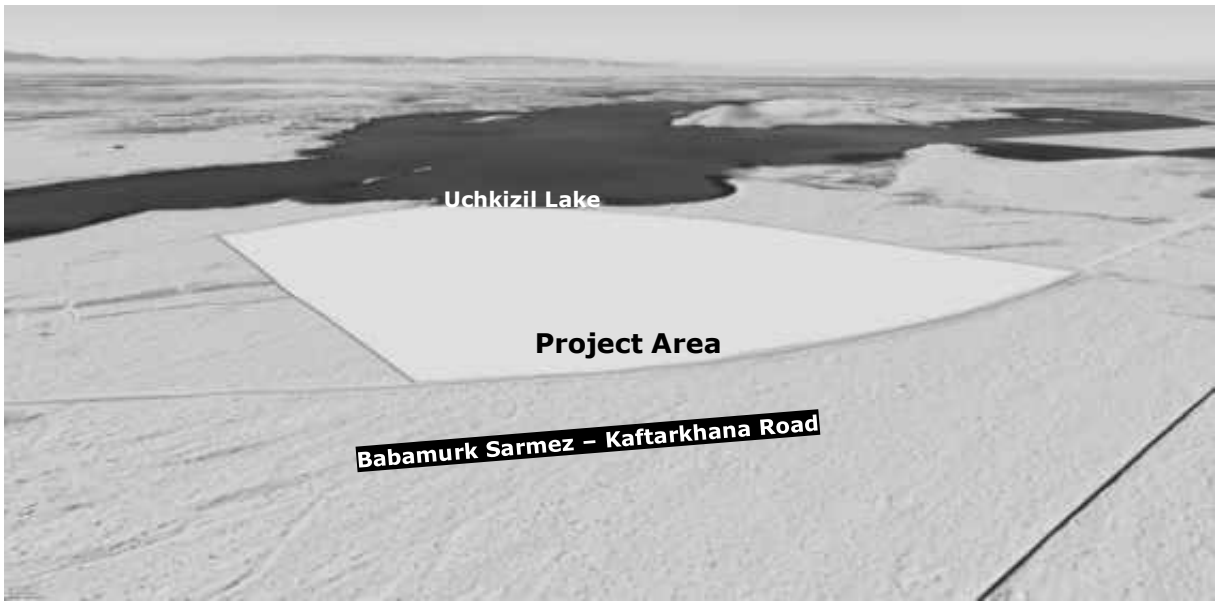


Figure 91: View of the Project Area from the north direction

Figure 92: View of the Project Area from the west direction

Figure 93: View of the Project Area from the south direction

Table 137: Significance Impacts on Landscape and Visual Amenity during the Operation Phase of the Project; and Mitigation and Management Measures

Potential Impacts	Receptor	Severity	Probability	Potential Impact Significance(Pre Mitigation)	Mitigation and Management Measures	Residual Impacts (Post Mitigation)
Loss of existing Landscape	**Residential and commercial areas in, Kattakum Village, Kaftarkhana & Uchkizil Towns**	**Marginal**	**Certain**	**High (H)**	**The landscaping will be ensured.** **Re-establishment of vegetation cover will be ensured with native plants on disturbed area** **Color selection and finishes for key infrastructure elements will be considered as part of the design process within the Project area.** **Minimize the extent to which Project activities will be visible from various view locations.** **Shiny building materials will be avoided** **Minimize the visual contrast between the main infrastructure elements associated with the Project and the surrounding landscape in which they will be seen.** **The number of lights during nighttime works will be kept to a minimum with the except flight corridors, insofar as is consistent with maintaining operations and health and safety requirements. Light spill will be contained to the greatest extent possible e.g. by using directional lighting wherever possible. If required based on the feedback of affected people an additional shielding might need to be installed.** **Regular monitoring of the affected people's feedback with regards to visual impacts will be provided.**	**Moderate (M)**
Disturbance on visual view on receptors	**Residential and commercial areas in, Kattakum Village, Kaftarkhana & Uchkizil Towns**	**Marginal**	**Certain**	**High (H)**		**Moderate (M)**

13.4 CUMULATIVE IMPACTS

All potential impacts on landscape and visual amenity during the construction and operation phase are presented in Section 13.3. The summary of cumulative impacts on landscape and visual amenity is presented in Table 138.

Table 138: Summary of Cumulative Impacts on Landscape and Visual Amenity

Environmental and Social Aspects	Construction Phase	Operation Phase
Cumulative Impacts	**There are no known development projects in the vicinity of the Project Area.** **If any simultaneous activity is planned in the region, the visual disturbance and dust emission that will result from the temporary construction activities on the local receptors in the region will be assessed as a cumulative effect.**	**The development of a similar industrial activity in the region will permanently change the landscape character of the Project area, which is currently dominated by predominantly agricultural areas and Uchkizil Lake.**

14. CLIMATE AFFAIRS

14.1 STANDARDS AND REGULATIONS

14.1.1 National Context and Regulations

The main legislation related to climate change and green economy in Uzbekistan are given below:

- Law "On the Rational Use of Energy" No. 412-I, dated April 25, 1997 (as amended on July 14, 2020)
- Decree of the President of the RUz. "On approval of the Strategy on transition of the RUz to the "green" economy for the period 2019-2030", No. 4477, dated October 4, 2019.
- Decree of the President of the RUz, "On approval of the Concept of environmental protection of the RUz until 2030", No.5863, dated October 30, 2019

The *Law "On the Rational Use of Energy"* aims to ensure efficient and environmentally sound use of energy in its production and consumption; encourage the development and application of energy efficient technologies; extraction and production of less expensive petroleum products, natural gas, coal and other types of natural fuel; ensure accuracy and uniformity of measurements, as well as accounting for energy produced and consumed in terms of both quality and quantity; execution of supervision and control by the state over the efficiency of energy production and consumption, as well as over the state of energy equipment and energy supply and consumption systems.

Uzbekistan is a party to the UNFCCC, the Kyoto Protocol and, the Paris Agreement, since November 2018. Uzbekistan submitted the Third National Communication (TNC) in 2016, includes three different emission scenarios until 2030.

This strategy aims to enable the adoption of comprehensive measures aimed at deepening structural transformations, modernization and diversification of key sectors of the economy through a balanced socio-economic development of territories. The document lists seven goals to pursue. Among them are increasing energy efficiency, develop renewables, and transform the state's apparatus. Climate targets in this law Reduction in specific greenhouse gas emissions per unit of gross domestic product by 10% from the level of 2010 until 2030.

The Strategy has a framework character. It defines priority areas for both mitigation and adaptation. Its implementation will be ensured through measures included in sectoral plans and strategies.

The Strategy has the following priority areas:

- Increased energy efficiency in key economic sectors;
- Diversification of energy resources consumed and the development of RES;
- Climate change mitigation and adaptation, increased efficiency of the use of natural resources and conservation of natural ecosystems;
- Development of financial and other mechanisms to support green economy.

Implementation of the Strategy is to be ensured by the Intergovernmental Council to Promote and Implement Green Economy (composed of ministers and chairpersons of state committees). It is planned to prepare annual action plans for implementation of the Strategy. The Strategy does not include any assessment of costs of its implementation. Furthermore, no mechanism for reporting on implementation is envisaged by the Strategy. The Concept on Environmental Protection until 2030, adopted in October 2019, provides for a number of measures to improve the use of economic instruments in support of environmental protection. The Concept envisages reduction of the amount of controlled pollutants; ensuring the dependence of pollution charges on the volume of emissions and discharges and their level of hazard to the environment and public health; and the introduction of feed-in-tariffs for renewable energy. It is also planned to develop a mechanism for the economic valuation of biodiversity and ecosystem services.

14.1.2 Lender Requirements

Paris Convention

The Paris Agreement is the legally binding international treaty on climate change within the United Nations Framework Convention on Climate Change (UNFCCC) on climate change mitigation, adaptation, and finance. The convention is adopted by 196 parties. It was signed on 12 December 2015 and entered into force on 4 November 2016. The objective of the convention is to stabilize greenhouse gas concentrations in the atmosphere at a level that would prevent human-induced interference with the climate. The convention's long-term goal is that to sustain the global average

temperature below 2 degrees Celsius and further pursuance of 1.5 degrees Celsius. Emissions should be reduced as soon as possible to achieve the balance between human-induced emissions by sources and removal of them by greenhouse gas sinks. Under the Paris Agreement, each country must do plans and programs on mitigation of global warming.

Intergovernmental Panel on Climate Change (IPCC)

The IPCC is the intergovernmental body of the United Nations devoted to providing information regarding the scientific basis risks of climate change impacts driven by the human interference. IPCC covers the scientific and socioeconomically information regarding the human interference on climate change with its natural, political, and economical aspects and risks and suggest adaptation and offset strategies, by assessing the published literature and making it internationally accessible.

The Intergovernmental Panel on Climate Change (IPCC) is a panel that publishes reports on climate change and greenhouse gases, stating the situation at certain times and revealing the risks. According to the IPCC, the continuous release of GHGs increases the likelihood of the severe, common and irreversible effects causing more heating in all components of climate change and causing long term alterations. The limitation of the climate change will require significant and continuous declines in the GHG emissions that is likely to limit the climate change risks along with the adaptation.

Cumulative CO_2 emissions determine the global average surface heating on a great extent in the late 21st century and beyond. Estimate of GHG emissions varies depending upon the socioeconomic development and climate policy on a wide range. (IPCC,AR5 Synthesis Report: Climate Change 2014)

When calculating the non- CO_2 GHGs, they are calculated in terms of "CO_2 equivalent" (CO_2-e) according to their contribution to increase the greenhouse effect. CO2 equivalent of a gas is calculated using an index so-called Global Warming Potential (GWP).

Kyoto Protocol

The Kyoto Protocol is an international treaty which extended the 1992 UNFCCC that obligates state parties to reduce greenhouse gas emissions, based on the scientific agreement that (part one) global warming is occurring and (part two) that human-made CO_2 emissions are driving it. The Protocol was adopted in Kyoto, Japan, on 11 December 1997 and entered into force on 16 February 2005. There were 192 parties to the Protocol in 2020. The Kyoto Protocol implemented the objective of the UNFCCC to reduce the global warming by reducing greenhouse gas concentrations in the atmosphere to "a level that would prevent dangerous human caused intrusion with the climate system". The Kyoto Protocol applied to the six greenhouse gases. Carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF6).

The United Nations Framework Convention on Climate Change (UNFCCC)

UNFCCC is the international environmental treaty on climate change and adopted by 154 nations. It aims to stabilize the greenhouse gas concentrations up to a tolerable level that would prevent the human-induced climate threats to the ecosystem. The safety level can only be achieved within a timeframe that allows the climate adaptation and resilience. In this way, production is not threatened, and economic development will not be impeded according to the UNFCCC provisions.

International Finance Corporation/World Bank (IFC/WB)

In line with greenhouse gas and climate studies, World Bank (WB) developed a methodology, aims to enhance access to the GHG analysis, information, capacity and additional climate finance. Developing this methodology, present UNFCCC methodologies, IPCC International GHG Inventory guidelines, GEF

and CDM/JI methodological frameworks, GHG Protocol Initiative Standards World Bank Environmental Department documents and methodologies applied by other international finance institutions have been utilized.

The World Bank Group agreed a Country Partnership Framework (CPF) (2016–2020) with Uzbekistan. Climate change is identified as a cross-cutting area of engagement. WBG activities for increased climate resilience focus on three areas [59];

- 1. support to agriculture to increase resilience by diversification to less water-intensive crops, introduction of water saving techniques, and modernization of irrigation systems;
- 2. ensuring all infrastructure investments, including clean and renewable energy deployment would be screened both in terms of physical resilience to likely climate change and of economic returns if climate change considerations were fully costed;
- 3. the continued promotion of the collection of better data on climate change and water flows in the Syr Darya and Amudarya basins and in support of increased consultation by riparian to manage water resources for mutual benefit.

14.2 NATIONAL CONTEXT

Uzbekistan has an arid and continental climate characterized by large variations in temperature within days and between seasons. Large parts of the country (79% by area) feature flat topography either in the form of semi-desert steppes or desert zones, including desert areas in the far west that have formed as a result of the drying of the Aral Sea. The remaining south-eastern areas have a continental climate, including the area covering the largest cities of Tashkent and Samarkand, and contain high mountains forming part of the Tien-Shan and Gissar-Alai Ranges. Summers are long, hot and dry, with an average monthly temperature of 27.2°C in the hottest month (July), and with an average daily maximum of 35°C in many of the major cities. Winters are cold, with average monthly temperatures of −1°C to −3°C between December and February for the latest climatology, 1991–2020, (see Figure 94). Western areas of the country experience relatively colder winter temperatures, whereas temperatures are highest in the south, near the borders with Turkmenistan and Afghanistan. There is considerable spatial variation in precipitation levels. Many western areas receive less than 100 millimeters (mm) of precipitation per year, whereas parts of the east and south-east can receive up to 800–900 mm per year. Figure 95 shows the spatial differences of observed historical temperature and precipitation in Uzbekistan [60].

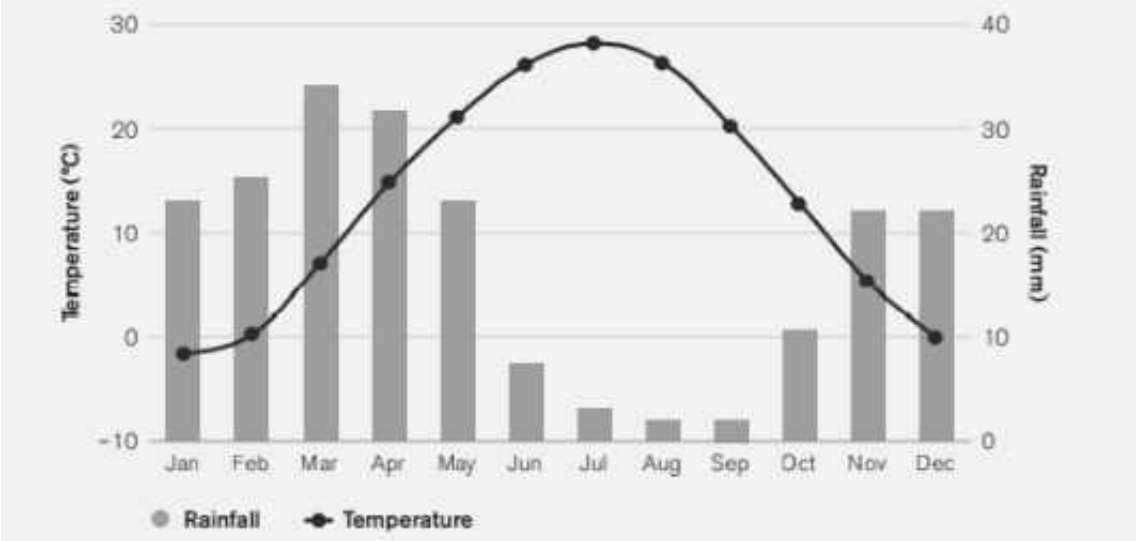


Figure 94: Average monthly temperature and rainfall in Uzbekistan, 1991–2020 [60]

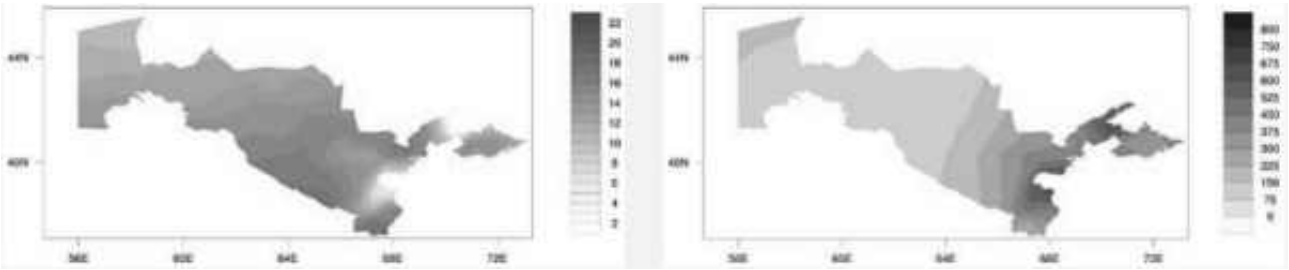


Figure 95: (Left) annual mean temperature (°C), and (right) annual mean precipitation (mm) in Uzbekistan over the period 1991–20201

Average annual air temperatures have risen steadily and significantly in Uzbekistan over the past century, albeit with notable variation from year to year. From 1950 to 2013, temperatures rose at an average rate of 0.27°C per decade. The average annual temperature range has narrowed in Uzbekistan over the same period, with average minimum temperatures rising by 2.0°C and average maximum temperatures by 1.6°C between 1950 and 2013. The drying, or 'desiccation', of the Aral Sea located at Uzbekistan's Northwestern corner has made a minor contribution to climate warming in the local vicinity. Uzbekistan's rate of warming varied considerably by region, with the steepest rises in temperature occurring in the north and in large cities (0.30°C–0.43°C per decade), and less warming occurring in mountainous areas (0.10°C–0.14°C per decade). Warming was fastest in spring (0.39°C per decade) and autumn (0.31°C), while temperature rises were relatively modest in winter (0.13°C per decade) [60].

In contrast to the clear trend in average temperatures, average annual precipitation has not shown statistically significant changes in Uzbekistan in recent decades. A slight decrease in average annual precipitation was observed between 1950 and 2013. Observations from the Tien Shan and Gissar-Alai mountain ranges exhibit some variation between seasons, with a slight increase in winter months (December to February) being offset by slight decreases in other months of the year. El Niño Southern Oscillation (ENSO) has a strong influence over multi-year dry and wet climate variability.

The main data source for the World Bank Group's Climate Change Knowledge Portal (CCKP) is the Coupled Model Inter-comparison Project Phase 5 (CMIP5) models, which are utilized within the Fifth Assessment Report (AR5) of the Intergovernmental Panel on Climate Change (IPCC), providing estimates of future temperature and precipitation. Four Representative Concentration Pathways (i.e. RCP2.6, RCP4.5, RCP6.0, and RCP8.5) were selected and defined by their total radiative forcing (cumulative measure of GHG emissions from all sources) pathway and level by 2100. In this analysis, RCP2.6 and RCP8.5, the extremes of low and high emissions pathways, are the primary focus where RCP2.6 represents a very strong mitigation scenario and RCP8.5 assumes business as-usual scenario [60].

For Uzbekistan, models show a trend of consistent warming despite emissions scenario. However, projections for rainfall are highly variable with no statistically significant change over the past decades. In addition, an increase in intensity for extreme rainfall events is likely.

Overall, weather conditions in the country are expected to become hotter and drier, with more frequent and more intense heatwaves, droughts and modifications in precipitations patterns leading to an increase of related extreme weather events such as heavy rains, floods and mudflows [59].

Greenhouse Gases Trends by Sector

Uzbekistan is a non-annex I party to the UNFCCC, and has submitted, to date, three national communications to the UNFCCC, including inventories of GHG emissions. The latest data, contained in the TNC, issued in 2016 and submitted in 2017, are updated to 2012. The inventory presented under the TNC includes data on emissions and sinks of CO_2, CH_4, N_2O and HFCs, as well as of CO, NOx, non-methane volatile organic compounds (NMVOCs) and SO_2. A new GHG inventory will be compiled in 2020–2021. The inventory does not include data on sulfur hexafluoride (SF_6) and perfluorocarbons (PCFs) due to the lack of relevant data. According to the TNC, in 2012, GHG emissions per capita in the country were 6.9 t of CO2-eq, while total emissions, excluding land use change and forestry (LUCF) sinks were 205.2 Mt CO2-eq (see Table 139). In comparison with 1990, there has been a 13.7 per cent increase in overall emissions and a 21.6 per cent decrease in emissions per capita. In 2012, the energy sector accounted for 82 per cent of emissions (excluding LUCF removals) for a total of 168.1 Mt of CO2-eq., and, as such, was the greatest contributor to the country's GHG emissions. The second biggest contribution to GHG emissions comes from the agricultural sector, accounting for 11 per cent of the emissions in 2012, followed by industrial processes and waste treatment, both accounting for slightly less than 8 per cent of the total GHG emissions of the country. Figure 96 illustrates the fluctuation and GHG emission trends by sector in Mt of CO2-eq. The historical trend of the 22-year period from 1990 to 2012 appears substantially stable, with a gentle, steady increase in emissions, which are being consistently dominated by the energy sector.

Table 139: GHG emissions and removals by sector, 1990, 1995, 2000, 2005, 2010, 2012, Mt CO_2-eq

	1990	1995	2000	2005	2010	2012
Energy	151.2	157.9	172.4	169.2	164.1	168.1
Industrial processes	8.1	5.3	4.9	6.2	7.9	7.8
Agriculture	17	16.7	16.2	16.1	19.9	21.6
LUCF	-1.6	-1.4	-1	0.4	-3.1	-2.9
Waste	4.1	4.3	4.5	4.7	7.3	7.7
Total (including LUCF removals)	**178.8**	**182.8**	**197**	**196.6**	**196.1**	**202.3**
Total (excluding LUCF removals)	**180.4**	**184.2**	**198**	**196.2**	**199.2**	**205.2**

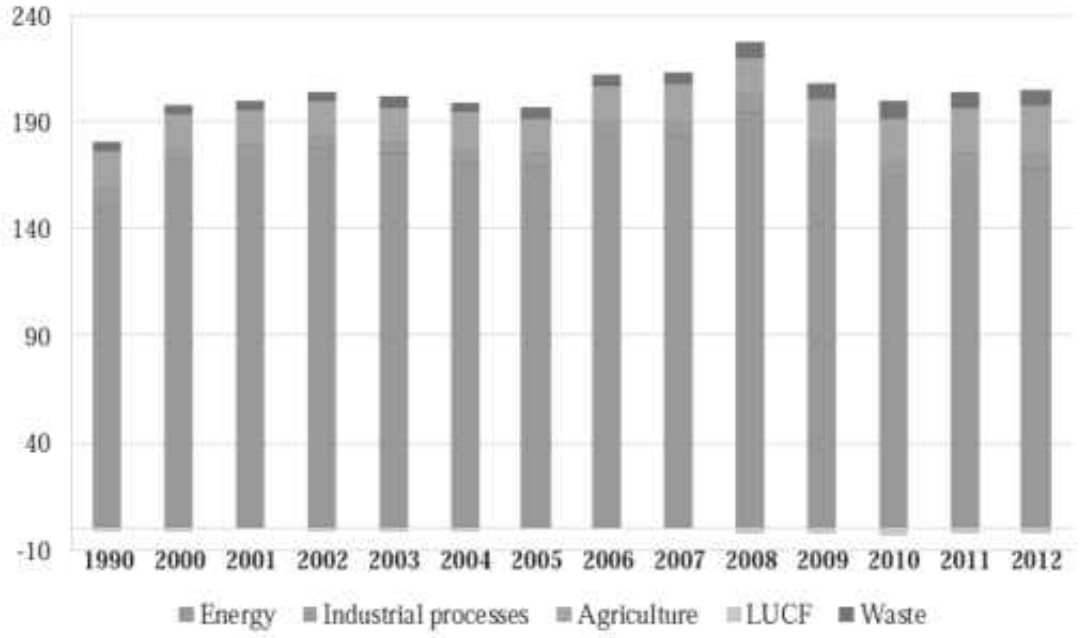


Figure 96: Total GHG emissions by sector, 1990, 2000–2012, Mt of CO2-eq

In 2012, CO_2 emissions accounted for 51 per cent of the overall GHG emissions of the country. Historically, they have accounted for about half the total emissions since 1990 (see *Figure 97*). CH4 emissions increased substantially, from 30 per cent of total emissions in 1990 to 43 per cent of total emissions in 2012 (converted to CO_2-eq.). The third most represented GHG is N_2O, accounting for 5 per cent of total emissions in 2012. In addition to this, the GHG inventory reports negligible quantities of emissions from HFCs (less than 0.1 per cent of the total emissions when converted to CO_2-eq.).

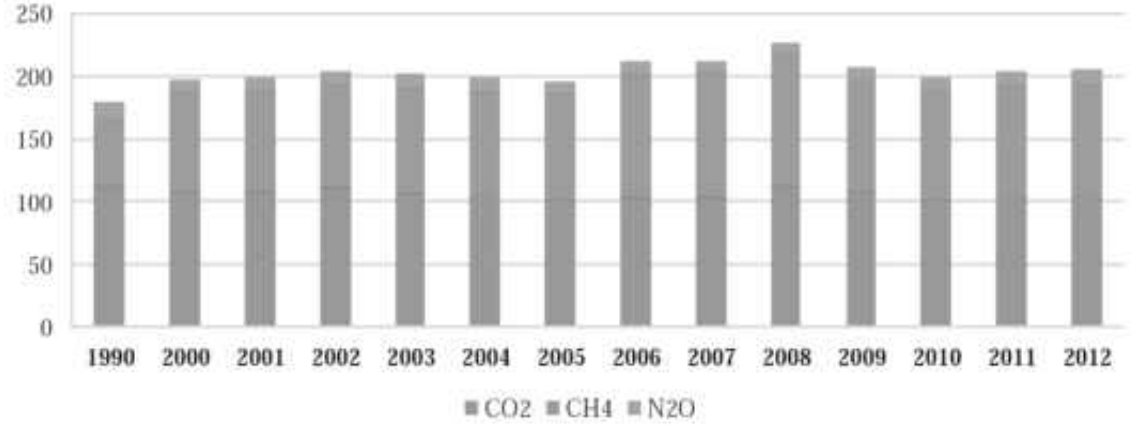


Figure 97: Total GHG emissions by gas, 1990, 2000–2012, Mt of CO_2-eq

Energy is the highest emitting sector in the country, emitting 168.1 Mt CO2-eq. in 2012 and thus accounting for 82 per cent per cent of total GHG emissions of the country (excluding LUCF removals). The contribution of the sector to overall emissions has increased slightly over the years, with an increase of 11.2 per cent in 2012 compared with 1990.

Approximately 75–80 per cent of the electricity in Uzbekistan is produced using natural gas produced in Uzbekistan. Within the energy sector, most emissions come from fuel combustion, accounting for 58 per cent of emissions in 2012, whereas the remaining 42 per cent is due to fugitive emissions. The fuel combustion category includes fuel combustion by energy industries and by manufacturing and construction industries and fuel combustion for transport. On the other hand, the "fugitive emissions" category includes fugitive emissions due to coal mining and processing, and fugitive emissions in the oil and gas sector. It is worth noting that GHG emissions from methane leakage alone account for more than 68.237 Mt CO2- eq. per year in 2012, with an increasing trend from 43.628 Mt CO2-eq. per year in 1990. Methane leakage is a significant issue for the country. Even though many project interventions, including those financed under the Clean Development Mechanism (CDM), have sought to address the issue, it is a growing source of emissions in the country, with its contribution to overall emissions having increased from 22.9 per cent in 1990 to 33.2 per cent in 2012 (see Figure 98).

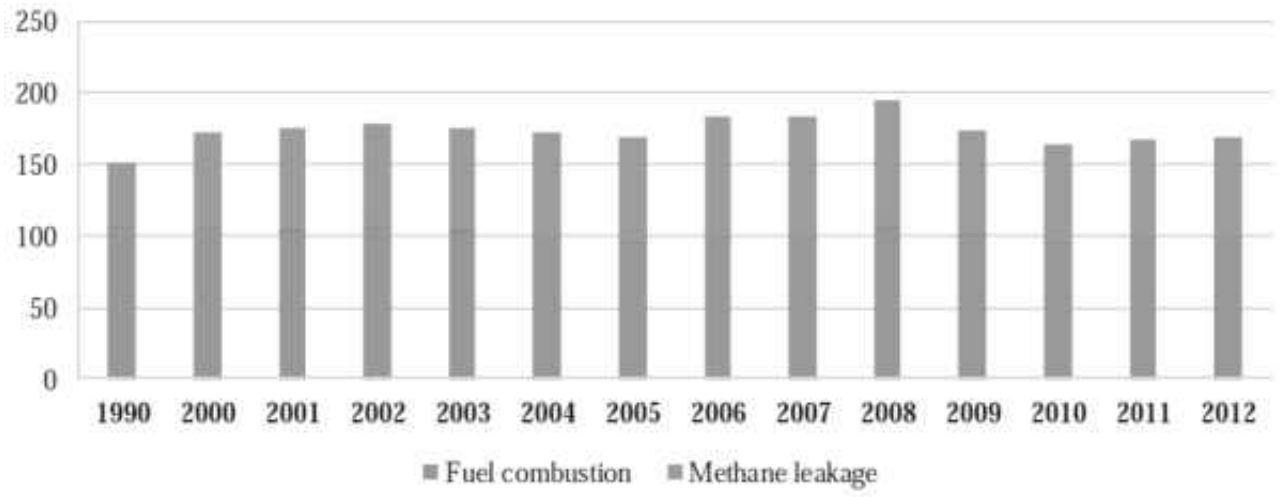


Figure 98: GHG emissions from the energy sector, 1990, 2000–2012, Mt CO2-eq

14.3 CLIMATE CHANGE RISKS

This list of potential climate change risks is based on the results of climate change desktop study (see Table 140) Success criteria for this Project can be divided into three categories:

- Efficiency of CCPP.
- Personnel safety,
- Maintenance and upgrade costs

Table 140: Potential Climate Change Risks

Climate Change Hazard (also Climate Change Response)	Future Projection	Impact on CCPP/ Personnel	Impact on Success Criteria
Increased ambient temperature	**According to the climate change projections, the average temperature is constantly increasing. Increased temperatures and more rapid melting of glaciers elsewhere in the region may lead to severe water shortages along Uzbekistan's most important rivers, the Amudarya and Syr Darya, by the 2040s and 2050s.** **Runoff rates are also expected to become more variable and more seasonal due to the loss of the buffer provided by glacier meltwater.**	**Increases temperature of cooling water source (i.e., Lake Uchkizil) The discharge of thermal waters, thanks to the use of a circulating system of technical water supply of the CCGT unit with the use of air compressor cooling units, will not have a negative impact on the water quality of Lake Uchkizil. According to the project, the discharge of thermal effluents into Lake Uchkizil will not lead to an increase in the water temperature by more than 3 ° C and will not change the chemical composition of the water, because The composition of the blowdown water discharged from the cooling towers is conditionally clean.**	**Reduces efficiency**
		Lowers the ratio of electricity produced to the amount of fuel used in producing it **Load of the Plant may be limited by maximum condenser pressure**	
		Increases life-cycle costs of buildings	**Increased maintenance and upgrade costs**
		Increases heat-related illnesses of personnel	**Reduces personnel safety due to health threat**

Climate Change Hazard (also Climate Change Response)	Future Projection	Impact on CCPP/ Personnel	Impact on Success Criteria
Changes to rainfall intensities and increased likelihood of flooding and flash flooding	**Precipitation and floods are critical for the project. Flood risks increase as a result of increased sudden precipitation events depend on the climate change. Due to the inability of the soil to absorb more water and the accumulation of water on the surface as a surface runoff, the facility may be damaged.** **The Project area is in the very south of the RUz close to the to the floodplain of the Amudarya River. The project area is part of the water protection zone of the Uchkizil lake and the coastal strip of the Uchkizil reservoir.**	**Damage on the main and auxiliary facilities and office buildings**	**Reduces personnel safety due to health threat** **Increased maintenance and upgrade costs**
Drought	**Uzbekistan's arid climate and regular high temperatures make drought an increasingly regular occurrence, with one drought every five years on average during the 1980s and 1990s and four episodes between 2000 and 2012. Hydrological drought has been occurring with increasing frequency and severity in the western areas of Uzbekistan in the past two decades, whereas the central and southern provinces have experienced the highest frequency of meteorological drought. There is also extensive evidence of the health impacts of the 2000–01 drought, which led to increased levels of water-related illness and malnutrition among children in western regions, iodine deficiencies, goiter, and diarrheal and respiratory diseases. Numann et al. (2018), provide a global overview of changes in drought conditions under different warming scenarios. They project large increases in the**	**Cooling water source shortage (Lake Uchkizil)**	**Reduces personnel safety due to health threat** **Increased maintenance and upgrade costs**

Climate Change Hazard (also Climate Change Response)	Future Projection	Impact on CCPP/ Personnel	Impact on Success Criteria
	duration and magnitude of droughts in Central Asia by the end of the 21st century under global warming levels of 1.5°C, 2.0°C and 3.0°C. Droughts of a magnitude that is extremely rare at present in Central Asia (100-year droughts) are projected to become 4 to 10 times more common under the same warming scenario.		

All the risks and measures to be taken for the climate change are will considered during the design phase of the project. In this way, the climate change impact on the Project will be minor.

14.3.1 GHG Emission during the Construction Phase

GHG emissions are expected from the construction period of the Project mainly due to exhaust emissions of the construction vehicles. The mitigation and management measures to reduce these emissions are given in Section 5 (see Table 19).

The amount of emissions that will be caused by the fuel consumption of these vehicles is 238,309,843.2 metric tCO_2-e. The calculation of the amount of emissions caused by fuel consumption is given in Table 141.

Table 141: GHG Emission Factors for Diesel Fuel Consumed by the Project Machinery

Item	Value/Amount	Units
Annual Diesel Volume Use	**89,790**	**Litres**
Density of Diesel Oil	**0.832**	**kg/L**
Diesel Emissions Factor (CO_2-e)	**3198**	**g/kg fuel**
Annual GHG Emissions (Rounded)	**238,309,843.2**	**tCO_2-e**

14.3.2 GHG Emission during the Operation Phase

Natural gas is the most effective solution in fossil fuel-based energy production due to its high efficiency in terms of being in clean fuel category and producing low greenhouse gas. Compared to coal plants, natural gas combined-cycle plants produce 60% less CO_2 and do not require SO_2 control systems. Therefore, only amount of CO_2 is calculated (see Table 142) within the scope of the Project.

Table 142: CO_2 emission (g CO_2-e/kWh) from the the Project [69]

Parameter	Unit	Value
Operating Time (nominal)	**hours**	**8,000**
Generated power	**MWe**	**1,600**
	GWh	**12,800**
Fuel use	**Nm3/a**	**2,264,000,000**
	GJ/a	**2,264,000,000* 0.033 =74,712,000**
The standard emission factor for natural gas (assumed lower heating value basis	**kg CO2-e/GJ**	**55.9***
CO2 emissions	**kg CO2-e/a**	**4,176,400,800**
	t CO2-e/a	**4,176,401**
Emission rate (based on generated power)	**t CO2-e/kWh**	**0.0003263**
	g CO2-e/kWh	**326.3**

The value of 326 g CO2-e/kWh, is in line with the IFCs estimated of CO_2 emissions from new gas CCGT power plants (325-439 g CO2-e/kWh) and would result in the emission of an estimated 4,176,401 for 8,000 hours of operation. This calculation shows the maximum amount of greenhouse gas that can occur under the worst-case conditions, and in real operating conditions, the amount of greenhouse gas that will occur will be lower if the plant is stopped at various times or will not always operate at full load. Moreover, emissions from the use of vehicles are also expected during the operation phase of the Project from the delivery vehicles to the plant and those of the employees. The mitigation and management measures to reduce emission are as given in Section 5.

15. SOCIO-ECONOMICS

15.1 BASELINE SOCIAL CONDITIONS

15.1.1 Social Structure

The administrative management system in Uzbekistan is comprised of two main bodies, central and local. Local government has three pillars as regional, district and city administration. Although, the community self – governments are not a body of central public administration system but they exist and operate locally.

The system of local government has been established according to the Law on Local Public Administration, adopted on 2 September 1993. Activities and responsibilities of Local government are specified in the seven chapters and twenty articles of the law. Article 1 states that the local representative authorities at the regional, district and city levels are the local councils, whose full name in Uzbek is "Councils of People's Deputies." Another article of the Constitution of Uzbekistan presents information about local councils at all levels are headed by a chairman, or hokim (hokim is translated as deputy ruler). Regional, district and city hokims also act as the head of the local executive branch or hokimiyat. In general, the authorized state structure consists of three distinct levels: the republican level (first), province-level (second), and district-level (third).

15.1.1.1 Province level

In particular, the Surkhandara regional hokimiyat is the (second level) main authorized executive body in the region. Tasks and functions of Surkhandarya province hokimiyat are a comprehensive analysis of trends in socio-economic development of Surkhandarya provice, Termez city and districts, analysis of the dynamics of the main economic indicators, monitoring and implementation of structural and institutional changes, monitoring of local budgets; Development of proposals for the integrated development of the region, the city of Termez and districts; Socio-economic development of the regions, attracting investments and introducing innovations in the province economy, effective organization of economic free and industrial zones as well as development of tourism. These and many other tasks and functions are being covered by Surkhandarya province khokimiyat on coordination of economic policies and take responsibility for implementing government programs (national – regional), projects, President's and Cabinet Ministers resolutions at the local level. In addition, in terms of the socio-economic aspect, regional hokimiyat in Surkhandarya introduces systematic monitoring of trends in socio-economic development, carries out social and economic reforms, timely identifies the causes of local challenges and makes decisions to eliminate these issues. The detailed administrative structure of Surkhandarya's hokimiyat is given in "*Annex 3 Organigram of Surkhandarya Province Hokimiyat*"

15.1.1.2 District level

It should be noted that provincial Hokimiyat in Surkhandaya manages other district-type hokimiyats. Since Surkhandarya region is divided into 13 districts, hokimiyats in each district is only highest state executive body that implements the government policy within their administrative borders. They are as follows in Table 143.

Table 143: 13 districts of Surkhandarya Region

#	Name of hokimiyat
1	**Denau**
2	**Shurchi**
3	**Sherobod**
4	**Jarkurgan**
5	**Saraosiyo**
6	**Muzrabod**
7	**Qumqorgon**
8	**Uzun**
9	**Angor**
10	**Boysun**
11	**Qiziriq**
12	**Oltinsoy**
13	**Termez**

As for administrative management the district based hokimiyats (third level) operate identical manner as province hokimiyats (second level). It has following functions and duties in terms of social and economic development:

Duties

- Comprehensive analysis of trends in socio-economic development of the district, monitoring of implementation of local budget and structural and institutional changes;
- Creation of an effective system for monitoring the implementation of socio-economic development programs in the regions
- Improve education, health, agriculture and construction spheres in the district
- Functions
- Development of specific measures to address social economic challenges in the district
- Implementation and monitoring programs in the field of social economic development of the district
- Organizes the hearing of the hokim's report on important issues of socio-economic development of the district

15.1.1.3 Community of self-government

In Uzbekistan local government is usually supplemented by self-government community organization as Mahalla at the third level. In current day mahalla is defined as an organization which aims to resolving local issues according interests of local people, traditions, language and ethnic background [69].

According to article 7 of the Law on Community Self-government, bodies of community self-government include citizen assemblies of villages, kishlaks as well as those of mahallas within cities, villages, kishlaks or auls [71]. It should be noted that both kishlaks and auls are rural settlements in the country and having different communities living there. For example, in Karakalpakstan almost all rural settlements have "aul" identification because of their culture and traditions while in Fergana valley use kishlak term for the description of the settlement.

However, as a result of recent socio-economic reforms in the country, mahallas became more active than before as a self-government structure [72].

In particular, according to the decree of the president of the Republic of Uzbekistan № PF-5938 of February 18, 2020 «on measures to restore the socio-spiritual environment in society, further support of the Institute of the mahalla, as well as to bring the system of working with family and women to a new level», the status of the meetings of local citizens has been set [73].

According to information collected by field survey new positions in the mahalla management system, including the positions of the chairman of the gathering of citizens on the issues of law enforcement, family, women's and socio-spiritual issues, beautification, farmland and entrepreneurship were introduced.

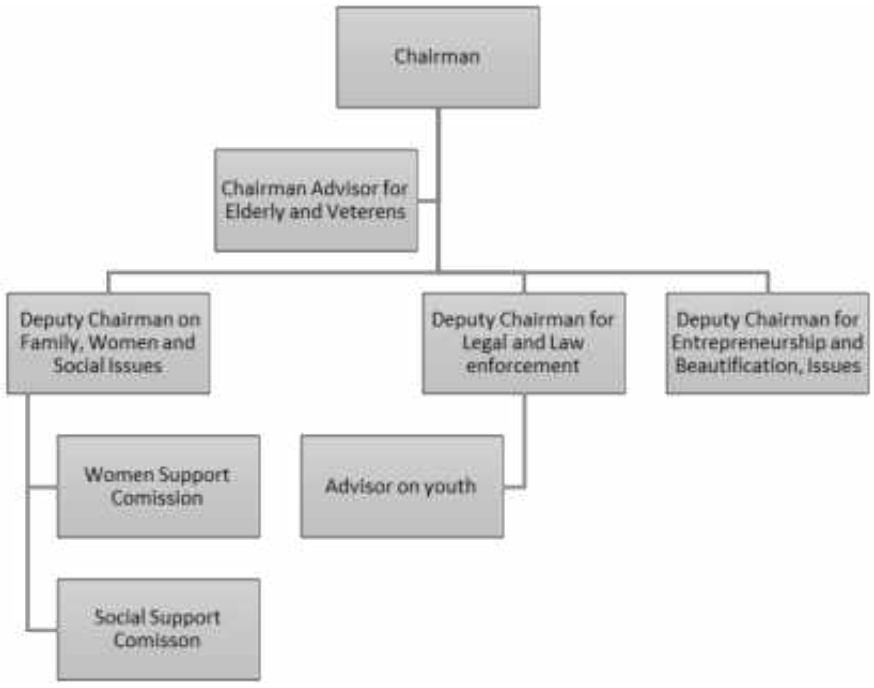


Figure 99: The typical administrative structure of Mahalla (Source: from data collected in the field)

According to field survey data, the establishment of a separate ministry in the country, which deals with the issues of mahalla and family at the state level, which has become a close assistant to the meetings of citizens in this regard, the work on supporting the mahalla system has reached a new level.

The ministry works as an important organization in the direction of taking the activities of the mahalla system, which is directly working with the people, forming as an important social institution, to a new level, increasing its status, developing the activities of the Citizens ' Assembly, supporting the family, women and the elderly, protecting their rights and legitimate interests, comprehensive support of families in need [72].

15.1.2 Demography

15.1.2.1 Past and Current Population

As of July 1, 2021, the resident population of Uzbekistan amounted to about 34,9 million people and since January 2020 has increased by 653.7 thousand people. The permanent population growth rate was 1.9% [74].

In January-July 2021, 390.7 thousand new born children were registered. At the same time, during this period, the number of deaths of citizens amounted to 79.7 thousand people.

As of April 1, 2021, the permanent population of Surkhandarya province is 2,693 thousand people (7, 2% of Republic) (see Figure 100). The population increased by 605 thousand people compared to the 2010. In particular, the urban population was 1,709.6 thousand people (36.2% of the total population), the rural population – 971.2 thousand people (63.8 %).

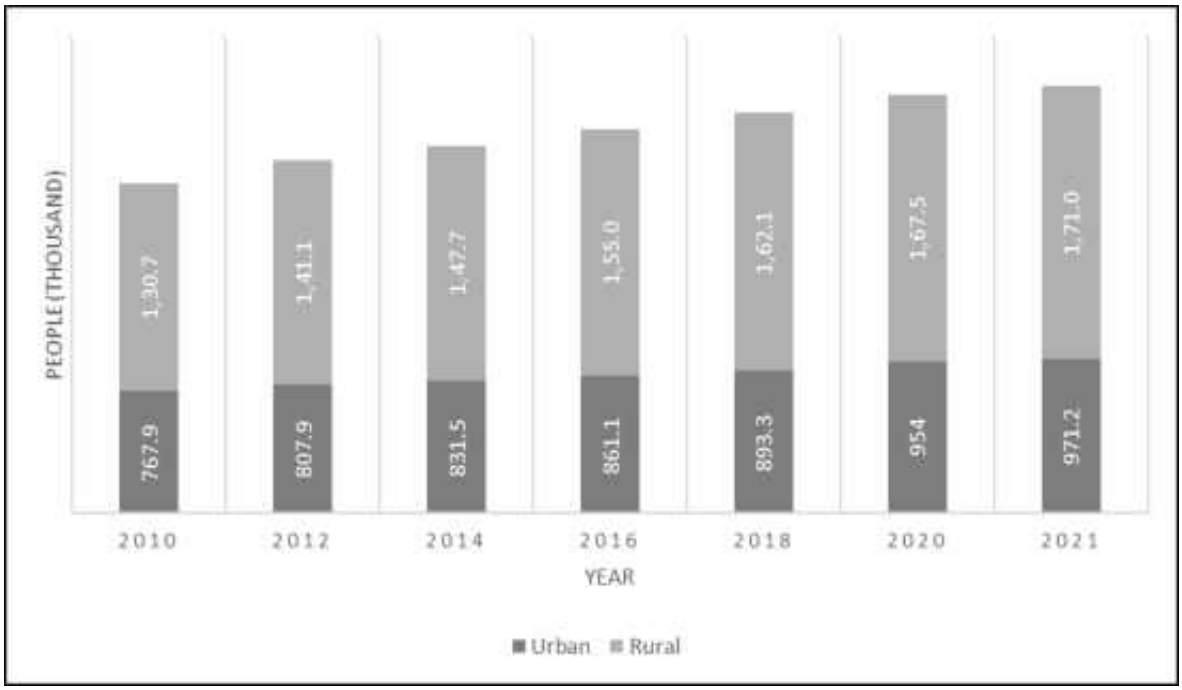


Figure 100: Dynamics of urban and rural population in Surkhandarya Province [74]

At district level, Figure 101 illustrates past and current population as well as dynamics of urban and rural population in Angor and Termez Districts. Since the project is located on the territory of the two above-mentioned districts, the demographic analysis was integrated [75].

The permanent population in Angor and Termez Districts has grown significantly from 189.2 thousand in 2010 to 230.8 thousand in 2018. In 2020, the population in the two districts slightly decreased to 209.2 thousand.

According to UzStat, at present there are 134.7 thousand (5% of the Surkhandarya region's population) people living in Angor, and 78.6 thousand people in Termez District.

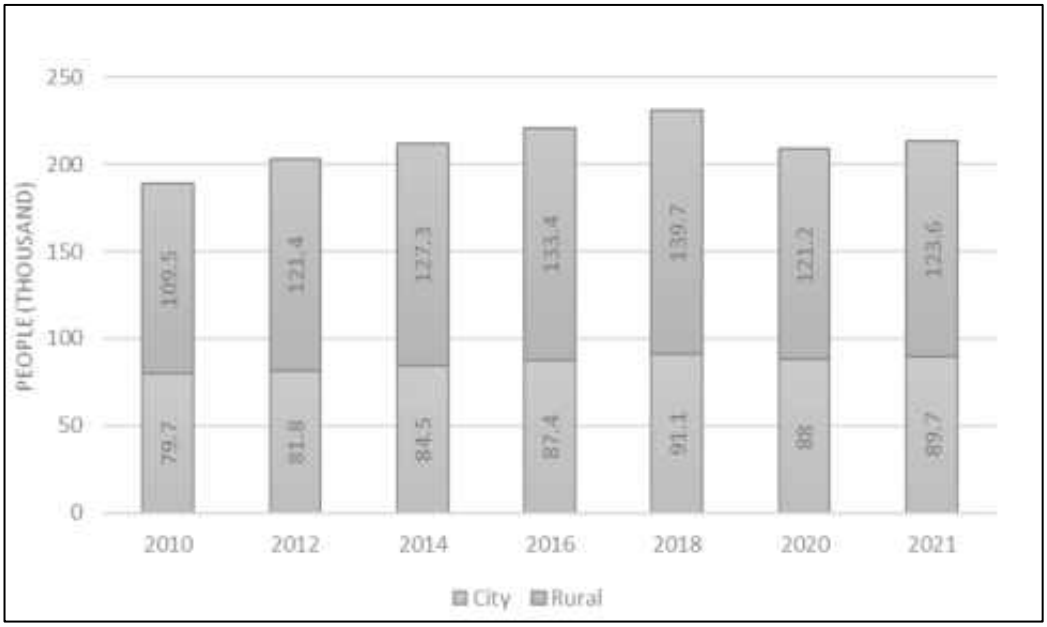


Figure 101: Dynamics of urban and rural population in Angor and Termez Districts [75]

As for January, 2021 the population density throughout the Republic of Uzbekistan amounts to 74.1 people per 1 square km.

15.1.2.2 The population density in Surkhandarya Province

The districts with highest population density are Devon, Altinsai, Angor and Kizirik [76]. Proportion of male and female citizens is almost similar with a slight excess of males (see Figure 102).

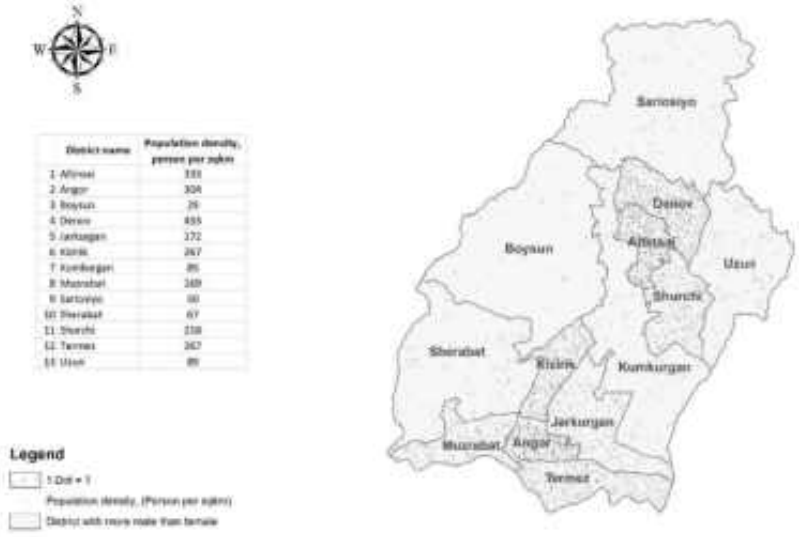


Figure 102: Population density and gender by district in Surkhandarya Province [76]

15.1.2.3 Change in Population

Internal and external migrations

According to a study of authors', Uzbekistan has a significant demographic growth and large labor force. In the context of population growth and unemployment, there is another issue - labor migration which observed during the field survey.

According to the Ministry of Labor, about 1.3 million are currently working in Russia, and about 200 thousand Uzbeks in Kazakhstan [77]. With the recent statistics of International Organization for Migration, a total number of emigrants in Uzbekistan at mid-year 2020 was 2 million and net migration rate in the 5 years prior was minus 44.3 thousand.

Due to economic difficulties in Uzbekistan, labor migration to Russia, Kazakhstan, the United Arab Emirates (UAE), Turkey, the Republic of Korea and Europe has been increasing over the last years [78].

In addition, in 2020, the number of immigrants reached 191.2 thousand people, and emigrants - 203.7 thousand people at country level. Emigrants are when people leave either district, province or country of origin, and immigrants when they arrive at their destination [74].

According to State committee of Uzbekistan on statistics in January-June 2021, the number of emigrants was 10,689 people, and the number of immigrants was 992 people from foreign countries (see Table 144). Majority of Uzbekistan residents (2,669 people) emigrated to Russia, Kazakhstan (7,013 people), Tajikistan and Kyrgyzstan. The largest share of arrivals from abroad to the Republic of Uzbekistan (in% of their total number) is accounted for by arrivals from Kazakhstan (35.9%), Tajikistan (21.6%), the Russian Federation (17.1%) and Kyrgyzstan (6.3%), the smallest - from Turkmenistan (4.0%) and other countries (15.1%) [79].

Table 144: Number of immigrants and emigrants in 2021 (January -June) [79]

Countries	Immigrants	Emigrants
AZERBAIJAN	**5**	**21**
ARMENIA	**6**	**4**
BELARUS	**0**	**28**
KAZAKHSTAN	**356**	**7,013**
KYRGZYSTAN	**62**	**175**
MOLDOVA	**2**	**5**
RUSSIA	**170**	**2,699**
TAJIKISTAN	**214**	**233**
TURKMENISTAN	**40**	**81**
UKRAINE	**28**	**103**
ISRAEL	**5**	**77**
USA	**9**	**15**
OTHERS	**95**	**235**
TOTAL	**992**	**10,689**

At the regional level in Surkhandarya Province in January 2020, the number of immigrants amounted to 8.5 thousand people, or 4.4% of the total republican and 19.5 thousand people emigrated from the region (9.5% of the total). Net migration rate is 11.06 thousand at regional level (see Figure 103). The highest net migration rate observed in Oltinsoy (- 327 people), Kumkorgan (- 340 people) and Sariosiyo (- 320 people) Districts [75].

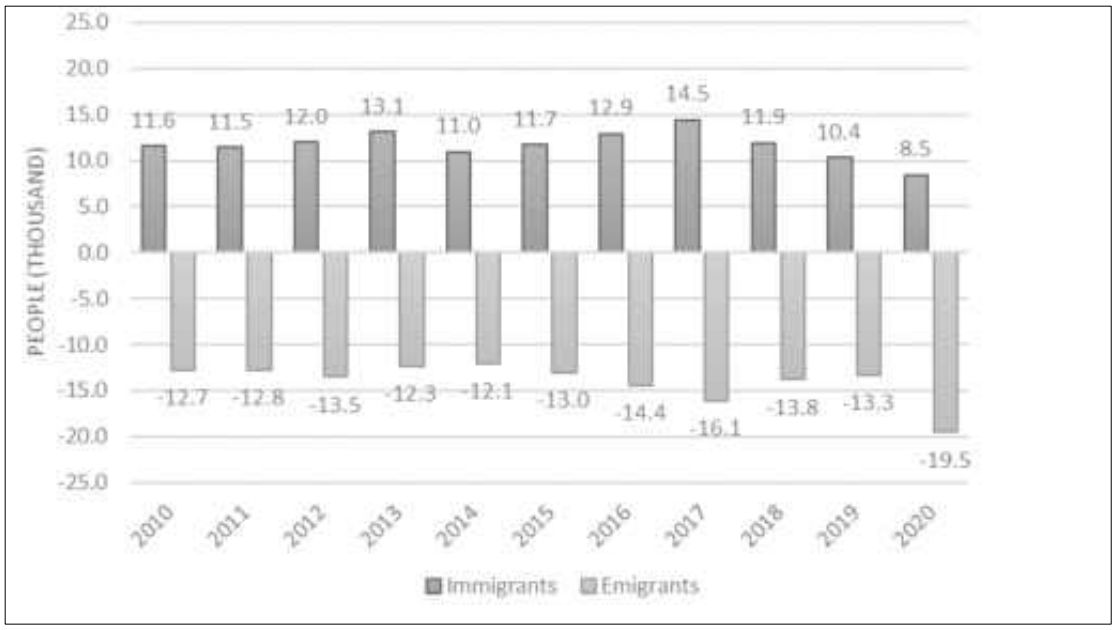


Figure 103: The number of immigrants and emigrants in Surkhandarya Province [75]

One of the positive impacts of the migration is reducing pressure on the labor market at local level as well as receipt of income from remittances (from 4.8 to 6 billion US dollars annually) [77].

The net migration level in Angor and Termez Districts is not significant among other regions. As Figure 104 shows the number of immigrated people fluctuated from 2010 (1.2 thousand people) to 2016 (1.04 thousand people). In 2017, both immigration (2.6 thousand people) and emigration (-1.6 thousand people) rates were peaked. The population that moves from these two areas between 2018 and 2020 has declined slightly. At present, the net migration rate is minus 245, or 2.2% of the total number of emigrated from the region [75]. Most of the district population moves within the region, which can be described as internal migration. According to the population, the main reason for such internal migration is the return to the hometown and the moving of the population in the process of urbanization in cities.

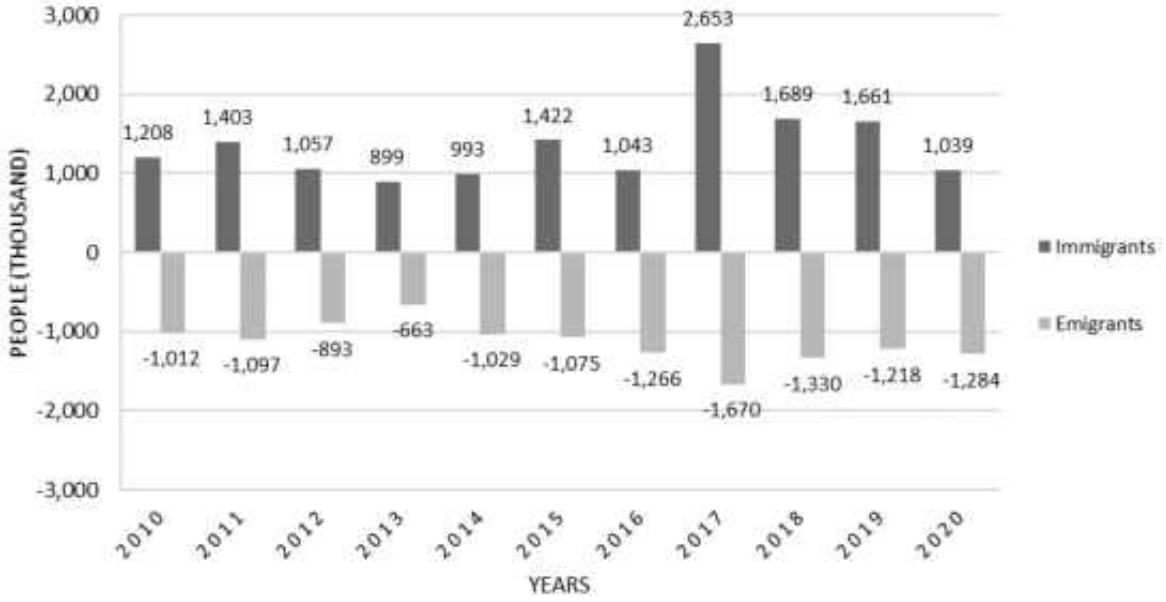


Figure 104: Number of immigrants and emigrants in Angor and Termez Districts [75]

15.1.3 Population Distribution

15.1.3.1 Distribution of Population by Age Groups and Gender

According to State Committee on Statistics, there are slightly more males in Uzbekistan -50.4 % of the population, females, respectively - 49.6% of the total number of citizens in 2021. As for 2021, in Surkhandarya Province the number of female population is 1.32 million (49.5%) and 1.35 million (50.5%) male population [74].

The age composition of the population is analyzed on the basis of an international standard four-year interval (see Figure 105). It should be emphasized that in 2020the highest representative of the population are children from zero (0) to four (9) years [80]. About ten (10) percent of the population is between the ages of 30 and 34. The population aged 60 and over makes up only 6.8% of the total population, but this figure in developing countries ranges from 25% to 30% [81].

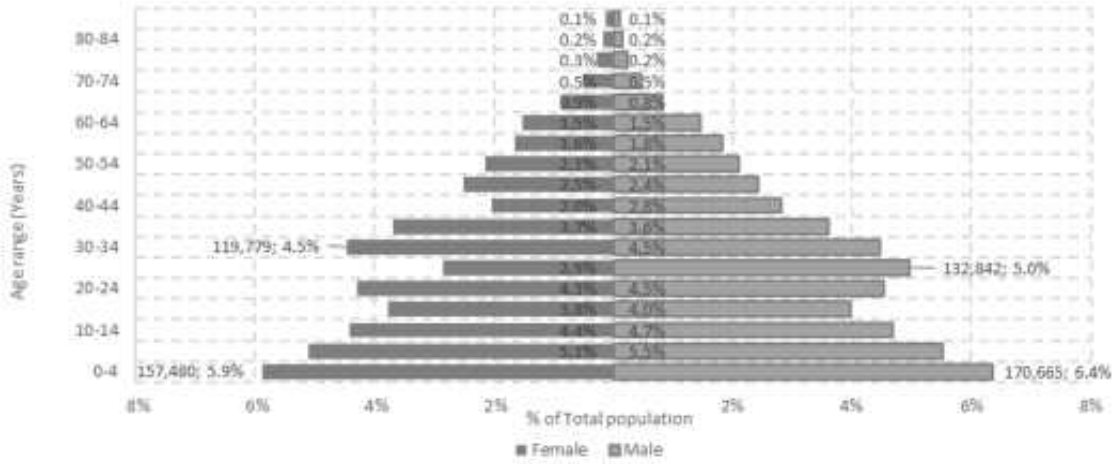


Figure 105: Disaggregation of Population by age groups and gender in Surkhandarya Province [80]

Figure 106 shows distribution of population by age groups and gender in Angor and Termez districts. Almost no difference between the number of male (50.1%) and female (49.9%) of the population. 22 thousand residents or 10.3 percent of the total population of Angor and Termez Districts aged 25 to 29 years. The largest representation of women between the ages of zero (0) to four (4) years, which amounted to 13.3 thousand people [80].

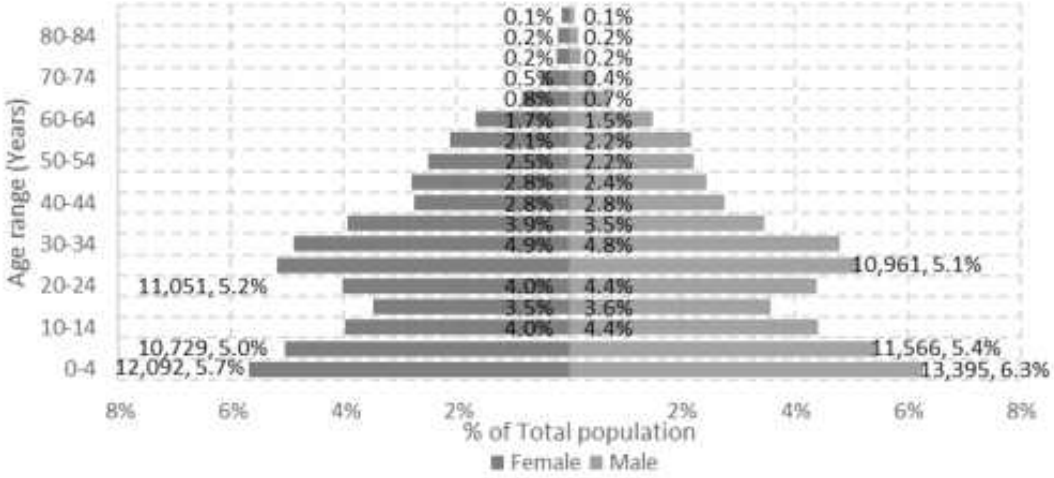


Figure 106: Disaggregation of Population by age groups and gender in Angor and Termez Districts [80]

15.1.4 Education

15.1.4.1 Education system in Uzbekistan

The education system in Uzbekistan is one of the important drivers of transformation in the country's society and economy. Although the education system at all levels is in a flux stage however the Government of Uzbekistan (GoU) is committed to improving its education system in the context of its wider reform program. For instance, the education reforms aim to expand access to preschool education while also restructuring the offerings for general secondary and secondary specialized education. The government of Uzbekistan aimed to reach 100 percent enrollment in preschool education for students aged 5–6 (or 7 depending on the birth date) by the end of this year [81].Along with this important initiative, the GoU is reinviting General Secondary Education (GSE), wherein students will have 11 years of compulsory education and multiple pathways to enter the labor market or higher education. These reforms have significant implications for improving student learning outcomes. Starting from the 2017/18 academic year GoU has changed its requirements for general secondary education and expanded compulsory GSE from 9 to 11 years of schooling (see Figure 107). Until these changes, GSE in Uzbekistan contained nine years of compulsory education from 1 to 9 grades. However, for students who want to continue their education in academic lyceums instead of GSE schools for grades 10 and 11 the study program for academic lyceums has been condensed to two years. In other words, compulsory GSE could involve 11 years in a GSE school or 9 years in a GSE school plus 2 years in an academic lyceum. Starting from the last academic year, graduates of grade 11 can choose to continue their studies in Secondary Specialized Vocational Education (SSVE) or apply to a university. The transformation of the economy and undergoing reforms in education sector have positively impacted to the Higher Education system (HE). As a result of these measures higher education graduates with more diverse skills set and fields of study are being implemented based on labor market demand [81].

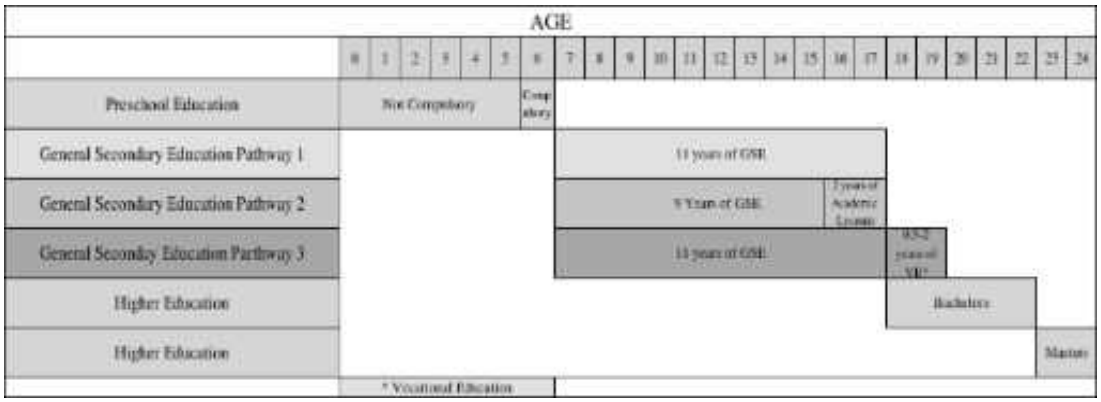


Figure 107: Education system structure [81]

Based on statistics of 2020/2021 academic year, there are 6,960 preschools, 10,090 GSEs, 1,117 SSVEs and 119 HEs operating in the country (see Table 145). Particularly, data on provincial level illustrates that only 8 percent of the total number of preschool educations in the republic falls on Surkhandarya region while proportions for GSE, SSVE and HE accounted at 9%, 3% and 6 % respectively [82].

In the case of district level, 32 preschools, 44 GSE and 5 SSVEs are operating in Angor district, while the 31 preschools, 28 GSEs and 1 SSVE in Termez district. It should be noted that there is no higher education institute in Angor district while there are two branches of higher education in Termez province [82] which makes Termez district more attractive in terms of created facilities for those who are pursuing higher education.

Table 145: Number of educational facilities in Surkhandarya [82] in comparison with Uzbekistan [83] in 2020/2021 academic year

Education facilities	Preschool	GSE	Secondary Specialized Vocational Education	Higher Education
Surkhandarya region	**546**	**920**	**31**	**7**
Angor	**32**	**44**	**5**	**0**
Termez	**31**	**28**	**1**	**2**
Total Education Entities in the Republic	**6,960**	**10,090**	**1,117**	**119**

15.1.4.2 Educational Facilities

According to data from the 2020/2021 academic year, the average student-teacher ratio in all levels of Uzbekistan's education is about 12:1, which is lower than the averages for countries such as the United Kingdom (16:1), the Netherlands (18:1), Finland (17:1), and Romania (14:1) [84]. Moreover, this ratio varies across regions, however ratio was observed in Surkhandarya region (nearly 11:1) in preschool, (nearly 9:1) in GSE and SSVE and (18:1) in higher education. As for district level, student ratio in both Angor and Termez districts' GSE and SSVE education indicates (about 12:1), while preschool sector increases this ratio up to (25:1) and (27:1) in Angor and Termez districts accordingly (see Figure 108) [85][86].

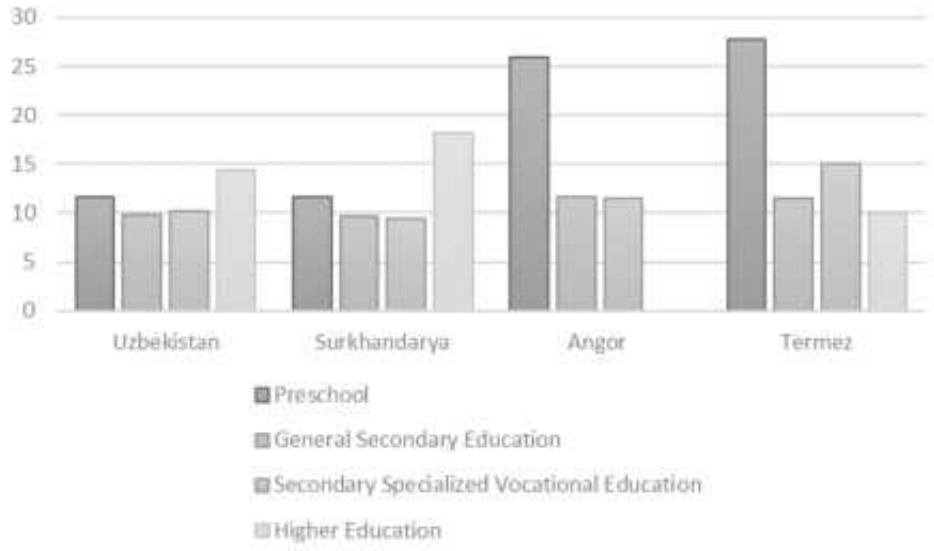


Figure 108: Student – Teacher Ratio in Education level. Source: (State Committee of the Republic of Uzbekistan on Statistics)

As it was mentioned above Uzbekistan government set up the plan to reach out 100 percent enrollment in preschool education for students aged 5–6 (or 7 depending on the birth date) by the end of this year [81]. The preschool enrollment rate in urban areas is approximately 46 percent [87], compared to 23 percent in rural areas, but substantial variation arises between regions. For example, in Tashkent City, almost 80 percent of children are enrolled in preschool, while this rate for Surkhandarya region is only 12 percent as the lowest enrollment rate in the republic. These are average figures for 2018/2019 academic year (see Figure 109).

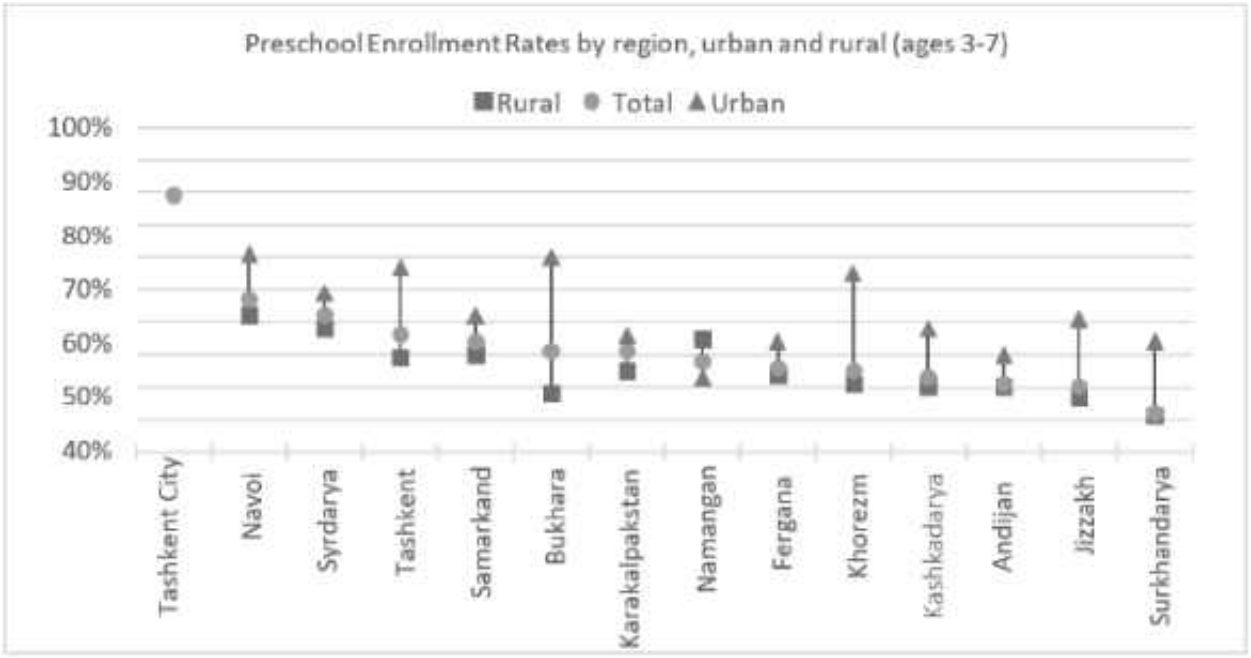


Figure 109: Preschool Enrollment Rates by region, urban and rural (ages 3-7) [81]

15.1.4.3 Distribution of Educational Facilities by Levels

Overall, education facilities in Surkhandarya province, Angor and Termez districts are evaluated as in a good condition. This delineation of the three different conditions (Excellent, Good, Unsatisfactory) contains the condition of the building and adjacent infrastructure, material and technical equipment including education materials, teachers working condition and their salaries (see Figure 110). So, Figure 110, (a) shows the status of GSEs located in Angor district in 2020/2021 academic year according to the data collected from Angor khokimiyat. An absolutely identical data was collected on conditions of GSEs in Termez district (see Figure 110 b).

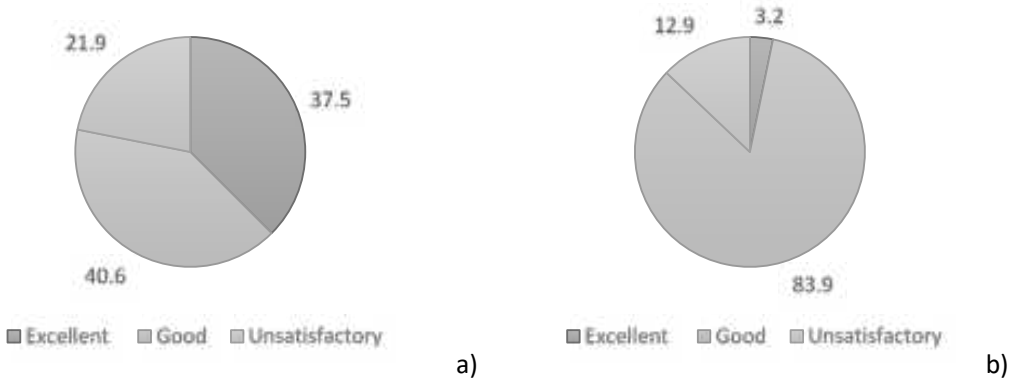


Figure 110: Condition of the GSEs in Angor (a) and Termez district (b) [85][86]

It is worth noting that secondary schools under the "good" category in Termez district almost twice more than same schools in Angor district. However, the total number of secondary schools in Angor - 44 and in Termez district - 28. Taking into account the fact that Uzbekistan has a rapidly growing young population with an average increase of 1.8 people under the age of 19 [79], this situation is expected to create additional challenges not only for the GSE, but also for the education system as a whole.

As a conclusion, the implementing by the government reforms have significant implications for improving student learning outcomes, but also pose relevant challenges for implementation and resource allocation. These challenges already appear at province and especially at the district level. Although preschool enrollment is increasing constantly in recent years, it remains at approximately 30 – 40 percent, which is low by international standards. Preschool is considered as the weakest part of the education in the selected districts because families who wish to enroll their children in public preschools must pay fees (around US$6 to US$28 per child per month in full-day groups), mostly to cover the costs of meals. The fees charged by nonpublic preschool education institutions are paid by families and can range from US$175 to US$300 per child per month [81]. Due to the high rate of unemployment and low-income source the above-mentioned pay fees are not affordable for a population of selected districts. Another issue can be related to the physical conditions of the GSEs and SSVEs in the districts. For example, based on data collected for this report it was revealed that there are not enough sports facilities for the school and college-age students in both Angor and Termez districts which potentially can negatively impact on health of students and worsen their academic performance.

15.1.5 Health

Uzbekistan has a public healthcare system and a small scaled private health sector. Cities in Uzbekistan are serviced by family polyclinics, while rural areas are serviced by rural medical centers. Pharmacies in Uzbekistan are privately owned and operated. A total of 14.8 trillion Uzbek soums (1,427 million USD, exchange rate for November 5, 2020) have been allocated from the state budget for the healthcare system in 2020. Funds allocated from the state budget in 2020 increased 1.2 times compared to last year and 1.6 times compared to 2018. This means that 12.2% of the total state budget expenditures and 2.3% of GDP were spent on health care [88].

The health of the population is considered as one of the indicators of the standard of living of the population. Therefore, the health sector and common diseases are going to be presented in two levels: provincial (Surkhandarya) and district (Termez and Angor). The comparison of the rates is given in country, province and district level.

Between 1991 and 2020, life expectancy in Uzbekistan increased from 66.4 years to 73.4 years, while in Surkhandarya it was 73.3 on average, females - 75.5 and males -71.3 years [89]. Reported maternal mortality ratio in the same years in the country level reduced 3.5 times—from 65.3 to 18.5 per 100,000 live births, but in Surkhandarya it was 36.2 in 2020 which is the second highest rate among provinces after Syrdarya. Infant mortality reduced 3.8 times to 9.3 cases per 1,000 live births, and in the province level, it was 8.6 [90].

15.1.5.1 Most Common Diseases

Diseases of the circulatory system, mainly ischemic heart disease and cerebrovascular disease are the most common causes of death in Uzbekistan (see Figure 111 and Figure 112) [91][92]. In country, 78% of all deaths are due to non-communicable diseases. In 2017, circulatory system diseases (69%), including ischemic heart disease, arterial hypertension and its complications (myocardial infarction, cerebral hemorrhage) took the first place in the overall standardized cause of death by sex and age. They were followed by malignant tumors (8%), diabetes (3%) and chronic respiratory diseases (3%) [92]. The changes of the causes of death in 10 years between 2009-2019 have not changed significantly [91]. Noteworthy change has been seen in decrease of tuberculosis infection (see Figure 111).

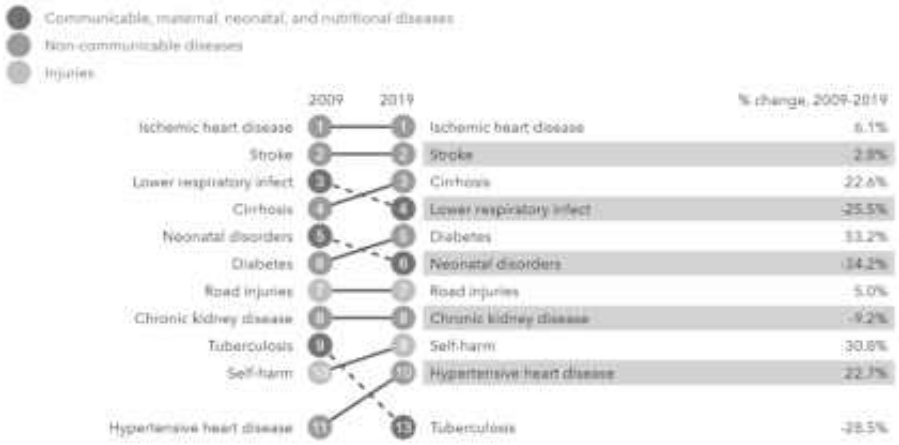


Figure 111: The causes of the most deaths in Uzbekistan [90]

What relates to the provincial level, in 2020, 11.9 thousand deaths were registered in Surkhandarya, of which 62.3% were due to diseases of the circulatory system, 5.9% due to tumors, 4.0% due to accidents, poisoning and injuries, 4.5% from digestive diseases, 7.4% from respiratory diseases, 1.5% from infectious and parasitic diseases, and 14.4% from other diseases.

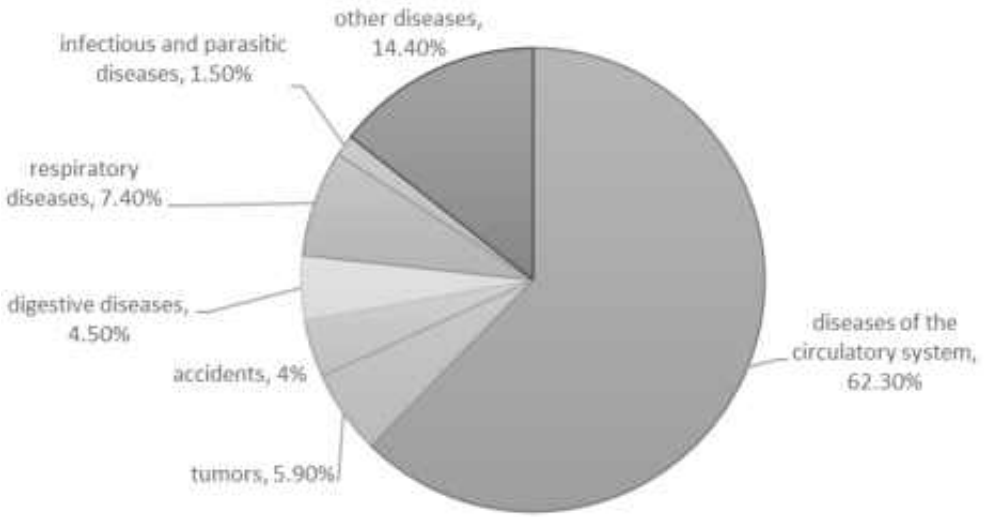


Figure 112: Distribution by main causes of death in Surkhandarya (in % of total deaths)

Diseases and morbidity rates for 10 thousand people in Angor and Termez districts are provided in Table 146. According to the statistical data, the most common diseases in the districts where study area is located are diseases of the stomach and intestines (182.1 infected per 10,000 population) and iodine deficiency (80.75 infected per 10,000 population) [85][86].

Table 146: Diseases and morbidity rates for 10 thousand people in Angor and Termez districts [85][86]

Name of the disease	Termez	Angor	Average
Infectious diseases:			
- Acquired Immune Deficiency Syndrome (AIDS)	**8.9**	**9.4**	**9.15**
- jaundice	**0**	**175.8**	**87.9**
- flu	**0**	**0**	**0**
- measles	**0.09**	**0**	**0.045**
- chickenpox	**0**	**0**	**0**
- others	**0**	**0**	**00**

Name of the disease	Termez	Angor	Average
Non-communicable diseases:			
- diabetes mellitus	**43.7**	**6.5**	**25.1**
- iodine deficiency	**129.7**	**31.8**	**80.75**
- diseases of the stomach and intestines	**26.6**	**337.6**	**182.1**
Other illnesses	**1,609.8**	**0**	**804.9**

The common diseases in the area can be seen in detail in the example of Angor district. Here the most common diseases are diseases of blood and blood-forming organs, respiratory diseases, diseases of nervous system and circulatory diseases. The total number of registered diseases for 2018, 2019 and 2020 with average comparison can be found in the Figure 113 [93].

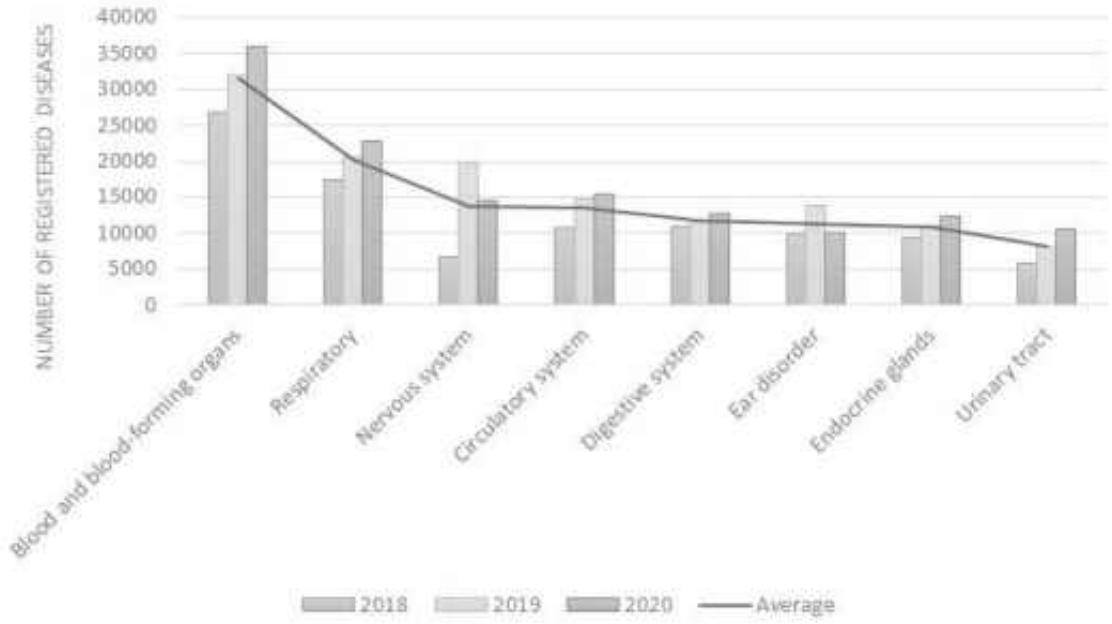


Figure 113: The total number of registered diseases for 2018, 2019 and 2020 with average comparison in Angor district [92]

The number of registered deaths of children under 1 year of age was 0.6 thousand, of which 58.1% were perinatal cases, 22.3% were respiratory diseases, and 14.0% were congenital anomalies and 5.6% died from other diseases.

15.1.5.2 Disabilities and Elderly

Based on the statistics of 1 January, 2014, the number of people with disabilities in Uzbekistan 16 years old or more were 581,869, which was approximately 2% of the whole population. A ratio of male and female was rather unbalanced, in other words, male was 60% and female was 40%. Regarding the disability group, more than 70% of people with disabilities belong to Group 2, while Groups 1, the most severe group, is only less than 10% [94].

In the district level, in the study area which includes Termez and Angor districts, the number of people with disabilities was 4,378, which was approximately 2% of the whole population. Regarding the disability group, Group 1 was 14%, Group 2 - 76.5%, Group 3 - 9.4% [85][86].

Table 147: Disabled people in Angor and Termez [85][86]

	Termez	Angor
Total number of disabled people, person	**2,007**	**2,371**
Share of disabled people from the district population, %	**2.5**	**1.8**
including by disability group:		
- Number of group I disabled people	**289**	**326**
- Number of group II disabled people	**1,508**	**1,843**
- Number of group III disabled people	**210**	**202**
Number of children with disabilities, person	**352**	**402**
Share of children with disabilities from the total number of children in the district, %	**0.8**	**0.9**

Under current law of Uzbekistan which is Law of the Republic of Uzbekistan "on state pension of citizens" 03.09.1993, N 938-XII, the right to an old-age pension is granted to men at the age of 60 and at least 25 years of service, and to women at the age of 55 and at least 20 years. As of February 1, 2021, 3 million 845 thousand 462 people in the country will receive pensions and benefits.

Therefore, in this assessment, people who reached their pension age according to the law of Uzbekistan are taken as elder person (see Table 148). According to the statistics, total 3,724,594 people have reached pension age, and ratio of males and females are 36% to 64% respectively. The share of elder people from total population in Uzbekistan is 11%.

Both in provincial and district level, shares of elder people in the total population showed almost the same amount – 9%.

Table 148: Elder population according to their gender, and share in total population in 2021 [79]

	Males	Females	Sum	Total population	Share of elder people
Surkhandarya region	**87,215**	**147,465**	**234,680**	**2,680,800**	**9%**
Angor	**3,925**	**7,262**	**11,187**	**134,700**	**8%**
Termez	**2,687**	**4,802**	**7,489**	**79,200**	**9%**
Total in the Republic	**1,331,528**	**2,393,066**	**3,724,594**	**34,558,900**	**11%**

15.1.5.3 Health Facilities

In 2019, there were about 1,205 hospitals with 153.4 thousand beds in the country, of which 57 hospitals with 8.5 thousand beds in Surkhandarya region [83]. Specifically, Termez had 7 hospitals in total with 868 beds while Angor had only one hospital with 265 beds [82](see Table 149).

Table 149: Number of hospitals and beds in country, province and district level [82] [83]

	Hospitals	Beds
Surkhandarya	**57**	**8,500**
Termez	**7**	**868**
Angor	**1**	**265**
Uzbekistan	**1,205**	**153,400**

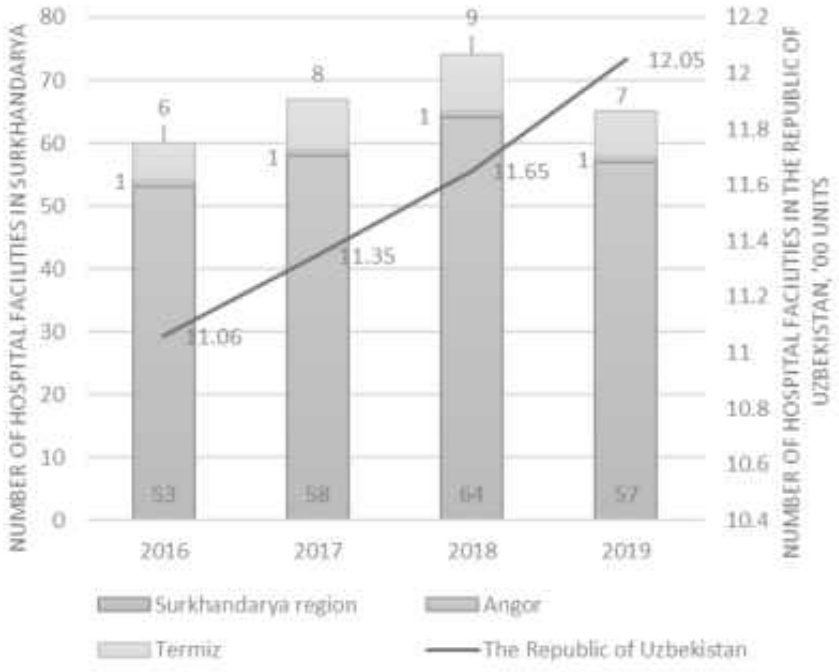


Figure 114: Number of hospital facilities in Surkhandarya in comparison with Uzbekistan in 2016-2019 [82] [83]

Table 150: Number of medical workers in the Republic of Uzbekistan by specialty, thousand people [82] [83]

	2015	2016	2017	2018	2019
Surkhandarya region	**3.5**	**3.9**	**3.9**	**4.2**	**4.1**
Angor	**0.2**	**0.1**	**0.1**	**0.1**	**0.1**
Termez	**0.1**	**0.2**	**0.2**	**0.2**	**0.2**
Total physicians in the Republic	**83.4**	**84.1**	**85.4**	**89.8**	**91.9**
Surkhandarya region	**21.7**	**22.0**	**22.0**	**22.1**	**22.5**
Angor	**1.1**	**1.1**	**1.1**	**1**	**1**
Termez	**1.1**	**1.0**	**1.1**	**0.7**	**0.7**
Total nurses in the Republic	**336**	**341**	**348**	**356.7**	**365.7**

In the country level, from 2015 to 2019, the number of physicians increased by 10% to 91,900, and nurses by 9% to 365,700 (see Table 151) [83]. Doctor-population ratio is another important indicator for assessing the health care sector. World Health Organization standard for doctor-population ratio is 1:1000. In terms of population ratios, physicians made 27.6 per 10,000, and nurses 109.9 per 10,000 people.

In the province level, the number of physicians was 4,100 and nurses 22,500 [83]; population ratio, 15.9 physicians for 10,000 people and 87.6 per 10,000 were serving in 2019.

In the case of district level, 25.2 physicians and 88.4 nurses are serving for 10,000 people in Termez district, while only 7.4 physicians and 74.2 nurses are serving for 10,000 people in Angor district [82].

According to the passport of both districts, developed and provided by related Hokimiyats [85][86], Termez district does not have any ambulance transports, while Angor has 10 vehicles. However, Angor district owned 86% of total calls of ambulance. Nevertheless, 96% of deaths from calls for emergency medical care happened in Angor district (see Table 151).

Table 151: Districts' Ambulance Service in Termez and Angor districts in 2021 [85][86]

	Termez	Angor	Total
Number of workers and employees of ambulance service, which of	**97**	**115**	**212**
Medical doctors	**23**	**19**	**42**
Nurses	**74**	**96**	**170**
Number of ambulance transports	**-**	**10**	**10**
hence, need repair	**-**	**3**	**3**
Distance from ambulance to the farthest village in the district, km	**70**	**25-30**	**25-70**
The number of ambulance appeals during 2020	**57,020**	**370,189**	**427,209**
hence, by phone call	**54,233**	**34,425**	**88,658**
Deaths from calls for emergency medical care	**2**	**63**	**65**
hence, death of children	**-**	**-**	**0**

As a conclusion, health sector in district level needs improvement. The common diseases in country, province and district level are diseases of blood and blood-forming organs, respiratory diseases, diseases of nervous system and circulatory diseases. In the district level, the number of people with disabilities was 4,378 which is 2% of total population. As World Health Organization standard for doctor-population ratio is 1:1,000, Angor district does not follow the requirement having 0.7: 1,000, while Termez does 2.5: 1,000. The ambulance service has a need on high performance vehicles with speed capacity.

15.1.6 Social Services

Surkhandarya has wide range of cultural facilities, including cultural organizations and centers, study courses, theatres, worship areas, cultural heritage sites and museums (see Table 152). Particularly, 123 cultural organizations and centers have been functioning in 2021 which has 1,720 courses with more than 20 thousand participants [34]. The main purpose of the centers are:

- Further develop national culture in the Republic of Uzbekistan,
- Improve the quality of cultural services to the population,
- Meet their cultural needs and ensure meaningful leisure,
- The formation of exemplary programs embodying national values,
- Traditions and customs of creative communities,
- Preservation and development of art,
- Organization of various clubs, studios, courses, hobby clubs, amateur art groups and
- Creation of favorable conditions for their activity.

There also two theaters and two museums have been functioning in the province. Most interesting part is that the province has 561 cultural heritage sites which explains the area's importance in social development history [95].

Table 152: The list of cultural facilities in Surkhandarya province [95]

	Cultural Facilities and Participants	#
1	**Cultural organizations and centers**	**123**
2	**Number of courses**	**1,720**
3	**Number of participants**	**20,554**
4	**Number of theatres**	**2**
5	**Number of cultural heritage sites**	**561**
6	**Number of cultural and recreational parks**	**17**
7	**Number of museums**	**2**
8	**Visits to museums**	**15,378**
9	**Number of children's music schools**	**22**

15.1.6.1 Public Institutions and Social Services

In Termez and Angor districts there are also cultural and educational institutions like the library which is also called as information resource center, museum and recreational park. However, cinemas and theaters are absent in both districts (see Table 153) [85][86]. The international publications indicated

the roles of theaters and cinemas in community development and their benefits to human well-being. However, any standard for assessing social life conditions based on cultural institutions are lacking for implementing in the study area.

Table 153: Cultural and educational institutions of the district in Angor and Termez districts [85][86]

	Termez	Angor
Number of information resource centers	**1**	**1**
Annual visit to the library by person	**8,500**	**45,808**
Number of museums (branches)	**1**	**-**
Number of theatres	**-**	**-**
Number of cinemas	**-**	**-**
Number of cultural and recreational parks in the district	**1**	**1**

15.1.6.2 Worship Areas

The U.S. government estimates that 88% of Uzbekistan's population is Muslim, while the Ministry of Foreign Affairs estimates 93-94% of the population is Muslim [96]. Statistics provided by Termez khokimiyat [86] showed that the area, where 39,900 residents out of 79,200 are men (only men in Islam pray in mosques), owns only one mosque with a capacity of 3,000 people. There are 3 mosques in Angor with a population of 134,700 people, of whom 67,400 are male, where 3,500 people can simultaneously worship (see Table 154) [85].

Table 154: Religious institutions in Angor and Termez districts [85][86]

	Termez	Angor
Total number of religious institutions	**1**	**3**
hence, mosques	**1**	**3**
Average daily attendance at mosques	**400**	**200**
including the number of people performing the Eid prayer in the mosque	**3,000**	**3,500**

15.1.6.3 Recreational and Touristic Sites and Areas

According to data provided by khokimyats of districts, Termez is considered as one of Central Asia's oldest towns, and district has many historical and archeological monuments. The cultural areas depict experience of the area of Zoroastrianism, Buddhism and Islam. Some of the cultural heritage areas belong to the history of I-V centuries. Among these places is the Fayaztepa Buddhist building which is also included to United Nations Educational, Scientific, and Cultural Organization (UNESCO).

Figure 115: The mausoleum of At-Tirmidhi

Most famous place of Termez for both local and international visitors is Mausoleum of Khoja Abu Isa Muhammad Imam Termezi (see Figure 115).

Angor district also has 20 historical, archeological monuments which belong to I-XIII centuries. Some of the oldest relate to Kushan Empire including remains of fortress and warehouse (I-IV centuries). According to the status of these historical heritages, the objects have protection symbols. However, the roads to the monuments are in need of repair [85][86].

15.1.6.4 Leisure Facilities and Sports Facilities

The social development of the area can be witnessed by the presence of sport and leisure facilities. Termez district has 56 sport facilities, including 26 stadiums and 30 gyms, while Angor has two - one stadium and one gym. The number of sport courses and participants are consequently significantly higher in Termez district (see Table 155) [85][86]. Some facilities like swimming pools, tennis and basketball courts are absent in the area. The percentage of population who are engaged in sport activities are 11% or 8,742 people in Termez, and 0.7% or 1,042 in Angor.

Table 155: Sports and health facilities in Angor and Termez districts in 2021 [85][86]

Type of facility	Termez	Angor
Total sports facilities:	**56**	**2**
- Stadiums	**26**	**1**
- Gyms	**30**	**1**
Number of sports courses	**247**	**14**
The number of participants in them	**8,742**	**1,042**
Swimming pools	**0**	**0**

Type of facility	Termez	Angor
Tennis courts	**0**	**0**
Small football fields with artificial turf	**14**	**0**
Children and youth sports schools	**1**	**1**
The number of trainees in them	**976**	**1,042**

The impacts of sport facilities and sport schools can be seen in the achievements of youth. Total 105 youth has participated till present in different regional (Championship of Uzbekistan among juniors and girls), national (Uzbekistan Cup, Championship of Uzbekistan) and international contests. The leading sport types are national wrestling, sambo and box. The achievements of district athletes can be assessed by their participation at the Asian championships, namely 10th Asian Championship in Pune, Republic of India and the 18th Asian Games are held in Jakarta and Palembang, Indonesia [85][86].

The existence of courses that mostly focus on wrestling makes wrestling a prominent sport. The lack of swimming pools, tennis courts and basketball courts may be the reason for the uncertain progress of other sports in the region.

Presence of leisure facilities which included ecotourism facilities and health facilities is another indicator which is included in the assessment. In the coast of Qizilsuv reservoir where the Project is going to be constructed, two facilities are located in the side of Termez district (exact location of Project is in the side of Angor district). They are "Termez Marvaridi" recreation area and "Termez Marvaridi" Sanatorium [85][86]. The sanatorium occupies a vast area of 7.5 hectares and can simultaneously accommodate 160 people [97].

Table 156: Ecotourism facilities, health facilities, other specific items in Angor and Termez districts [85][86]

	Termez	Angor
Recreation Area	**"Termez Marvaridi" recreation area**	**-**
Sanatorium	**"Termez Marvaridi" Sanatorium**	**-**
Children's camps	**-**	**-**

Figure 116: "Termez Marvaridi" Sanatorium [97]

As a conclusion of social services part, Surkhandarya has wide range of cultural facilities, including cultural organizations and centers, theatres, worship areas, cultural heritage sites and museums. In the district level, Termez and Angor districts have numerous cultural heritage sites which has an ancient historical background. However, cultural institutions, in the way that cinema and theaters are absent in the area. Finally, sport facilities are focusing more individual sport types like wrestling and boxing rather than team sports such as basketball and football.

15.2 BASELINE ECONOMICAL CONDITIONS

15.2.1 General Economic Structure and Sectors

As for December 2020, in Surkhandarya region, annual gross regional product (GRP) amounted to 24,003.6 billion soums increased by 14% compared to 2010 and higher than 4.4% from 2019. Growth circumstances of GRP were growth rates in agriculture, forestry and fisheries - 105.6% (share in the GRP structure - 50.4%), industry - 113.9% (7.8%), construction - 107.1% (8.8%). GDP of the region exceeded $1.3 billion and makes up 4% of Uzbekistan's total GDP (see Figure 117) [74].

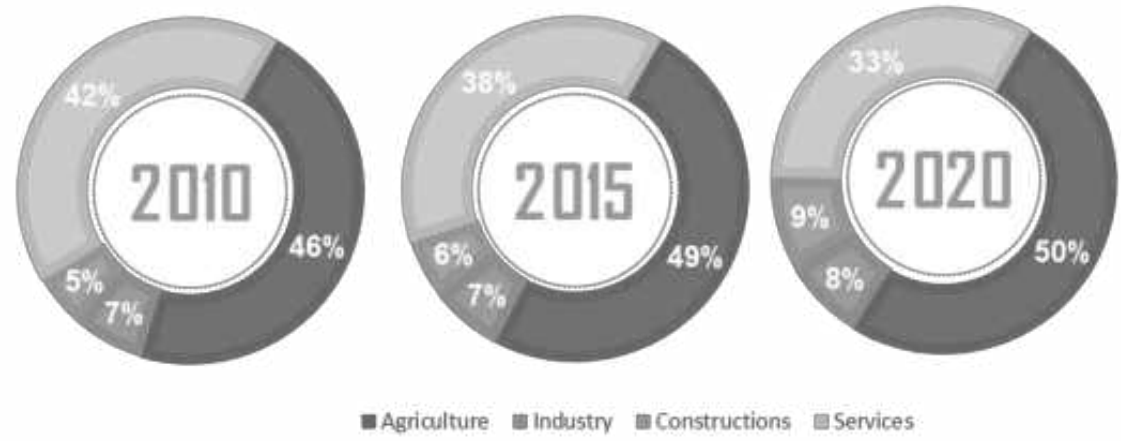


Figure 117: Composition of Surkhandarya's GDP by Sector from 2010 to 2020 [74]

Overall, Figure 118 demonstrates the changes in the GRP composition by the sectors of economy (agriculture, industry, constructions and services) in the period 2010 – 2020 in Surkhandarya Province.

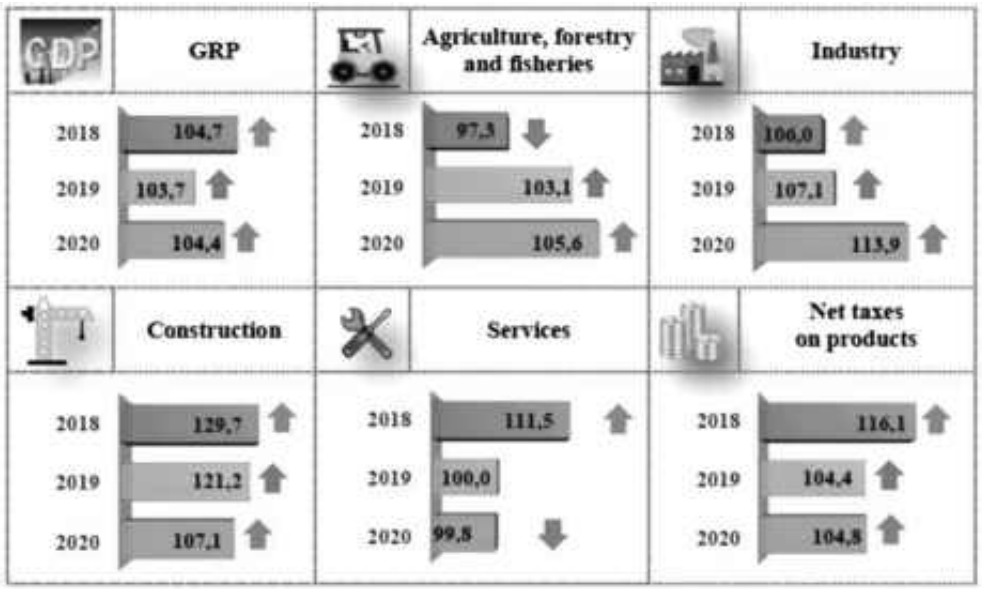


Figure 118: GRP growth rates for 2018-2020 in % to the previous year [74]

In 2020, compared to 2015, the share of agriculture increased to 50%, while the construction sector rose dramatically to 9%. GRP per capita amounted to 9,040.6 thousand soums in 2020 and increased by 2.2% compared to 2019. Services in the region declined last year due to COVID-19 restrictions, but the industry sector continues to grow (see Figure 119).

The region is one of the most agriculturally developed regions and provides over 9% of total agricultural production of the country.

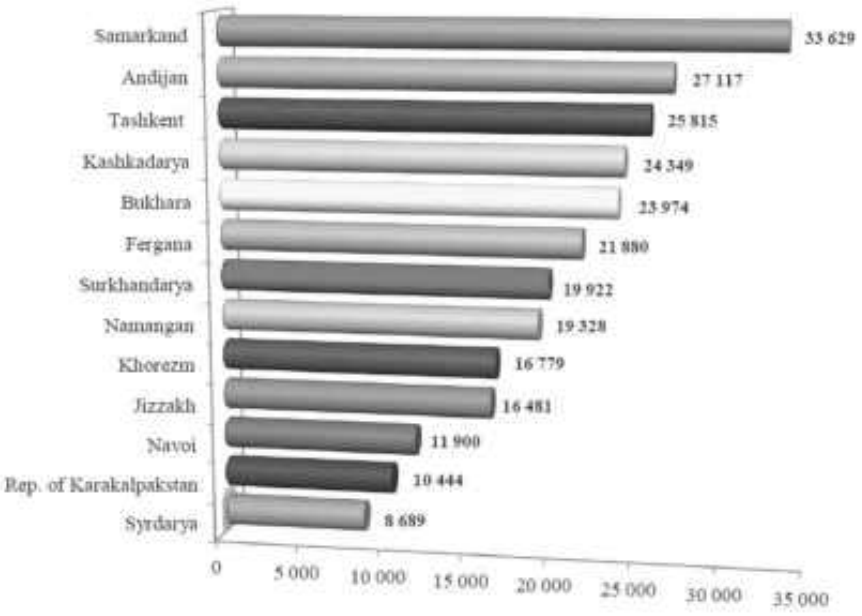


Figure 119: The volume of products (services) in agriculture, forestry and fisheries by region, forestry and fisheries by region in 2020, billion soums [74]

15.2.1.1 Agriculture

Agriculture is an important sector of Uzbekistan's economy, the share of agriculture in GDP is about 25.5% and employing about 27% of the labor force.

Over the past five years, the agricultural sector in Uzbekistan has developed dramatically in the context of elimination of quotas and price controls in 2020-2021. At the moment about 70 % of sown area was allocated to cotton and winter wheat. However, most of the farmers already shifted from state ordered crops to higher-value fruit and vegetable cultivation.

Despite of this, cotton and wheat crops occupied over 63 percent of total sown area in Surkhandarya Province. There are 101.8 thousand croplands in Termez region, of which 76.2% are cotton and wheat. Cotton and wheat were less spread in Angor District, occupying less than 10 percent of sown land (see Table 157).

Since the main source of income is agriculture, it is very important to have land for farming in rural areas. As for statistics, on average in Uzbekistan there is 0.23 hectares of sown area per one rural resident. In the Surkhadarya region, with the highest rural population density, one person can have access to 0.15 hectares of land.

Table 157: Selected indicators of agriculture in 2020.

	Total sown area, 1,000 ha	Total population, 1,000 persons	Share of rural population, %	Share of cotton & wheat in sown area, %	Sown area per rural inhabitant, ha/capita
Uzbekistan	**3,373.0**	**34,900.0**	**49.3**	**70.0%**	**0.20**
Surkhandarya Province	**255.0**	**2,693.0**	**63.8**	**65.5%**	**0.15**
Angor District	**155.3**	**134.6**	**51.0**	**9.8%**	**0.23**
Termez Distrcit	**10,183**	**78.6**	**69.7**	**76.2%**	**0.19**

Large number of orchards, melons cultivated areas, vineyards and pastures in household land plots provides indication of the value of agriculture as one of the important practices and livelihoods of local residents of the region. In general, the Figure 120 shows the capacity of agricultural production in Surkhandarya Province in 2020.

Surkhandarya region annually agricultural produces about one million tons of vegetables on the Uzbek market, which is 10% of the total production. The dry and hot climatic conditions of the region will make it possible to produce 307.5 thousand tons of the melon per year, in other words 14% of the total melon yield (see Figure 120).

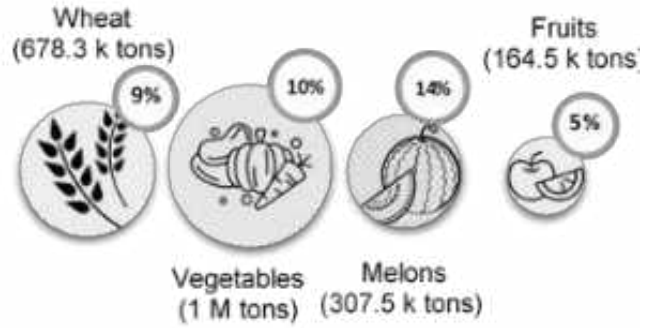


Figure 120: The volume of agricultural production in Surkhandarya Province in 2020 [74]

15.2.1.2 Husbandry

In Termez and Angor districts there are 134 farms which are involved in animal breeding and / or animal product production. Two animal farms are taking more than 80% of the total farms (see Figure 121). They conduct fishery activities within 71 fish farms, and cattle breeding within 39 cattle farms or 53% and 29% of 134 farms, respectively. Consequently, the land for the development of these two types of activity takes on the largest share: 1,572.9 ha for fish farming and 2,520.5 ha for cattle breeding [85][86].

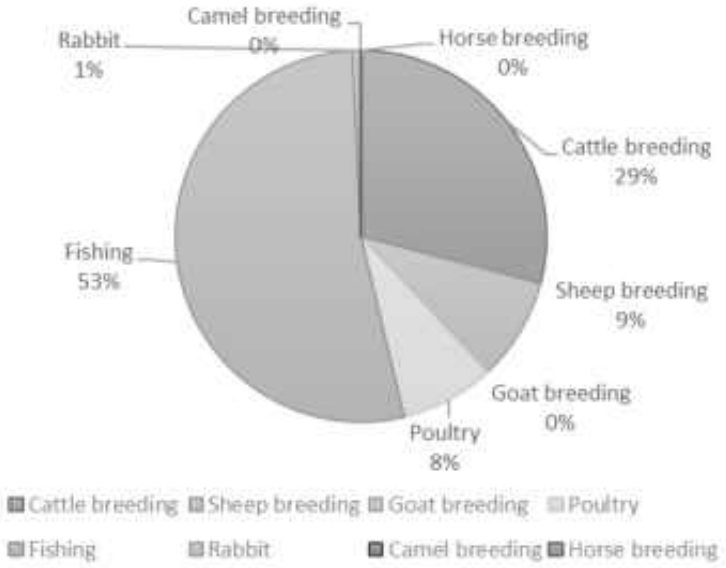


Figure 121: Share of farms depending on the livestock type [85][86]

As far as labor resources are concerned, nearly 700 people were employed in livestock sector in 2020 in two districts. As it is seen from Figure 122, poultry farming is the leading activity for job provision to locals with 289 employees, whereas cattle breeding and fish farming become other important employers in the sector. However, the animal farms of rabbit, camel, goat and horse breeding are lacking in both districts – Termez and Angor (see Figure 122) [85][86].

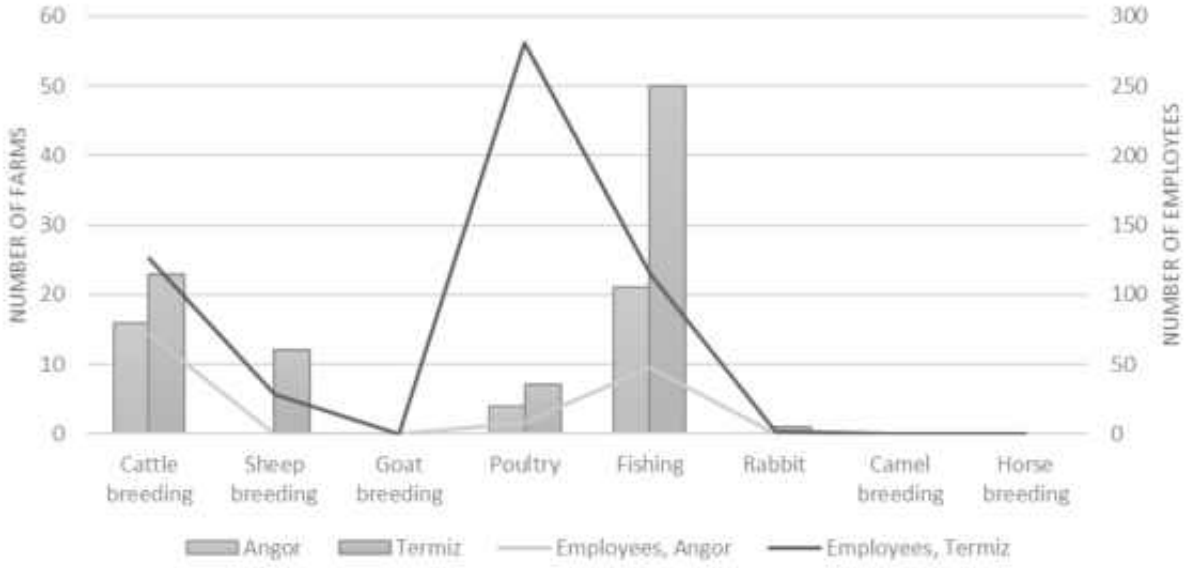


Figure 122: Livestock sector in Angor and Termez districts [85][86]

There are more than 86,000 heads of cattle, which provided 17,000 tons of meat and 81,000 tons of milk in 2020 in both districts. The poultry with 713,000 heads supplied with more than 120,000 thousand eggs, about 121 tons of animal fiber was received from 130,000 heads of sheep and 31,000 heads of goat (see Table 158 and Table 159) [85][86].

Table 158: The number of livestock heads [85][86]

	Termez	Angor	Total
Cattle	**46,428**	**39,662**	**86,090**
Sheep	**83,043**	**46,650**	**129,693**
Goats	**-**	**31,110**	**31,110**
Horses	**119**	**195**	**314**
Poultry	**479,300**	**233,600**	**713,000**

Table 159: Livestock production in Termez and Angor [85][86]

Type of product	Unit	Termez	Angor	Total
Meat (live weight)	**tons**	**7,945**	**9,257.3**	**17,202.3**
Milk	**tons**	**40,014**	**41,269.4**	**81,283.4**
Eggs	**thousand pcs**	**98,644**	**21,481.4**	**120,125.4**
Animal fiber	**tons**	**76.4**	**44.6**	**121**
Fish	**tons**	**899.7**	**275.1**	**1,174.8**

As it has been mentioned earlier in this husbandry part, fishery is the foremost practiced form of farming in Termez and Angor with 71 farms. The sector is involving 163 employees. The area of fish ponds is either artificial pool or natural water. Both districts are highly dependent on natural water reservoirs – 78% of fish ponds in Termez and in Angor whole fish farms are located in natural water reservoirs. As it has been stated in international papers, the environmental impact of the hydroelectric may affect to fishery and aquatic biodiversity. Therefore, there is a possibility of planned construction to have an impact to the fishery sector which are grown in natural water reserves.

Table 160: Fishery farms in Termez and Angor districts in 2020

	Termez	Angor	Total
Number of fish farms	**50**	**21**	**71**
Number of employees in fishery	**115**	**48**	**163**
Fish pond area (ha)	**1,351**	**269**	**1,620**
artificial pools	**290**	**-**	**290**
natural water	**1,061**	**269**	**1,330**
Grown fish (tons)	**1,178**	**275**	**1,453**
in artificial pools	**848**	**-**	**848**
in natural water	**80**	**275**	**355**

As a summary of husbandry part, livestock is important part of sustaining the study area. There, three types of livestock farming are widely practiced and also employs the most labor share in Termez and Angor districts, namely fishery, cattle breeding and poultry. Most importantly, the impact of planned project to the fishing industry in the area needs to be focused specifically as fishery mostly depends on natural water reserve.

15.2.1.3 Industry and Commercial

Uzbekistan is the main producer of machinery and heavy equipment in Central Asia. The republic manufactures machines and equipment for cotton cultivation, harvesting, and processing and for use in the textile industry, irrigation, and road construction. This emphasis on making machinery also makes ferrous and nonferrous metallurgy important. In 2020, Uzbekistan produced industrial products worth 367.1 trillion soums, the share of the processing industry was 83.0% (304.7 trillion soums).

As demonstrated in Figure 123 the volume of products manufactured by mining and quarrying enterprises in January-December 2020 amounted to 33.0 trillion soums, or 9.0% of the total industry. Water, electricity, gas, steam supply, sewerage and the country's industries include crude oil and natural gas productions amounted to 2.2 trillion soums (0.6% of the total industry).

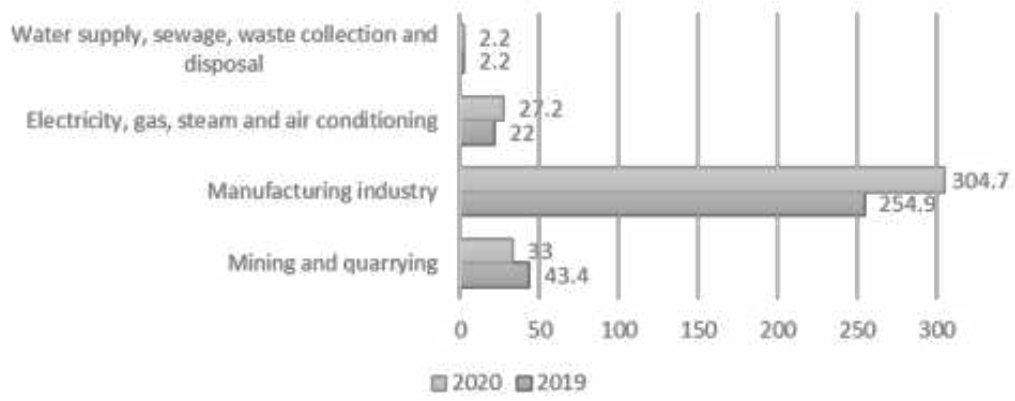


Figure 123: The share of value added to the industry of Uzbekistan from 2019 to 2020

Table 161 shows the indicators of industrial production in Angor and Termez Districts and its share at the regional level in 2020. The volume of industrial production of Surkhandarya Province is 5.5 trillion UZS, which is only 1.5% of the republican production volume. As for 2020, enterprises of Angor district produced industrial products amounted 123.6 billion soums (2.2 % of the regional total) and 151.8 billion soums respectively, in Termez district.

Table 161: Industrial production in Angor and Termez Districts in 2020.

	Industrial production (billion soums)	Share at the republican/ regional level
Surkhandarya Province	**5,515.9**	**1.5% (republican)**
Angor District	**123.6**	**2.2% (regional)**
Termez District	**151.8**	**2.8% (regional)**

In the structure of production in the region, the largest share falls on manufacturing enterprises (89%) – 4,929.3 billion soums. Water supply, sewerage, waste collection and disposal sector made very minor share (1.4 %) in the industry (see Figure 124) [74].

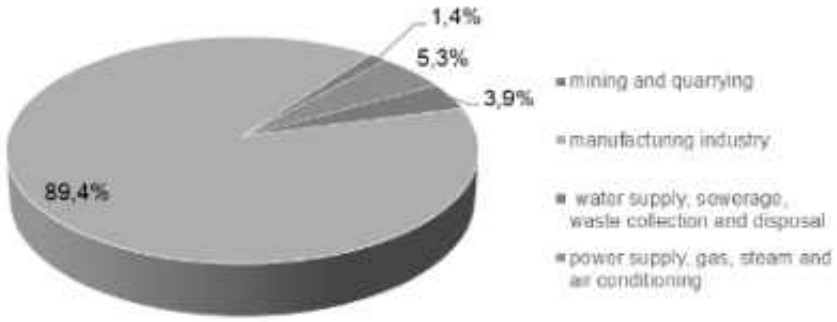


Figure 124: Composition of industrial production in Surkhandarya Province in 2020

Region has well developed textile industry (cotton ginning and consumption, textiles), food industry (food products and beverages), construction materials industry and flour-milling industry (see Figure 125) [98].

Figure 125: Production capacity of Surkhandarya region by the sectors of industry in 2020 [98]

According to United Nations Development Programme (UNDP) [98], the volume of industrial output in Surkhandarya region reached $289 million. The biggest industry is natural gas and oil production with the 511 million USD (see Figure 125). Two of three largest coal deposits of the country are located in Surkhandarya region. These are coal strip mines Shargun and Baysun, from which high-quality coal is extracted.

There are 49 joint ventures and foreign enterprises in Angor and Termez [85][86]. Afghanistan is the leading country with the largest number of foreign companies at the district level. 32 enterprises or 65% of the total are joint ventures or foreign enterprises of Afghanistan. In addition, Russia, Turkey, Kazakhstan and China also own by 2 businesses in the area. According to the directions, 13 companies are engaged in fruit and vegetable growing, production of building materials - 10 companies, retail and 6 companies are engaged in wholesale trade in food and clothing. Similarly, livestock related organizations are also owned by 6 international companies (see Figure 126).

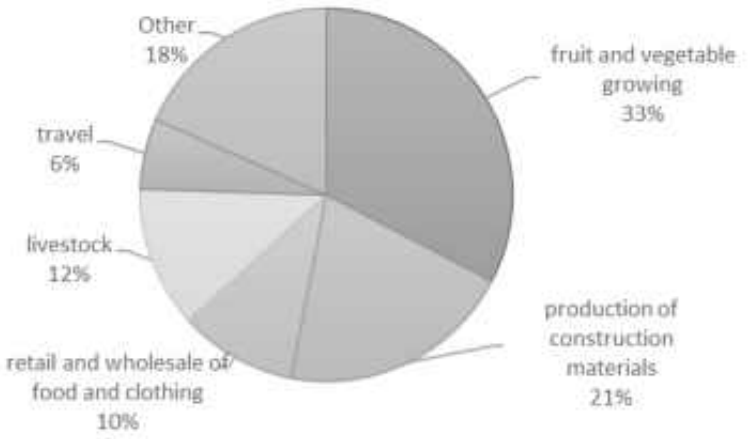


Figure 126: International companies functioning in Termez and Angor in 2020 according to their directions [85][86]

Consumer goods has special place in the livelihood. In general, Figure 127 illustrates the changes of consumer goods from 2010 to 2020 in Angor and Termez Districts and its comparison with the regional level [85][86]. The products made in the region have grown significantly 160.5 per capita to 1,589.7 per capita over the past decade (between 2010 and 2020).

Figure 127: Consumer goods per capita in Angor and Termez Districts and its comparison with regional level [85][86]

15.2.1.4 Transportation and Logistics

Uzbekistan has the highest road density in Central Asia, with 41 km of roads per 100 km² area. The total size of the road network is 185,000 km, of which 42,700 km are common use public roads. Common use roads are functionally divided into international roads - 3,981 km, national roads - 14,100 km, and regional roads - 24,614 km. For the most part, Uzbekistan has achieved basic road connectivity and only a few remote regions lack all-weather road access. About 95% of the network is paved and less than 5% is gravel and earth surfaced. At the end of 2017, nearly two-thirds of the common use roads were assessed as being in good or excellent condition. This assessment is based on biannual visual inspections, which are highly subjective and may not be based on a consistently applied metric. Much road deterioration is due to aging infrastructure, which needs both structural and safety upgrades [99]. Lastly, Uzbekistan has 83 cars per 1,000 people in 2018 [100].

In the province level, transport infrastructure of Surkhandarya is fairly developed. Length of railways crossing the territory of the region is 372.5 km. There are more than 10 railway stations in the region. Railway route (or line) Taguzar - Boysun – Kumkurgan connects the south of Uzbekistan with the center of the country and Kazakhstan. There is the main passageway running between Termez and Tashkent. There are 2,844 km of automobile roads in the region, including international and national. There is also Termez Cargo Center is large logistical terminal, located in Termez district of the region at the close proximity to the border with Afghanistan. This terminal provides transport and logistical services, including customs checks, loading and offloading, goods storage at warehouses of the terminal, as well as processing of transit cargo for intermodal transportation (rail - truck) to and from Afghanistan highways [98].

Transportation part of two districts is going to describe the sector by analyzing public-private vehicles share, public transport provision, number of private vehicles per 1,000 population and the conditions of roads.

According to the Khokimiyat of Angor district, there are 2,149 vehicles in 2020 to serve the local population, including private vehicles and vehicles of legal entities and/or enterprises. Of these, 75% of transport is private, 25% belongs to enterprises [85]. There are 7,657 vehicles in Termez district to serve the local population. Of these, 90% of transport is private, and 10% belongs to enterprises (see Figure 128) [86].

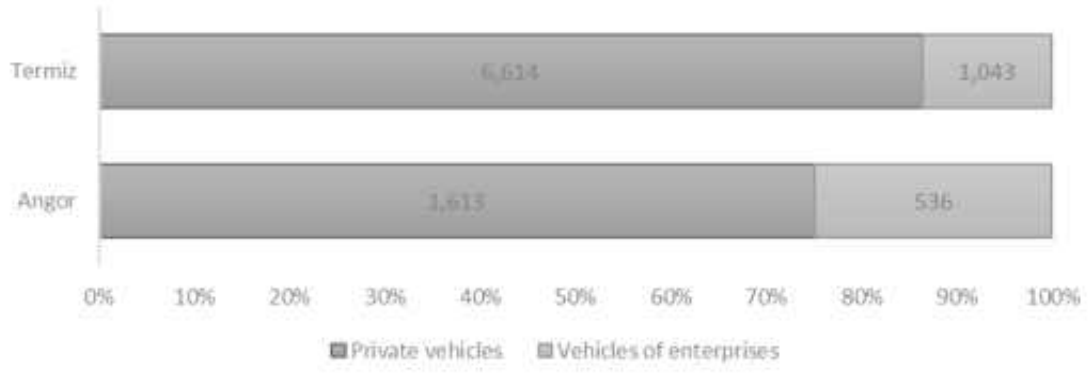


Figure 128: Private vehicles and vehicles of enterprises distribution in Termez and Angor districts [85] [86]

Another interesting indicator is the number of people per vehicle which is used as a public transport (taxi, bus, minibus). Public transport system in both Termez and Angor districts is operated by private organizations. According to the data of the Khokimiyat of Angor region, there are 11 working enterprises with a total of 368 vehicles to serve the local population. Most of them are light vehicles (taxi services with maximum capacity of 7 passengers) in the amount of 348 units. Also, there are 6 buses and 2 minibuses. Overall, there are 366 people per unit of transport, with the calculation of the total population of the district being 134,700 people.

In Termez district, there are only 2 engaged enterprises with a total of 48 transport vehicles to serve the local population. Most of them are automobiles (taxi services) in the amount of 40 units. The number of buses is 8 units of minibuses. This complicates the maintenance of transport by most of the population, since there are 1,650 people per unit of transport, with the calculation of the total population of the district being 79,200 thousand people.

However, number of people per private car could explain the significant difference between the ratios of public transport. In Angor per 1,000 people own 11 private cars, while in Termez, it is 83. Therefore, people in Termez depend less on public transports in their daily needs, while Angor population mostly depend on public vehicles.

Another important public asset to know about the social condition is road infrastructure. A society relies on a good road system as the basis to access jobs, health care, education and social connections. The total length of internal roads in Angor district is 604.3 km of which only 28 km of the road was repaired in 2020 and 379.6 km of the road requires further repair. In Termez district, the total length of internal roads is 716.2 km, of which only 9.5 km of the road were repaired in 2020 and 274 km of the road requires further repair. It can be concluded that in Angor 30% while in Termez 60% of internal roads require repair (see Figure 129).

Figure 129: Total condition of roads in Termez and Angor districts in 2020 [85][86]

As a conclusion, the roads which need repair prevails the roads with good conditions. Public transport is more used by Angor population than Termez. Understandably, population in Angor owns fewer private car (11 : 1,000) comparing to Termez (83 : 1,000) even though its population is more than Termez for 60%.

15.2.1.5 Electricity and Energy

Electricity

Uzbekistan is capable of meeting its energy needs from its own energy resources. The total installed capacity of power plants in Uzbekistan is more than 14,000 MW.

Uzbekistan's plans for energy are aimed at increasing the share of renewable energy sources by 2030. Within 10 years, the government plans to the implement the major investment projects to increase electricity generating capacity. It includes the construction of new power units with total capacity of about 27 GW for a total of about 35 billion U.S. [103].

In accordance with a Resolution of the President of the Republic of Uzbekistan PP-4477 of 4 October 2019 on the strategy for further development and reform of the electricity sector of the Republic of Uzbekistan, the Ministry is developing a programme for the development of generating facilities for the period up to 2030 (see Table 162). Uzbekistan generated 61.6 terawatt hours (TWh) of electricity in 2019, mostly from natural gas (>85%).

Table 162: Uzbekistan generating capacity targets to 2030 [104]

Indicator	Forecast generating capacity increase (MW)					Share of electricity generation (%)	
	2019	2020	2021	2022	2023-30	2018	2030
Traditional energy	**1,050**	**1,807**	**1,777**	**2,259.4**	**10,910.2**	**90**	**75**
Including capacity withdrawal	**-**	**1,060**	**320**	**740**	**4,280**	**-**	**-**
Total renewable energy sources	**24.1**	**119.8**	**504.5**	**542.2**	**7,387.6**	**10**	**25**
Total	**1,074.1**	**886.8**	**1,961.5**	**2,061.6**	**14,017.8**	**100**	**100**
- hydropower	**24.1**	**119.8**	**204.5**	**42.2**	**1,487.6**	**10**	**11.2**
- solar power	**-**	**-**	**300**	**400**	**4,300**	**-**	**8.8**
- wind power	**-**	**-**	**-**	**100**	**1,600**	**-**	**5**

Energy

Uzbekistan is one of the world's largest natural gas producers, annually producing around 60 billion cubic meters (bcm) (see Figure 130). In 2019, production totaled 60.4 billion cubic meters (bcm) [74][105].

Figure 130: Natural gas production in million cubic meter in Uzbekistan, 2017-2019 [74][105]

In 2019, gas condensate production amounted to 2.1 million tones (Mt) – equal to three times the conventional oil production in the same year. Conventional oil production peaked in the early 2000s and has since declined steadily [74][105].

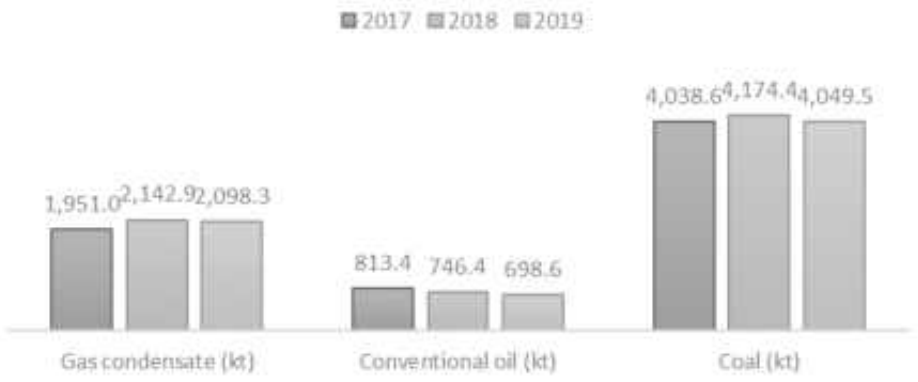


Figure 131: Uzbekistan energy production in kiloton, 2017-2019 [105]

Uzbekistan's most important export destinations for energy commodities are China, Russia and Kazakhstan. Since the early 2000s, Uzbekistan has been exporting 10-15 bcm of natural gas annually. The relevant values are as follows:15 bcm in 2018: 8 bcm to China; 4.5 bcm to Russia; 2.5 bcm to Kazakhstan; and 500-550 mcm to other Central Asian countries [105].

The following table describes supply rate of Termez and Angor districts in electricity, gas, drinking water and sewage system, in district level.

Table 163: Level of provision of the population with electricity, natural gas and drinking water supply [85][86]

	Termez	Angor
With electricity (%)	**100**	**100**
per capita electricity consumption (1 kW per day)		**3-4**
With natural gas (%)	**100%**	**100%**
per capita natural gas consumption (m³ per day)	**1.5 m³**	**1.45 m³**
- in summer (normally)	**1 m³**	**0.05/0.04**
- in winter (normally)	**4 m³**	**1.6/0.9**
With drinking water supply (%)	**71%**	**11%**

According to the data provided by hokimiyats, both districts are entirely supplied with electricity. However, in Angor 48% of the electric power transformers and 42% of power lines require repair. In Termez, the situation is better requiring repair of 25% and 20% of transformer and power lines respectively (see Table 164).

Table 164: Power supply condition in Termez and Angor [85][86]

	Termez		Angor	
	Total	Requires repair	Total	Requires repair
Electric Power Transformer	**244**	**63**	**263**	**126**
Power line length, km	**735.2**	**150.1**	**992.92**	**424.3**

Having 29 mahallas with total 27,062 households of Termez District, 11 of them or 6,490 households has been supplied with gas supply system [86]. However, 20,572 households of all mahallas where gas has not been supplied (72% of total households), limited number of liquefied gas cylinders have been provided. In Angor district, there are 37 mahallas with 23,344 households, out of which 2 mahallas with 1,255 households were entirely, 2 others with 1,021 were partly supplied with gas [85]. Overall, 35 mahallas or 21,068 households (90% of total households) use liquefied gas cylinders for their everyday chores including cooking, to warm the water for washing dishes or having a bath.

Table 163 has been provided by Angor and Termez Hokimiyats, and it shows that provision with gas is 100% in both Angor and Termez. Knowing the fact that has been provided in above paragraph which is also taken from the khokimats' passports, Districts with 100% meant provision with gas no matter if it is from gas supply system or liquefied gas cylinders.

Access to the drinking water, 71% of the population or 56,300 people have drinking water supply for daily use. While in Angor it is only 11% with 15,466 people while rest of the population consume water from springs, boreholes (except wells), rivers, streams and canals. Neither of the districts have sewerage supply system [85][86]

15.2.2 Income sources

According to data of State statistics in 2020, the gross domestic product (hereinafter - GDP) of the Republic of Uzbekistan amounted to 580,203.2 billion soums [13]. When calculated in US dollars at the average exchange rate for the reporting period (average exchange rate for 2020 – 10,055.8 soums), nominal GDP amounted to 57,698.5 million US dollars. In 2020, GDP per capita amounted to 16,949.1 thousand soums (in the equivalent – 1,685.5 USD).

The gross value added of the Uzbek economy is fairly evenly divided among (a) agriculture, (b) industry, and (c) services (see Figure 132). Agriculture was dominant in the GDP since the independence of the country (see Figure 132).

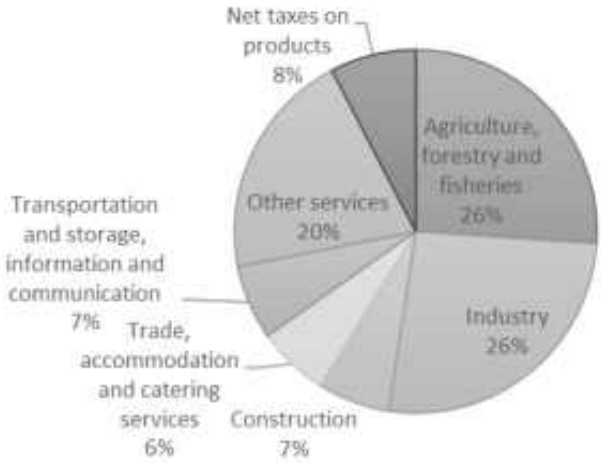


Figure 132: GDP by sectors of Uzbekistan in 2020 [74]

There has been a structural shift in non-agricultural production, whose share of GDP was 32.4% in 2018 versus 50.0% in 1993–1995. The share of services increased from 28.1% in 1993 to 35.6% in 2018, while that of manufacturing grew from 17.1% to 26.3% over the same period (see Figure 133) [101].

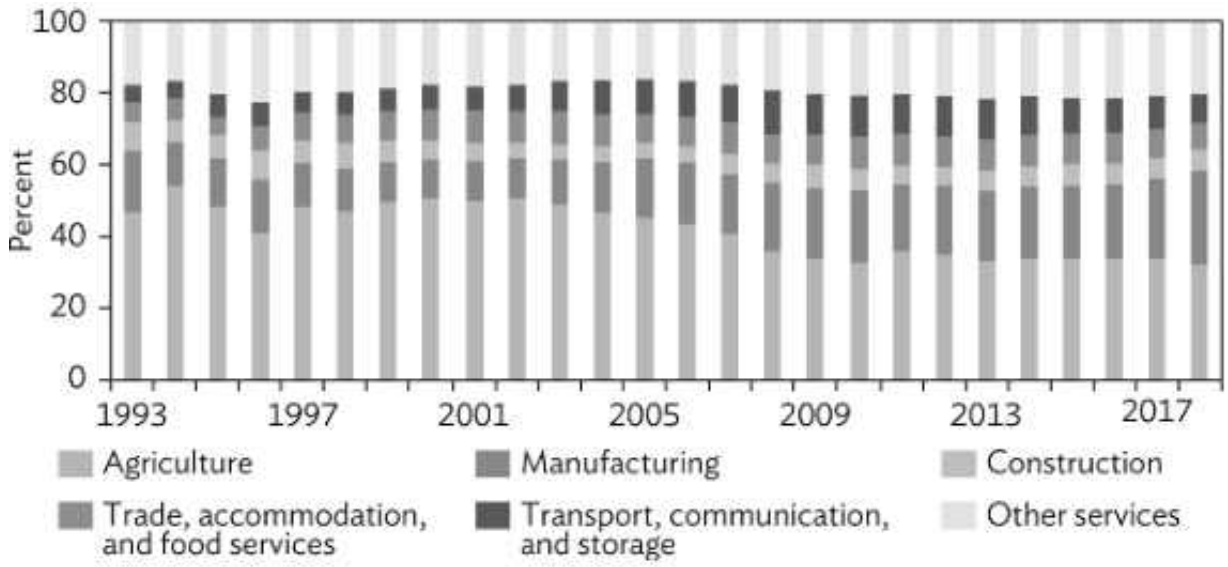


Figure 133: Asian Development Bank (ADB) Statistical Data Base System [101]

In terms of income levels, Uzbekistan has remained in the lower-middle income group since 2001 (having briefly been classified as a low-income country during 1998–2000) [101].

Poverty in country level in 2012 was 20% in average country level. However, it was higher than the national average in several Uzbekistan's provinces, especially in the remote and sparsely populated rural provinces including Surkhandarya, where most households are employed in agriculture, and few receive remittances [101] [102].

In the province level, the gross regional product (hereinafter - GRP) of Surkhandarya amounted to 16 949,1 billion soums in 2021 [74]. In US dollars at the average exchange rate for the reporting period (average exchange rate for 2020 – 10,055.8 soums), nominal GDP amounted to 1,685 million US dollars. In 2020, GDP per capita amounted to 9 040,6 thousand soums (in the equivalent – 899 USD).

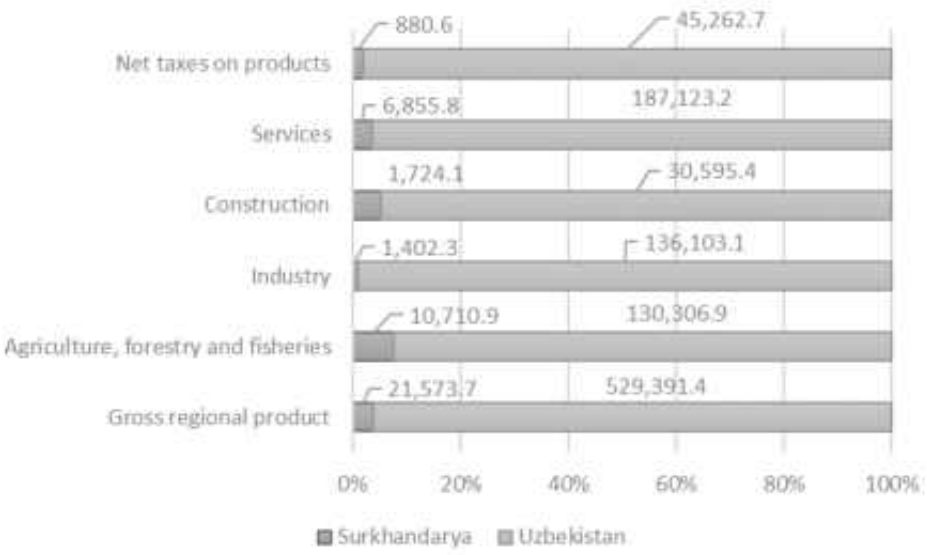


Figure 134: Share of GRP of Surkhandarya by sectors in GDP of Uzbekistan in 2019, in billion UZS [74]

From the comparison of Figure 134 and Table 165, it can be roughly concluded that Angor and Termez together contribute to 15% of its economy. In Termez, foreign trade turnover in 2020 was 44 million US dollars, of which exports – 19.5 million US dollars, imports – 24.5 million US dollars. In Angor, foreign trade turnover in 2020 was 19.5 million US dollars, of which exports - 14.2 million US dollars, import - 5.3 million US dollars.

Table 165: Key macroeconomic indicators in Termez and Angor districts in 2021 [85][86]

	Angor 2020 (billion UZS)	Termez 2020 (billion UZS)
Industrial products	**123.6**	**112.0**
Consumer goods	**71.5**	**39.1**
Gross agricultural output	**1,105.7**	**478.5**
Investments in fixed assets	**255.6**	**381.3**
Construction works	**187.1**	**258.6**
Retail turnover	**533**	**137.9**
Services	**257.9**	**198.1**
Foreign trade turnover (million USD)	**19.5**	**44**
Export (million USD)	**14.2**	**19.5**
Import (million USD)	**5.3**	**24.5**

Uzbekistan's economic growth has been supported by the expansion of private sector businesses, and accelerated by government efforts to transition to a market-based economy. Such private sector development is critical for a smooth shift from state-driven to private-sector-led economic growth in which small business entities play a key role. In Termez, small business entities – 1,901 (including: 686 farms). In Angor, number of small businesses – 1,317 (including: 288 farms). Specifically, these SMEs importance in the economy of the districts could be explained in the numbers, for example, 92% of all industry products and 85% of agriculture products were produced by them in 2020 [85][86].

Table 166: SMEs operating in Angor and Termez districts in 2020 [85][86]

Type of SME	Angor	Termez
in agriculture	**393**	**376**
in the forestry	**9**	
in the industry	**213**	**265**
in construction	**143**	**228**
in trade	**334**	**398**
in the service of transportation and storage	**21**	**67**
in the service of living and eating	**73**	**126**
information and communication	**8**	
provision of health and social services	**18**	
in others	**281**	**116**
Total SMEs	**1,493**	**1,576**

According to Table 166 one can draw a conclusion about the sources of income of the districts. 'Agriculture' is the dominant income sector in both districts, which is followed by sector 'services'. Summing up, Angor region is more focused on agriculture compared to Termez, while the former is less industrialized than the latter.

15.2.3 Labor Force

15.2.3.1 Labor Force Indicators

Generally, there are three key indicators of market activities. The first indicator is unemployment rate which is probably the best-known labor market measure. Moreover, this rate is useful for the underutilization of the labor market. It usually indicates the inability of economy to create the new job opportunities for those people who want to work but are not doing so, even though they are available for employment and actively seeking work. The second indicator is labor force participation which represents the relative amount of the labor resource available for the production of goods and services [106]. Another key indicator is the employment-to-population ratio. According to the International Labor Organization (ILO) the employment – to – Population ratio as proportion of a country's working-age population that is employed. A high ratio means that a large proportion of a country's population is employed, while a low ratio means that a large share of the population is not involved directly in market-related activities, because they are either unemployed or (more likely) out of the labor force altogether [107].

15.2.3.2 Unemployment rate

Uzbekistan was one of only three economies in the Europe and Central Asia (ECA) region that had a positive economic growth in 2020. Despite the global impact of the COVID-19 crisis, reforms implemented in the economy supported growth in 2020. According to the data retrieved from Ministry of Employment and Labor relations the unemployment rate in Uzbekistan remained unchanged at 10.50 percent in the first quarter of 2021 from 10.50 percent in the fourth quarter of 2020 [108]. For the same period in 2019, the unemployment rate was 9.1 percent. The total number of people who is seeking for job is 1.9 million (the unemployment rate for ages 16-30 is 20.1%, and the unemployment rate for women is 17.4%). The positive trend in unemployment during the last year occurred due to spread of COVID -19 infection and measures that the GoU took against virus.

In regard to Surkhandarya province unemployment rate was 11.1 percent in the fourth quarter of 2020 [49]. Moreover, the total number of unemployed people in the region estimated to 3,100 individuals. But this figure is slightly better in Termez district with 10.6 percent while this this rate in Angor district was 11.2 percent accordingly (Figure 135).

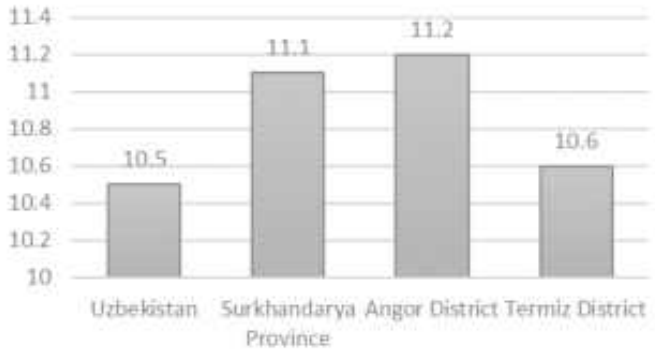


Figure 135: Unemployment rate in Uzbekistan, Surkhandarya province and Angor, Termez districts [109][110]

15.2.3.3 Labor force participation rate

As labor force participation rate measures the number of people who actively seeking for job or those who already employed, it omits the part of population that 16 or older. For example, the employment to population ratio is depend on working age population which according to international standards all person aged 15 or older but this value differs in Uzbekistan where working age population starts from 16 aged population. This rate especially interesting to the government and investors to analyze and anticipate the potential labor force to the planned programs and projects in the field of industry, service and business. Therefore, industrialization projects tend to increase participation by creating employment opportunities in labor markets that attract people to leave household production roles or employment in the informal economy. This is particularly important to the developing countries as Uzbekistan to increase its labor participation rate.

Based on statistics from 2020, labor force participation rate in Uzbekistan was 85.5 percent. For comparison, this value for Kazakhstan was 69.2 percent while Kyrgyzstan has 53 percent [111]. However, the world average in 2020 based on 181 countries is 60.32 percent. When it comes to the province level, Surkhandarya had 70 percent while Angor and Termez districts 86 and 82 percent respectively (see Figure 136) [109][110]. The high labor participation rate in Uzbekistan can be as a result of reform in education sector because more educated population most likely remain employed.

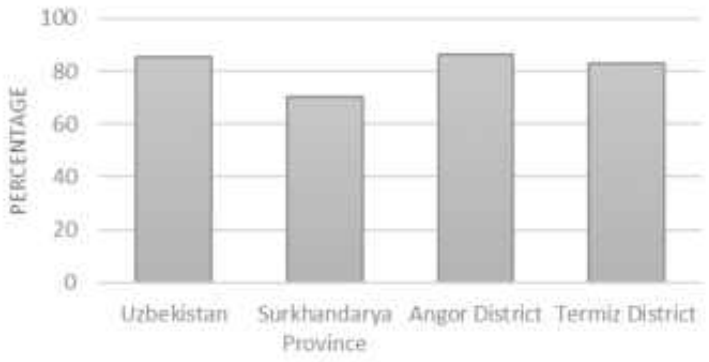


Figure 136: Labor force participation rate in 2020 in Surkhandarya province and Angor, Termez districts [109][110]

15.2.3.4 Employment to population ratio

The employment to population ratio or in other words the percent of population which is currently employed in Uzbekistan is accounted around 77.1 percent. Since employment to population ratio is depend on working age population which according to international standards all person aged 15 or older. However, this value differs in Uzbekistan where working age population starts from 16 aged population. Based on available statistical data, about 77 percent of working aged population is employed or 14,926,300 individuals out of 19,277,600 have a job (see Figure 137). For comparison, Iceland's country employment rate was at 83.8 percent in 2020 the highest of any OECD country [112]. Despite high employment to population ratio within country the value for Surkhandarya province was at 64.4 percent. Relatively high unemployment rate within the province has affected to the province population ratio with 1,104,100-person total and from them 122,000 individuals unemployed.

In regard to district level, the percentage of employment in Angor and in Termez in 2020 was 74.9 and 77.5, respectively. Again, the unemployment rate in relation to the working-age population is about 11 percent in Angor district and same relation for Termez is 10.5 percent.

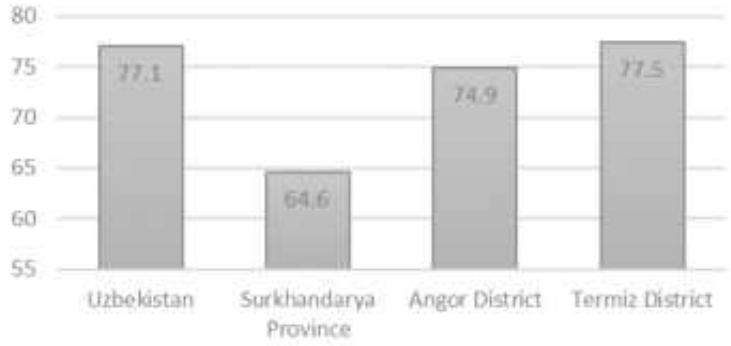


Figure 137: Employment to population ratio in 2020 in Surkhandarya province and Angor, Termez districts [109][110]

Although, the given above figures and numbers seem positive in employment point of view but it should be noted that the reliability for those numbers and figures is the subject to the scrutiny review.

In the project districts, the unemployment rate is quite high, on average 11% of the workable population, for Angor district this figure is 11.2%. And in Termez district, the unemployment rate is 10.6%. Moreover, unemployment among women is 13.2%. It is worth to noting that an acute shortage of jobs, informal employment, low wages from one hand and bad working and labor conditions on the other hand forces rural area forces to become migrant worker in other countries.

The level of official employment is especially low among women, in Surkhandarya province only 7% of women have jobs in enterprises and organizations of the non-agricultural sector. There are also very few entrepreneurs among the employed population. The problems of high unemployment are relevant for both regions. In all areas, female unemployment prevails. Another negative feature of the labor market of these areas is the high level of the economically inactive population, especially among women. In Surkhandarya province, every fifth woman did not work and did not look for a job. Perhaps some of these women stopped looking for a job, because they lost hope of finding a job.

15.3 SOCIAL IMPACT ASSESSMENT

15.3.1 Introduction

15.3.1.1 Purpose

The Republic of Uzbekistan (Uzbekistan) has an area of 448,978 km² and is located between the Amudarya and Syrdarya rivers. Uzbekistan has underground resources such as oil, gas, coal and uranium.

In recent years, Uzbekistan has implemented large-scale reforms to boost its energy sector [61]. The government of Uzbekistan has approved a strategy of supply electric power for ten years from 2020 until 2030 [62]. This strategy illustrates priority given by the government to the development of electric power industry, increase electricity production in order to supply population's growing demand and foster economic growth of the country. The proposed project might contribute to the strategy of supply electricity power for further ten years, which includes: (i) modernization and reconstruction of existing power plants; (ii) construction of modern ones using energy-efficient technologies. In line with these plans, an agreement between Uzbekistan government and Dutch company Stone City Energy (Investor) was signed on the construction of a new thermal power plant in Surkhandarya region on the basis of public-private partnership. It is considered to construct a CCPP in Angor District Surkhandarya region, just on the north – eastern shore of the Uchkizil water reservoir.

The project benefits include:

- Retrenchment natural resources: The project aims to save 1.1 billion cubic meters of natural.
- Improved generation efficiency: The project will achieve a minimum of 60 percent efficiency. This will improve Uzbekistan's overall energy generation efficiency.
- Reduced greenhouse gas emission: The project will reduce greenhouse gas emissions per kWh of energy generated in Uzbekistan.
- Improved energy reliability: The plant represents a major investment in baseload generation capacity in Uzbekistan.

15.3.1.2 Importance of Social Impact Assessment

The Social Impact Assessment (SIA) is the study where the social impacts of the industrial projects are identified and assessed. It can also be applied to policies, plans and programmes. SIA is used to forecast and prevent negative consequences, as well as to find possibilities to improve benefits for local communities and society as a whole. The involvement of impacted communities and other stakeholders in the process is one of the major concepts and practices of SIA.

As a good international practice SIA required by the International Finance Institutions (IFI's) to assess the social, economic and cultural impacts of industrial activities on local population and communities. The results of the assessment then will be converted into implementation plan over the period of the project. This is especially important for the industrial projects, whose activities frequently encroach on the pollution of water, land and air that local people depend on for their traditional livelihood activities. Thus, it helps to avoid potential negative impacts on critical natural resources, such as water and forests, as well as impacts on cultural resources. However, SIA process also helps to identify ways that local communities could benefit from a proposed development, for example, through infrastructure development, job creation or create better live conditions for the local people.

The purpose of this Social Impact Assessment is to obtain relevant data to establish basic indicators "before" the implementation of the Project. Also, the assessment materials will serve as the basis for the development of socio-economic and gender design elements of the Project of the construction in Surkhandarya region of Uzbekistan. The Assessment will contribute to the development of a monitoring and evaluation strategy, as well as a framework for the Project impact assessment.

The main objectives of this SIA in this project prospective as follows:

- To conduct surveys that includes basic information necessary for a qualitative and quantitative assessment of the results and indicators of the Project impact;
- Assessment of baseline conditions (existing conditions) prior to the development of the Project through review of available data and conducting surveys;
- Assessment of the social impacts of the proposed project during the construction and operation phases;
- Assessment of the risks for various social groups, especially vulnerable groups (low-income families, women, children, etc.);
- Assessment of socio-economic factors and develop proposals to mitigate/eliminate negative consequences;
- Review of compliance obligations, regulations and standards that requires International Finance Institutions such as World Bank (WB), International Finance Corporation (IFC), European Bank for Reconstruction and Development (EBRD);
- To engage with key stakeholders and Project affected people to disclose Project information, study outcomes, gain lay knowledge about the local social context and seek feedback on Project.

Although the assessment results will an important part of the feasibility study of this project but it also might be used as separate document of the proposal to IFI's.

15.3.1.3 Scope

This part of the report presents the scope of the study, presenting the requirements of three international financial institutions on social assessment, namely World Bank, International Finance Corporation and European Bank for Reconstruction and Development. The requirements for the social aspects of each financial institution are presented in their own documents, the so-called frameworks, which are always accompanied by environmental aspects.

World Bank Requirements on Social Assessment

The World Bank Environmental and Social Framework (ESF) displays the adherence of World Bank to sustainable development. The aim of the Bank is ending extreme poverty and promoting prosperity by means of a Bank Policy and a set of Environmental and Social Standards. It needs to be highlighted that environmental and social aspects always come together as environmental problems simultaneously are considered as the problems for society. Therefore, the general idea on the Bank's ESF is described following Environmental and Social Standards which are obligatory requirements that apply to the Borrower and projects. The Standards present the requirements for Borrowers relating to the identification and assessment of environmental and social risks and impacts associated with projects. Later, only social risks and impacts are listed to define the general idea to the requirements of World Bank on Social Assessment. This section is described according to the World Bank's Environmental and Social Framework document [63].

The World Bank ESF encompasses:

- World Bank's Vision for Sustainable Development - aspirations of the Bank regarding environmental and social sustainability;
- World Bank Environmental and Social Policy for Investment Project Financing - the mandatory requirements that is relevant to the Bank;
- World Bank's Environmental and Social Standards - mandatory requirements that is relevant to the Borrower and projects.

As Vision for Sustainable Development and Environmental and Social Policy for Investment Project Financing are directed to the World Bank, presenting its objectives, commitments, role and responsibilities related to environmental and social sustainability, Environmental and Social Standards refer to the Borrower itself, providing guidance on how to identify environmental and social risks and impacts. Thus, Environmental and Social Standards are considered as the collection of requirements which needs to be developed by the Borrower.

The Environmental and Social Standards (ESSs) establish the requirements for Borrowers on identification and assessment of environmental and social risks and impacts associated with projects. The ten ESSs establish the standards that the Borrower and the project will meet through the project life cycle, as follows:

ESS 1:	•Assessment and Management of Environmental and Social Risks and Impacts;
ESS 2:	•Labor and Working Conditions;
ESS 3:	•Resource Efficiency and Pollution Prevention and Management;
ESS 4:	•Community Health and Safety;
ESS 5:	•Land Acquisition, Restrictions on Land Use and Involuntary Resettlement;
ESS 6:	•Biodiversity Conservation and Sustainable Management of Living Natural Resources;
ESS 7:	•Indigenous Peoples/Sub-Saharan African Historically Underserved Traditional Local Communities;
ESS 8:	•Cultural Heritage;
ESS 9:	•Financial Intermediaries;
ESS 10:	•Stakeholder Engagement and Information Disclosure.

-Environmental risks and impacts; -Social risks and impacts; -Risks and impacts of both;

The ESSs are designed to manage the risks and impacts of a project, and improve their environmental and social performance. Particularly, Standards ESS2, ESS4, ESS5, ESS7, ESS8 and ESS10 directly relate to social aspects of the project which shows its crucially in the sustainable development.

Environmental and Social Standard ESS1 relates to all projects for which Bank investment project financing is required. ESS1 establishes the importance of:

- The Borrower's existing ESF to address the risks and impacts of the project;

- An integrated environmental and social assessment to identify the risks and impacts of a project;
- Effective community engagement through disclosure of project-related information, consultation and effective feedback; and
- Management of environmental and social risks and impacts by the Borrower throughout the project life cycle.

ESS2–10 determine Borrower's duties in finding and addressing environmental and social risks and impacts that may require particular attention. Overall, these standards set objectives for prevention, minimization, reduction and mitigation of risks and impacts or establishes measures for compensation of impacts. Therefore, the clear approach that addresses to every 10 standards need to be provided in the appropriate environmental and social assessment by the Borrower.

According to the nature and scale of the project, different tools can be used for the assessment. The tools which are suggested the World Bank itself are - Environmental and social impact assessment (ESIA), Environmental and social audit, Hazard or risk assessment, Cumulative Impact Assessment, Social and conflict analysis, Environmental and social management plan (ESMP), Environmental and social management framework (ESMF), Regional ESIA, Sectoral ESIA, Strategic Environmental and Social Assessment (SESA). Moreover, project's explicit features may necessitate the Borrower to develop specific methods and tools for assessment, for example Biodiversity Action Plan, Cultural Heritage Management Plan, Indigenous Peoples Plan, Livelihood Restoration Plan, Resettlement Plan and further plans as agreed with the Bank.

Thus, Framework includes provisions on grievance redress and accountability to deal with the complaints from stakeholders and people affected by the project. A Bank-supported project is required to include a number of mechanisms for addressing concerns and grievances arising in connection with a project.

The social risks and impacts which the Bank will take into account in its due diligence are project-related and include the following:

- Threats to human security through the escalation of personal, communal or interstate conflict, crime or violence;
- Risks that project impacts fall disproportionately on individuals or groups who, because of their particular circumstances, may be disadvantaged or vulnerable;
- Any prejudice or discrimination toward individuals or groups in providing access to development resources and project benefits, particularly in the case of those who may be disadvantaged or vulnerable;
- Negative economic and social impacts relating to the involuntary taking of land or restrictions on land use;
- Risks or impacts associated with land and natural resource tenure and use, including (as relevant) potential project impacts on local land use patterns and tenurial arrangements, land access and availability, food security and land values, and any corresponding risks related to conflict or contestation over land and natural resources;
- Impacts on the health, safety and well-being of workers and project-affected communities;
- Risks to cultural heritage.

The Bank expects that application of these standards will support Borrowers to reach their goal to reduce poverty and increase prosperity which will consequently improve the environment. The standards are anticipated to:

- Support Borrowers in achieving good international practice relating to environmental and social sustainability;
- Assist Borrowers in fulfilling their national and international environmental and social obligations;
- Enhance nondiscrimination, transparency, participation, accountability and governance; and
- Enhance the sustainable development outcomes of projects through ongoing stakeholder engagement.

Performance Standards (IFC) for Social Assessment

IFC's Sustainability Framework expresses the Corporation's commitment to sustainable development by avoiding and mitigating adverse impacts and by managing risks. The Framework consists of:

- IFC's Policy on Environmental and Social Sustainability – commitment to sustainable development, roles, and responsibilities related to environmental and social sustainability;
- IFC's Access to Information Policy - commitment to transparency and good governance on its operations, and outlines the Corporation's institutional disclosure obligations regarding its investment and advisory services;
- IFC's Performance Standards - for clients, providing guidance on how to identify risks and impacts.

As Policy on Environmental and Social Sustainability and Access to Information Policy are directed towards Corporation itself, Performance Standards are directed towards clients, providing direction on risks and impacts identification. The standards are designed to assist in avoidance, mitigation, and management of risks and impacts of the project financed. Moreover, it includes stakeholder engagement and disclosure obligations of the client in relation to project-level activities. Therefore, development of Performance Standards developed by client is considered as the mandatory document for IFC financing. As IFC is the sister organization of World Bank, its Performance standards is very similar to the Environmental and Social Standards of World Bank, which has been presented earlier. The standards on Performance standards were described based on the report IFC Performance Standards on Environmental and Social Sustainability [64].

However, IFC has eight Performance Standards (PS) for establishing standards that the client is to meet throughout the life cycle:

-Environmental risks and impacts; -Social risks and impacts; -Risks and impacts of both;

Specifically, Standards PS2, PS4, PS5, ESS7 and ESS8 directly relate to social aspects of the project evidencing its crucially in the sustainable development.

Similarly, to ESS1 of the World Bank, PS1 is relevant to all the projects that has environmental and social impact and establishes the importance of:

- integrated assessment of environmental and social impacts of the project;
- effective community engagement through disclosure of project-related information, consultation; and
- management of environmental and social risks and impacts by the client throughout the project life cycle.

PS2-8 establish objectives and requirements to avoid and minimize the risks and impacts of the project identified in PS1. While all relevant environmental and social risks and potential impacts are needed to be considered as part of the assessment in PS1, PS 2-8 describe potential environmental and social risks and impacts that need specific attention. As environmental or social risks and impacts are clarified, the client is ought to manage them through its Environmental and Social Management System (ESMS) coherent with PS 1.

Performance Requirements (EBRD) for Social Assessment

The European Bank for Reconstruction and Development (EBRD) is dedicated to promotion of "environmentally sound and sustainable development" in its activities. The Bank prioritizes the environmental and social sustainability as it is identified as fundamental aspect of achieving expected outcomes. EBRD requires from the projects to meet environmental principles, practices and substantive standards of European Union, irrespective of their geographic location.

Similar to World Bank and IFC, EBRD has Performance Requirements (PR) to meet environmental and social sustainability that projects are required to meet. The requirements and their comprehensive enlightenment are given in the document Environmental and Social Policy [65]. The PRs are very similar to the World Bank's ESSs, which also consist of 10 impacts and risks which are needed to be addressed.

--Environmental risks and impacts; -Social risks and impacts; -Risks and impacts of both

All projects undertake environmental and social assessment both to clarify EBRD if the project should be financed and, if yes, then which environmental and social risks and impacts should be addressed in life cycle of a project.

As a conclusion, safeguard policies of all three International Financial Institutions have iterative manner, and there are numerous similarities between the safeguard policies of the World Bank, IFC and EBRD. Even though the requirements were named differently (ESS – World Bank, PS – IFC, PR - EBRD), their commitment to address to social impact and risks hold similar priorities. The main concentration of all three financial institutions is paid into - stakeholder engagement, vulnerable groups, disclose sufficient information about the risks and impacts, provisions on grievance redress and accountability, promotion of gender equality, address to climate change etc.

15.3.2 Definition of Project Impact Area

15.3.2.1 Project Area

The Project area means all areas proposed to be disturbed, altered, or used by the proposed activity or the construction of any proposed structures. This section provides wider explanation of project location at three levels: country, regional and districts respectively.

The Republic of Uzbekistan is situated between the rivers of Amudarya and Syrdarya and occupies 448,9 thousand square km. The territory borders on Kazakhstan in the north, on Kyrgyzstan and Tajikistan in the east and southeast, on Turkmenistan in the west, and on Afghanistan in the south [66].

There are 14 territorial and administrative divisions-regions in Uzbekistan. One of them is Surkhandarya Province that covers 20.1 thousand square km (4.48% of the total area of the Republic of Uzbekistan) [67]. Surkhandarya Province borders with the Republic of Tajikistan on the north and north-east, Afghanistan on the south (the border stretches along the Amudarya), and Turkmenistan on the south and west.

The Project will be constructed in Angor District of Surkhandarya Province, about 14 km from the Termez City, which is located on southeast of the Country. The project impact area is located on the north-eastern coast of the Uchkizil reservoir.

The relief of the project area is gently undulating, flat, with a general slope to the south, complicated by eolian forms in the form of hilly and ridge sands. The proposed location of the Project is provided in the Figure 138.

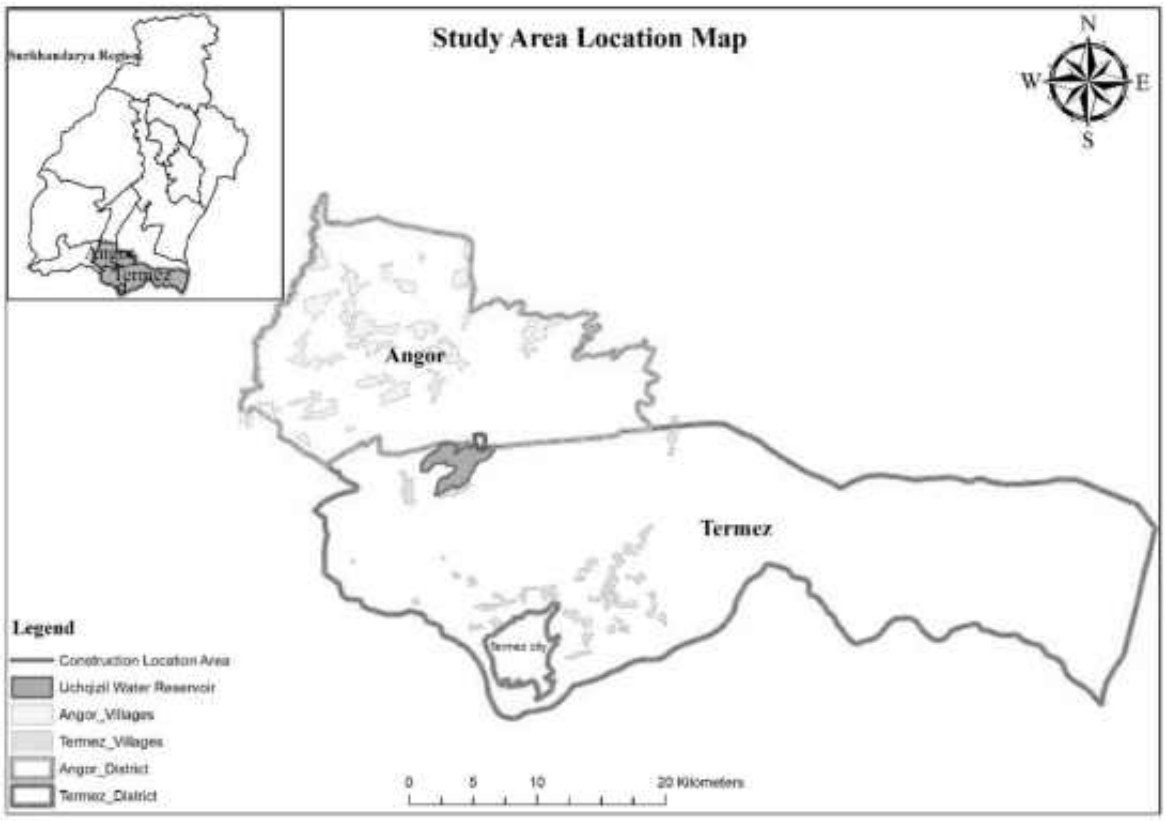


Figure 138: Project Location Map – Local Context

The Project impact area is located within Angor and partly Termez districts. Angor District has 36 settlements of which 12 towns including total 23.2 thousand households. There are 29 mahallas (settlements) and 7 towns in Termez District, which includes 19.2 thousand households. The nearest residential settlement, Uchkizil Village is located 2.0 km away from the Project, which meets the requirements of Sanitary norms and rules for the protection of atmospheric air in populated areas of the Republic of Uzbekistan [68] . Distance to the regional center - the city of Termez - 14 km (see Table 167). [68]

Table 167: Distance of the settlements and buildings from the Project

ID	Type	Distance to Project	Description
Reservoir	**Hydrotechnical**	**0.1 km**	**Uchkizil Reservoir**
M-39 numbered highway	**Road**	**0.5 km**	**Highway between Tashkent-Termez**
Canal	**Hydrotechnical**	**0.8 km**	**Zang Canal**
Bio Tehno Eko LLC	**Industrial**	**1.2 km**	**Waste processing enterprise**
Village	**Residential**	**2.0 km**	**Uchkizil Village**
Village	**Residential**	**2.0 km**	**Kattakum Village**
Railway	**Road**	**7.0 km**	**Railway line Kagan-Termez-Dushanbe**
City	**Residential**	**12.0 km**	**Termez city**

Project Impact Area

This section describes the project impact area. Two level of impact area was included in the study, first is 0-5 km, and second is 5-10 km. Project had not yet been commissioned when this study was conducted. Therefore, the Project impact area is defined as a place where a Project can positively and negatively affect social life, economic infrastructure and the environment.

0 to 5 km radius area

There is no large community and settlement within a radius of 5 km from the Project impact area. The territory of the Project construction from the north, east and west is surrounded desert. There is an irrigation source Zang canal, located very close, 800 meters west of the Project. This canal flows into Uchkizil reservoir. The distance from Project to Uchkizil lake - 100 meters from the southern part. Another advantage of the Project location is access to the main road (M - highway connecting Tashkent and Termez) at a distance of 500 meters. Furthermore, there is the main railway line Kagan-Termez-Dushanbe at a distance of 7 km from the south of the Project area.

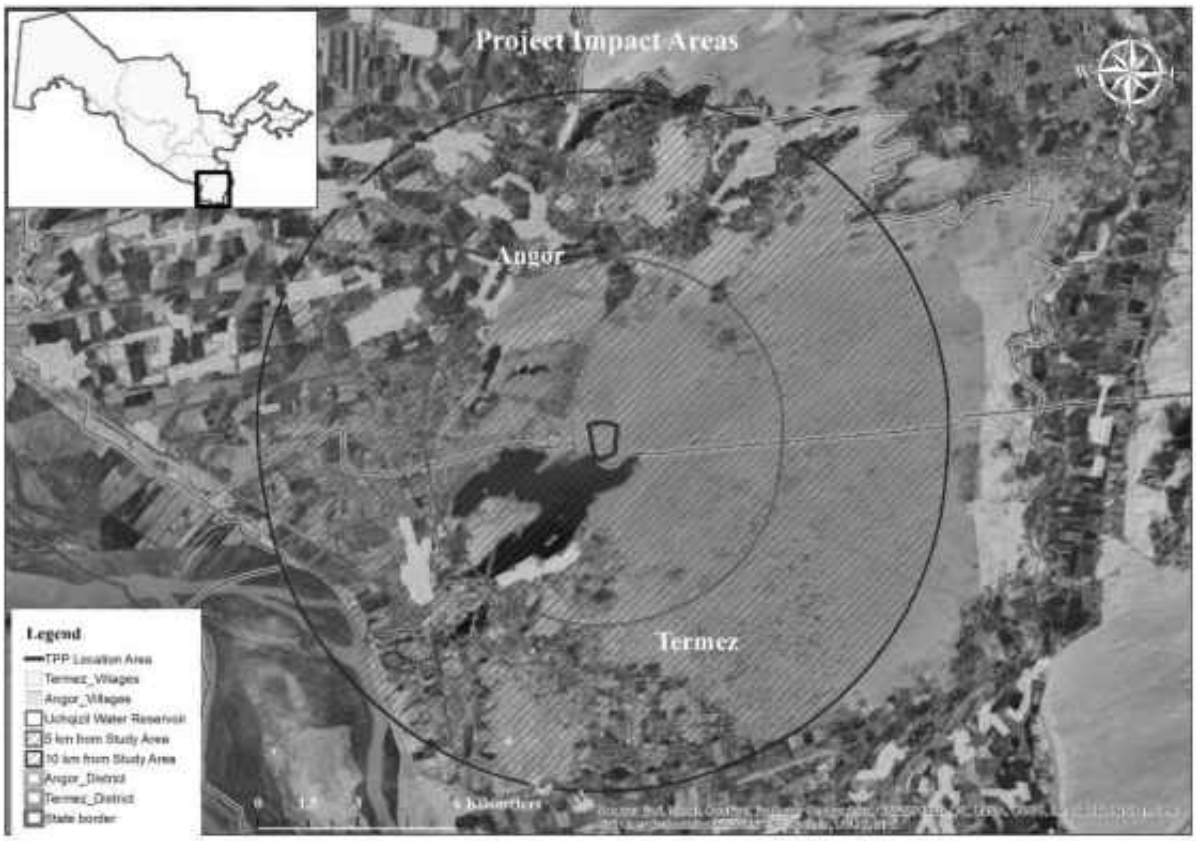


Figure 139: Project Impact Area 5 and 10 km radius

5 to 10 km radius area

The ArcGIS software was used to define the Project Impact Area within a radius of 10 (ten) km.

10 km area includes 16 settlements in Angor and Termez Districts.

Table 168. Settlements located within Project Impact area in 10 km

#	Settlements (Mahalla)	Population	Household
1	**Bahor**	**4,120**	**680**
2	**Dehqonbirlashuv**	**2,594**	**478**
3	**Ilgor**	**3,100**	**645**
4	**Karvon**	**3,708**	**623**

#	Settlements (Mahalla)	Population	Household
5	**Kattaqum**	**5,334**	**1,004**
6	**Kayran**	**4,712**	**792**
7	**Khalqobod**	**4,545**	**804**
8	**Madaniyat**	**2,650**	**510**
9	**Markaz**	**3,100**	**485**
10	**Namuna**	**3,414**	**556**
11	**Orol**	**4,178**	**725**
12	**Qoshtegirmon**	**3,631**	**631**
13	**Tallashqon**	**3,574**	**538**
14	**Uchkizil**	**4,582**	**894**
15	**Zang Gilambop**	**2,173**	**342**
16	**Zartepa**	**4,460**	**770**
	TOTAL	**59,875**	**10,477**

15.3.3 General Social Aspect

This chapter of the study describes the methodology of the baseline socio-economic study, including the methods of sampling, data collection, data types, research approaches used, and data collection time period.

Based on the goals and objectives of the study, the study focuses on:

- Data acquisition to assess socio-economic characteristics of the project located area and households affected by the project;
- Establishment of baseline indicators for the project of construction of the Project;
- Data acquisition to identify community's thoughts and attitudes about the Project;
- Assessment of the stakeholder engagement and information disclosure of the stakeholders about the project organization in the area;
- Analysis of the data for identification of adverse social impacts and risks for various social groups, including vulnerable groups;
- Analysis of the data to propose mitigation measures for adverse impacts and risks for various social groups, including vulnerable groups in order to avoid or reduce the impact;
- Development of grievance redress mechanism.

15.3.3.1 Methodology of the study

Initially, the preliminary phase of the study was carried out in selected Project Impact Areas (Angor and Termez) to collect preliminary information and conduct pilot interviews. The collected information was utilized to develop study tools, refine the questionnaire, identify focus group mahallas, make a sampling, evaluate possible challenges during the field work and identify the ways to overcome them.

. The study tools (questionnaries) have been developed based on the selected methods of collecting information:

- For quantitative survey technique, two questionnaires were developed: for households and for local authorities (in mahalla level). Consequently, the questionnaires were tested as a pilot in one of the project impact areas.
- For qualitative survey technique, list of questions for focus group discussions (FGD) has been developed.

15.3.3.2 Data Type and Sources

In order to conduct socio-economic assessment of the project, the primary and secondary data are used (see Figure 140). Primary data is the data that is acquired by experts straight from sources by using different data collection methods while secondary data is the data that has already been collected by other parties that are readily available for consultants to utilize in the study. In this study, secondary data was obtained from various sources. Such data include official state statistics, district and province passports prepared by khokimyatsand local authority management organizations, including mahallas. The list of secondary data collected and used included the following data:

- Size of population, households and gender distribution in the project impact area in three levels: province, district and mahalla (State statistics, local authorities);
- Social and public utilities infrastructure (State statistics, data from Ministries of Health, local authorities);
- Labor resources, employment rate, labor migration (State statistics).

Along with state statistical data, existing literature including journal articles, web-articles and legislative databases (lex.uz; norm.uz) were used.

Primary data is the outcome of questionnaires, stakeholder meetings and focus group discussions. There 3 questionnaires are developed to primary data collection: household questionnaire, local authority questionnaire, focus group meeting questionnaire (see *Annex 1. Questionnaire forms in Attachment F*).

Household and local authority questionnaires inquire mostly quantitative information about demography, economic conditions, educational levels, health, agriculture and stockbreeding, transportation, infrastructure and communication at the regional (districts) and local level (impact area: 0 – 10 km).

Particularly, baseline conditions of the impact area and region covers information about:

- Population structure (Population numbers, distribution, changes in years, religion, ethnicity, etc.)
- Economic structure (Economic indicators, activities, etc.)
- Access to Social Services (Health, transportation, education, etc. services)

Focus group meeting questionnaire inquire the answers to the questions about:

- Stakeholder engagement in the project;
- Disclosure of information;
- Revealing the positive/negative impacts of the project;
- Stakeholders' grievances related to the project;
- Benefits and problems of the area and the project;
- Expectations of the stakeholders from the project and their suggestions.

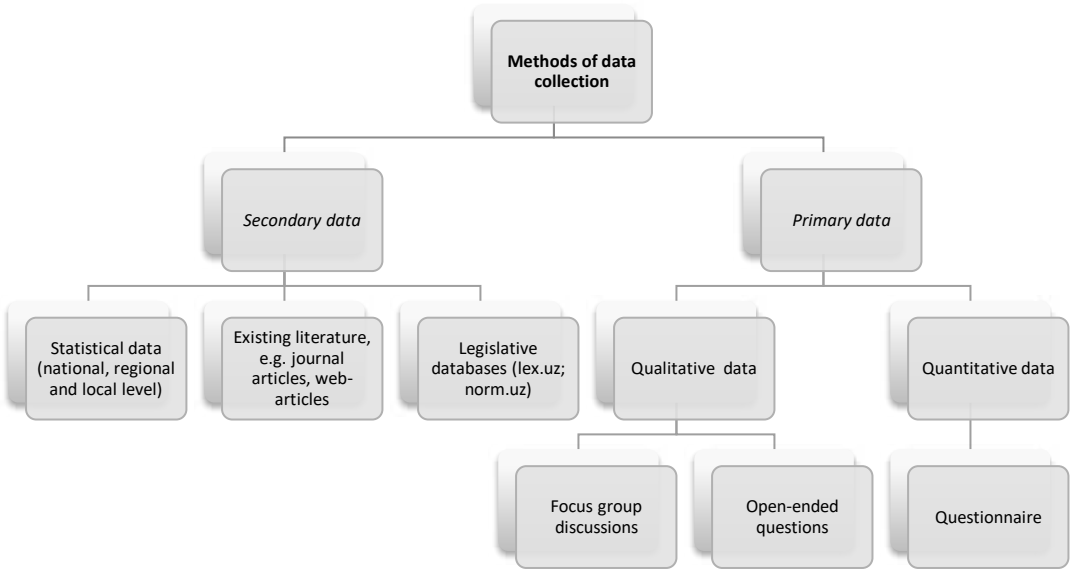


Figure 140: Data collection methodology of the social impact assessment of the project

15.3.3.3 Sampling

The sample size of the household survey was designed in such a way, so as to ensure representativeness of the data obtained for the project districts. The calculation of simple random sampling size was carried out according to the formula:

$$n=\frac{z^2 N \delta^2}{\Delta^2 N+Z^2 \delta^2}$$

where: n - is sampling size

N - is general totality

Z - is a confidence level

∆ - is margin of sampling error

δ - is general totality dispersion with normal distribution and relevant for study purposes.

Table 169: Determining sample size for the Socio-economic assessment

General totality	***N***	***10,477***
Confidence level	**Z**	**1.96**
Margin of sampling error	**∆**	**0.05**
General totality dispersion	**δ**	**0.5**
Sample size	**n**	**370**

To conclude about the socio-economic condition of the study area, 370 survey was required to carry out in 95% confidence level with 5% margin of error. However, due to several limitations which was depicted in detail in *"Limitations" (Section 15.3.4.3)* part of the report, 83 households were surveyed. When the data collection from households was finished, the results were discussed in the focus group discussion. The reason was cross checking the reliability of the survey results despite the few households inclusion.

What relates to the local authority questionnaire, out of 16 makhalla heads, 8 were interviewed in person. However, so called passports of all 16 makhallas were received from district khokimyats. The document included up to date information which was asked in the local authority questionnaire.

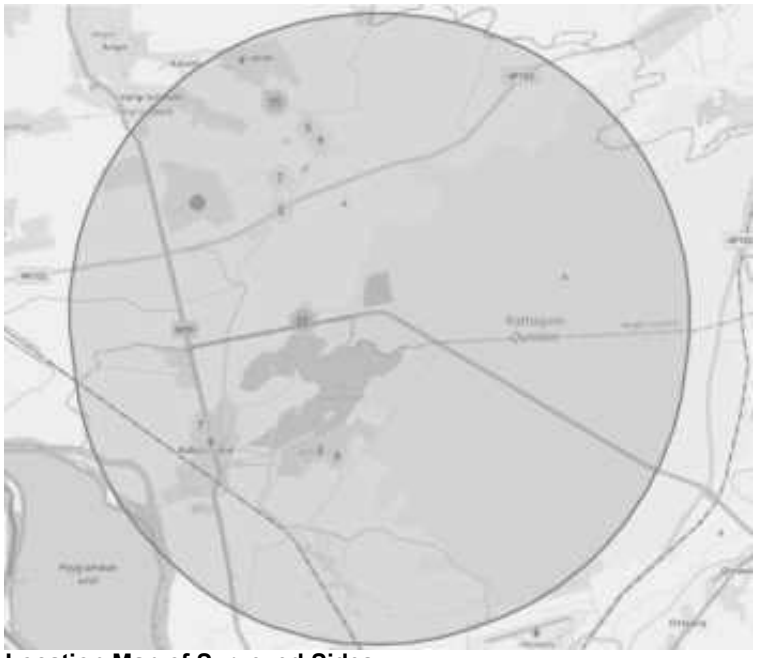
The general totality (number of households) was calculated according to state statistics and Mahallas.

In Uzbekistan, there is no a full list of households at the country, regional, or district level. The household lists are compiled by local self-governments - mahalla committees. From 8 mahalla heads, questionnaire on local authorities were carried out. Primarily, the purpose of the visit was explained and their willingness to participate in the survey was asked.

The households were selected directly in the mahalla committees, together with the head of mahallas. Accordingly, all household surveys were conducted in presence of mahalla representatives. By doing this, building trusts from respondents was achieved which reflected on collection of responses.

The households were selected from the updated list of households in the mahallas. Household heads or members the most informed on family and community problems and decision makers were selected as respondents. In each selected household, one respondent was interviewed at home by specially trained interviewers. The interviews were conducted face to face.

In total, 83 households were surveyed, including 57 households in Angor and 26 in Termez districts (see Figure 141).



Location Map of Surveyed Sides

Surveyed side in Kayran mahalla, Angor

Surveyed side in Uchkizil mahalla, Termez

Figure 141: Map of surveyed households' location within 10 km of Project, retrieved from Kobo Toolbox

During the qualitative phase, 2 FGDs were also conducted with stakeholders, one in Termez district and one in Angor district. Stakeholders are persons or groups who:

- Are directly or indirectly affected by a project;
- Have interests in a project;
- Have ability to influence its outcome, either positively or negatively.

Stakeholders include:

- Locally affected communities or individuals and their formal and informal representatives;
- National or local government authorities;
- Politicians;
- Religious leaders;
- Civil society organizations;
- Groups with special interests;
- The academic community;
- Other businesses.

Potential stakeholders are:

- Project affected communities/settlements;
- Vulnerable groups (female, low-income, disabled and elderly people) in the Project affected settlements;
- Local authorities;
- Municipalities.

15.3.3.4 Data collection and analysis procedures

In total, 4 specialists were involved in the field survey and to moderate and organize FGD.

The results were recorded to Kobo Toolbox software which enabled to collect and store data offline, and being handy in challenging environments and demanding contexts. The software enabled creation of automatic database together with basic analysis, figures and maps (see Figure 142).

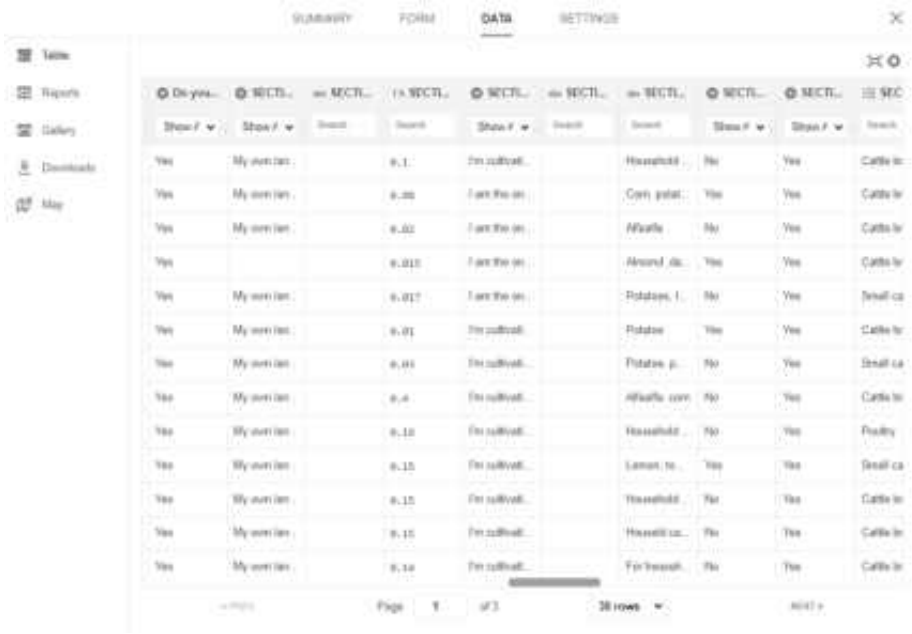


Figure 142: KoBo Toolbox database of the survey

The database of the survey which was developed through interviews was exported to XLSForms for using in MS Excel. Consequently, data cleaning was done for a standard statistical processing.

Finally, 15-20 stakeholders participated in each FGDs. Each group included representatives of different stakeholder groups. By conduction the FGDs, the social impacts of the project to be constructed have been identified through discussions.

Social impact of the project can be defined as the impact of an activity on a community and the well-being of individuals and households. As the purpose of the impact assessment is to identify and assess the potential social impacts associated with a project, impacts could be positive and negative. Types of social impacts include:

- Impacts on culture and ability to access cultural resources
- Impacts on communities' physical safety, exposure to hazards or risks, and access to and control over resources
- Impacts on communities' quality of life including liveability and aesthetics, as well as the condition of their environment (for example, air quality, noise levels, and access to water)
- Impacts on communities' access to, and quality of, infrastructure, services and facilities

- Impacts on communities' physical and mental health and well-being, as well as their social, cultural and economic well-being
- Changes to livelihoods, for example, whether peoples' jobs, properties or businesses are affected, or whether they experience advantage/disadvantage.

Here the impacts have been identified, and list of questions were asked in order to clarify the stakeholders' expectations on the project. Questions asked included following points:

- Defining the impacts of the project, clarifying if they are positive and/or negative
- Awareness about the project
- Main issues in the area, their prioritization
- Expectations from the project

15.3.4 Evaluation of the Field Survey Findings

15.3.4.1 Household Survey Findings

List of Household Member(s)

The results of a socio-economic study are based on an interview of residents of households in Angor and Termez districts. Primarily, the survey analyzed the socio-demographic characteristics of household members participating in the interview. Totally 83 households were interviewed, including 57 households in Angor and the remaining 26 are in Termez District. Specifically, the household survey covered the data on 474 people in both selected districts (see Table 170).

Table 170: Number of households and population covered

	Total	Angor	Termez
Number of households interviewed	**83**	**57**	**26**
Number of population covered	**472**	**326**	**146**

Out of 472 total surveyed populations there are 239 (50.6%) of household members are men and accordingly, 233 of them (49.4%) are women. This gender distribution is close to the gender structure of the population of the surveyed areas. It should be pointed out that the expert group who conducted a household survey among residents of Angor and Termez districts, stroked to approach men and women representatives equally without any exclusion and by referring to gender equality. In addition, 47 men and 36 women participated and represented their households during the survey (see Table 171).

Table 171: Covered residents by gender disaggregation in numbers and percentages

	Total	Male	%	Female	%
Household	**83**	**47**	**57**	**36**	**43**
Population covered	**472**	**239**	**50.6**	**233**	**49.4**

The average age of the surveyed population is 45.6 with the youngest respondent at the age of 19 and the oldest survey participant in 75 years old.

Table 172: Main Values

Mean (%)	Median (%)	Mode (%)
45.6	**45.00**	**40.00**

The survey showed that the average number of permanent residents in each household is around 5 persons whereas the total number of residents who live temporarily is 27 individuals or 6 percent of the total number of covered populations in this survey (see Figure 143). It is worth noting that the majority of people who live temporarily are migrant workers. They usually leave their homes during the construction period in countries such as the Russian Federation, Kazakhstan and other countries.

Figure 143: Comparison of permanent and temporary residents

Table 173: Numbers of permanent and temporary residents in detail including percentages

	#	%
Permanent	**444**	**94**
Temporarily	**28**	**6**
TOTAL	**472**	**100**

Economic Conditions and Income Sources

Questions related to the general economic conditions from the one hand and primary, secondary income sources from another were asked. These data were collected to all working age population among 83 households in Angor and Termez districts. The collected information gives a solid overview on economic conditions of the households living there and their income sources. In order to understand how many labor force is available out of 472 individuals, the labor force participation indicator was calculated. As per calculation results, 362 persons were in the age of 16 and elder and can be considered as potential labor force of population surveyed in selected areas.

To the question "Do you have any income source", 57 percent of the interviewees stated "No" whereas 43 percent informed that they have income source (see Figure 144). The result shows that slightly more than half of the surveyed people have no income source which can be referred to the unemployment rate and lack of suitable job opportunities in the area.

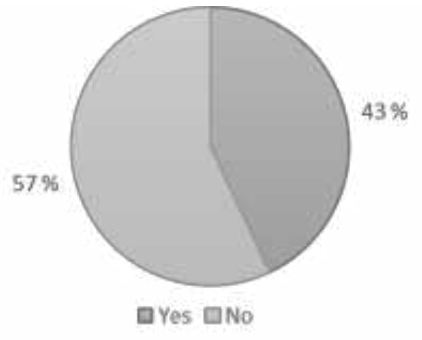


Figure 144: Does he/she have any income source

Table 174: The number and percentage of the population with/without any income sources

	#	%
Population with income source	**204**	**43**
Population with no income source	**268**	**57**

When asked about how many people from a household have a regular income, the seven of them stated that they have not a single household member who has regular income. 34 households out of total 83 households emphasized that they have one household member who has a regular income among 83 surveyed households (see Figure 148).

Figure 145: Number of members with regular income

Table 175: The numbers and percentages of people with regular income

Item	#	%
1 member	**34**	**41.0**
2 members	**23**	**27.7**
3 members	**8**	**9.6**
4 members	**9**	**10.8**
5 members	**2**	**2.4**
Household with no regular income	**7**	**8.4**
TOTAL	**83**	**100**

As for the primary income sources, the majority of respondents or 78 individuals (21% of potential labor force of 362), indicated that they work for state organizations and private sector from where get regular salary. The second most popular income source was a pension: 53 persons receive money as a fact of retirement. Moreover, 34 out of 83 household respondents stated that they have not regular or seasonal employment and 13 respondents work in agriculture sector while only 9 and 5 people have income sources from trade and obtained state assistance respectfully (see Figure 146).

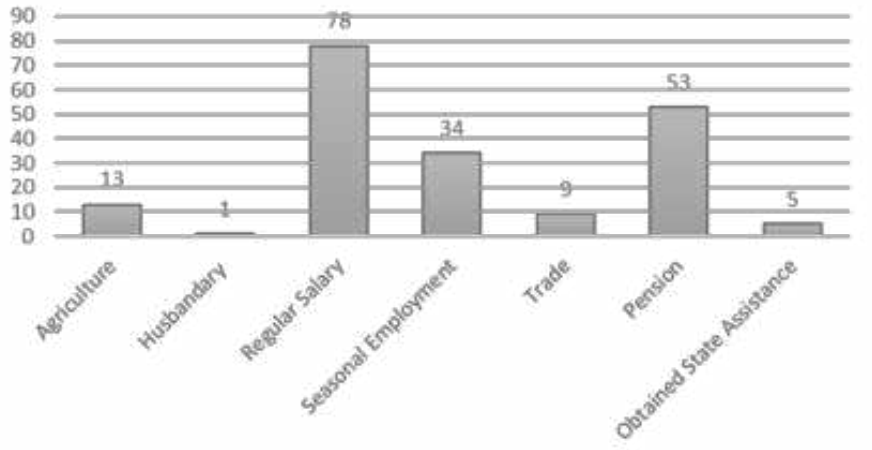


Figure 146: What is his / her primary income source

Overall, more than 86 % of the surveyed population have no secondary income source while 14 % are involved in agriculture, husbandry, seasonal employment and trade sectors to earn additional profit (see Figure 147, a). Based on survey results, population in selected districts have willingness to have an additional source of income but they have not such opportunity at this stage. Those who have secondary income are mostly practicing agriculture in their own courtyard where agricultural products are planted for selling in the local bazaars. However, the next and the most popular secondary income source was husbandry with 23 people engaged. Seasonal employment and trade have the least share with 6 and 2 people respectfully (see Figure 147, b).

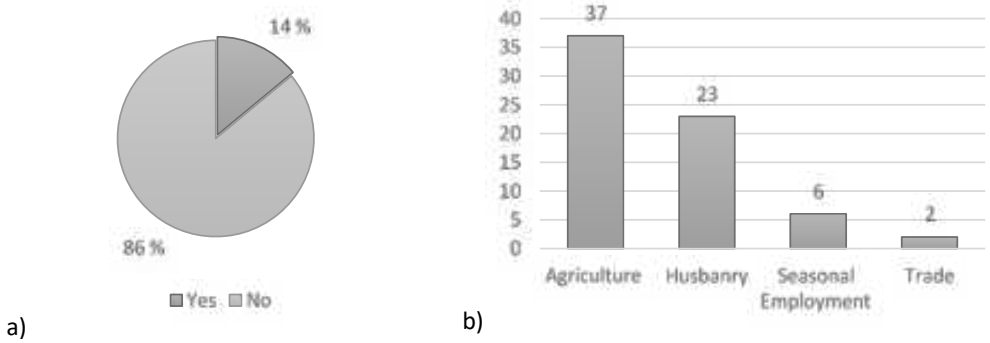


Figure 147: Percentage of people with secondary income (a) and the field and number of engaged people (b)

60 respondents or 16.5 % of surveyed population indicated that they are officially unemployed and have registered in state organizations to seek a job based on their professional and personal skills. This number is higher than the data provided by the hokimiyats on local unemployment rate.

On the other hand, the survey shows that 41 respondents are housewife and they also have no income source but they expressed their readiness to be employed if there are any opportunity for this. However, from 472 people who were covered in the survey, 176 people are either children or student with zero income source (see Figure 148).

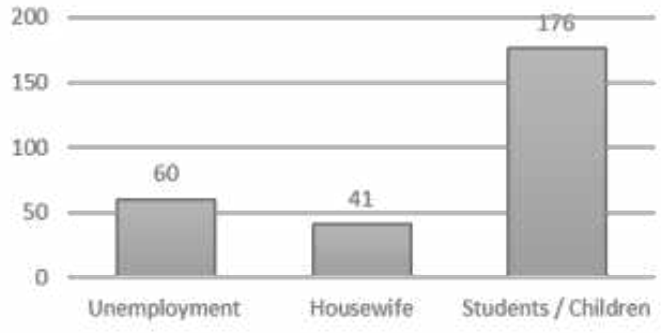


Figure 148: No income source population

Literacy, Educational Status and Being Student

The largest group in terms of education is people with secondary school education. Specifically, 50.4% of the total number of household members of working age have secondary school education. The proportion of household members with specialized vocational education (college, lyceum, vocational school, specialized vocational school, technical school) is 24.6% while household members at working age with a bachelor degree is only 7.8% (see Figure 149).

Also, survey results revealed that 50 of them (10.6%) are children who are under the school age who go to preschools. Although, the birth rate in selected areas is not negative, such a small number approves the fact that preschool education as a whole and its availability is a huge pending issue for local education system authorities. Thus, children who have no access to preschool or due to other reasons cannot afford it classified as "other "category. Only one person responded that he has graduated his master's degree and now working as a teacher in secondary school.

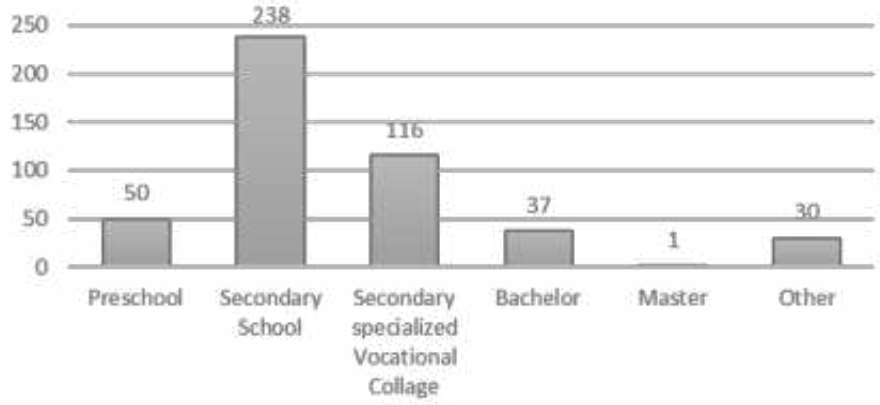


Figure 149: Educational level of surveyed household members

Health

Out of 472 surveyed people 71 had different illnesses while 18 of them were suffering simultaneously from more than one disease (see Figure 150).

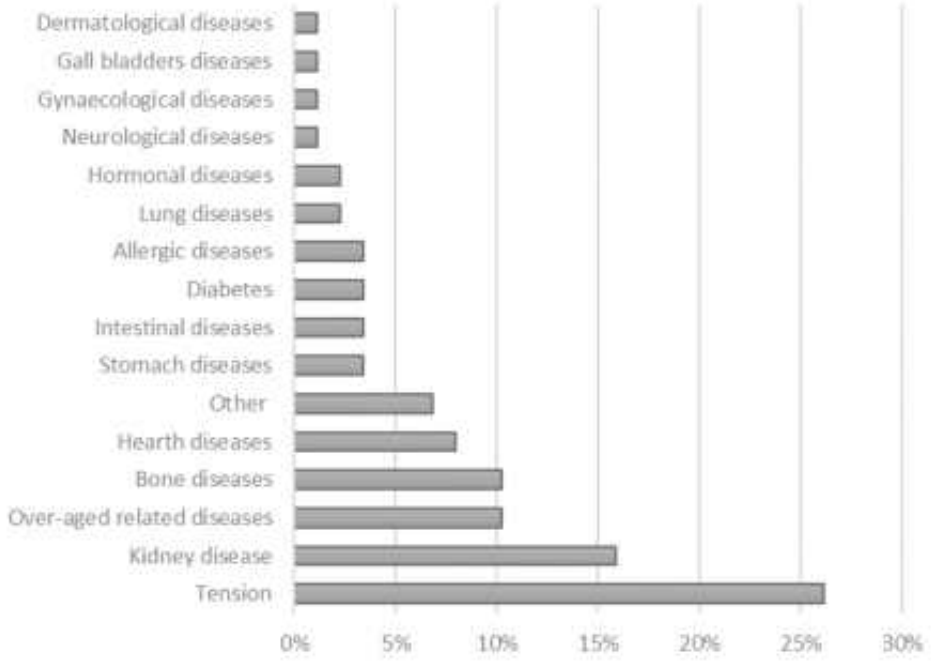


Figure 150: What is the primary chronic disease of his /her

Most respondents were suffering from the heart related issues, which was also mentioned in the socio-economic baseline of the area. Tension and heart diseases are leading in the responses. However, the people who were having problems with tension are mostly over-aged people. What is very frequent and individual for the area was having high frequency of kidney diseases in the residents with different age groups. The youngest persons among the surveyed with kidney illness was 8 and 13, with middle aged 26 and 28 and as old as 82. One of the respondents said that kidney diseases are mostly common is Surkhandarya due to the lack to drinking water in an acceptable quality.

Coming to the disability, 18 disabled people were among 472 people. This number is higher than the data provided by the hokimiyats. Share of disabled people from the district population on average, in Termez it was 2.5% of total population, while in Angor it was 1.8%. However, from 472 people who were covered in the survey, 18 disabled people means to have 3.8% of total population which is almost twice higher than the statistics.

Mental disability is the most frequent illness in the area having about 40% of the total disability. Then physically handicapped disability is second most frequent type. Hearing together with speech handicapped disability and visual handicapped disability had the same number of people (see Figure 151). At the finalization of the survey, additional face to face interview with the doctor of village medical center was conducted to find out the reason behind of frequency of mental disability among other disabilities. The doctor told that mental illnesses are frequent as people let consanguineous marriage to take place. "Relative marriage is linked with an amplified risk of genetic disorders in their offspring" – said the doctor.

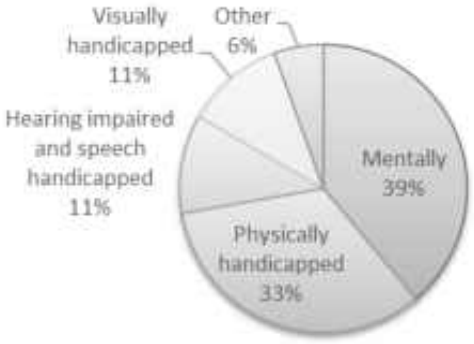


Figure 151: Type of disability

Migration and other movements

Another interesting fact is that among the respondents, a small proportion of emigrates was identified. Only 3 respondents emigrated from close-by cities as Termez and Angor whereas others 5 respondents moved from neighbor settlements (Mahallas). Remaining residents argued that they live the place where they were born and "have no plans to immigrate to somewhere else" – said one of the resident.

There are several reasons why did they emigrate from settlements A to B. The majority of respondents changed their permanent living place due to the following reasons:

- Returning to the hometown;
- Seeking better job opportunities;
- Other.

Agricultural Areas and Products

Out of 83 households, 63 are practicing agriculture. 62 told that the land is their own property and they are the one, who are cultivating the land of their family and sharing the income, while only one person worked as a seasonal worker in somebody's land and paid land rent for cultivation. On average people own 0.14 ha land, however, some people are selling their agricultural products while some are consuming the products for their own household. On average 0.19 ha land was owned by people who trade the production, while about 0.09 ha belongs to people who produce for their own use.

People cultivate different types of products on their land. They are vegetables (mostly, potato, onion, garlic, carrot, eggplant, green pepper, tomato, cabbage), fruits (especially, watermelon), cereal grains (wheat, maize), fodder (alfalfa) and legume (peanut and almond) (see Figure 152).

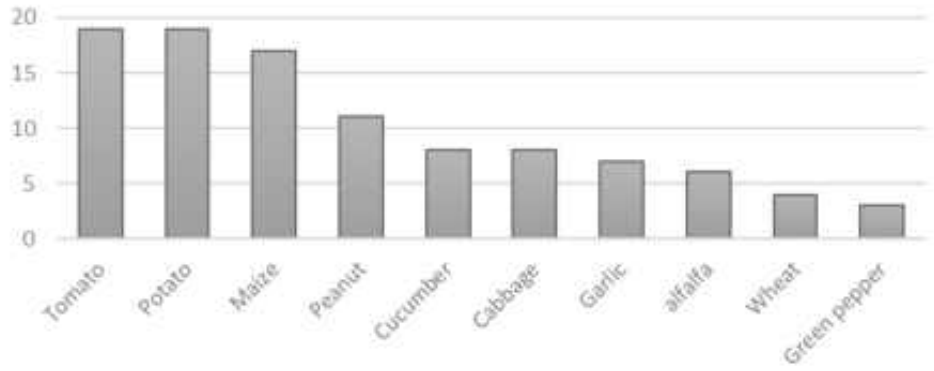


Figure 152: Most mentioned agricultural products to the question "Which products are mostly produced in the land"

People who commercialize their products mostly produce peanut, tomato, cabbage and garlic. Vegetables for everyday consumption like potato, onion, eggplant, green pepper, tomato, cucumber, etc. Households that own livestock also produce alfalfa and maize.

Husbandry

Similarly to the number of involved households in agriculture, 63 out of 83 households are practicing livestock. Solely cattle breeding (cows and bulls) is the most common livestock activity among surveyed families, while poultry; cattle & small cattle breeding (sheep and goats); and having all three at once were practiced by 10 families each (see Figure 153).

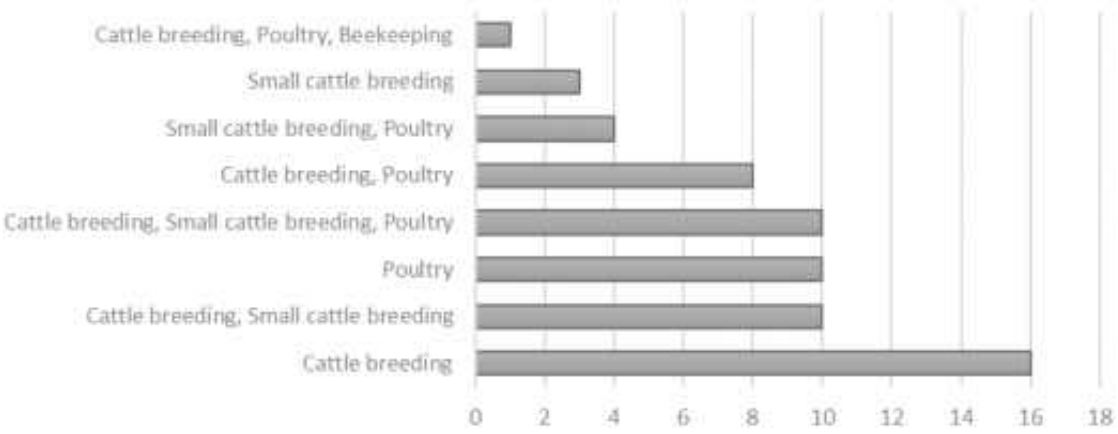


Figure 153: Livestock activities of surveyed households

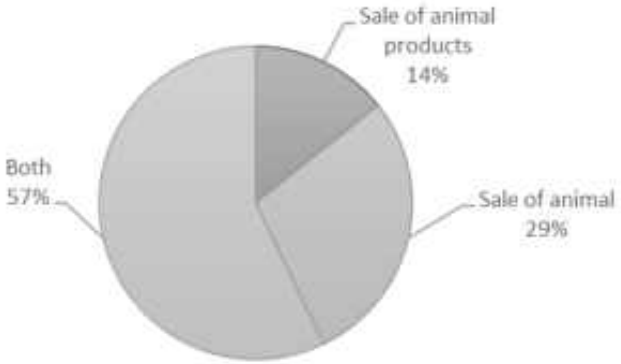


Figure 154: Type of deriving revenue from animal keeping

The number of cattle in families were on average 1-2, and 14 out of 63 families were selling the animal and animal products for earning. Specifically, 57% were selling both animal and animal products, 29% animals and 14% only animal products (see Figure 154).

General Features of the Housing

The questions related to the general features of the housing included the availability of electricity, if yes, then if its solar power, availability of water supply network and sewerage system (see Figure 155). All respondents claimed availability of electricity at their houses, confirming the statistical data of the hokimiyats. However, the interviewees stated the existence of electricity but having not constant, mostly low electric current. The reason was explained with outdated electric power transformers, power lines and also connecting the lines to transformers above than its capacity. No solar power has been used among respondents.

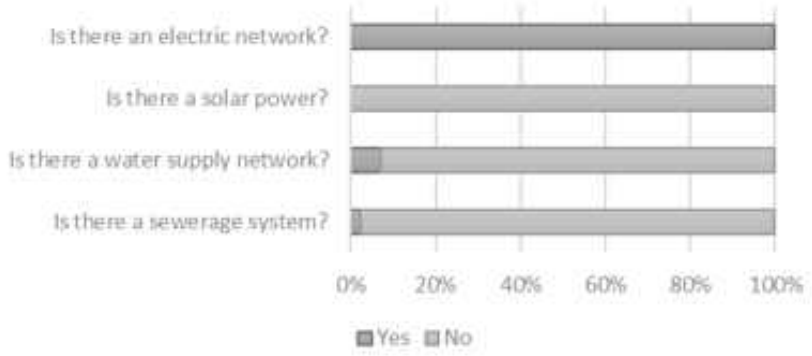


Figure 155: Questions related to the properties of the housing, such as electricity, water and sewage

Services

About the availability of water supply network, which was meant tap water from centralized water system, 7% of the respondents answered "yes" and 93% claimed the opposite (see Figure 156). The results show even lower score than the data of governmental hokimiyat on drinking water coverage.

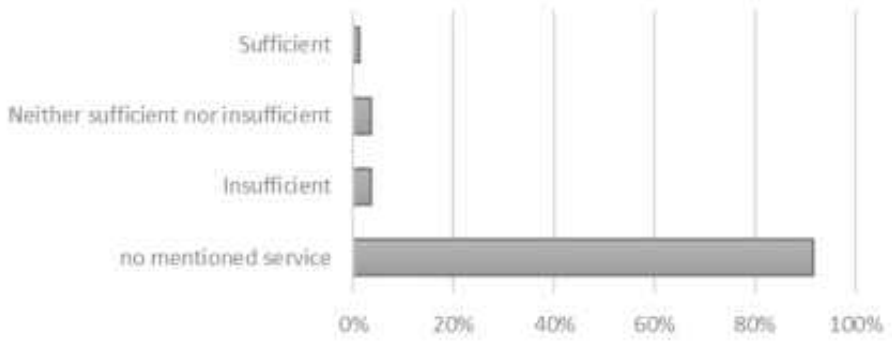


Figure 156: According to you is sufficient your drinking water supply system?

Followingly, the level of their satisfaction to drinking water supply system was asked (see Figure 156). Here, 91% people indicated that there is no drinking water supply system, while only 1 person selected "sufficient". When the source of their drinking water was asked from the respondents who indicated as "no mentioned service", they said that it is related with the financial status of the household: if household can afford, then, bottled water is used for consumption; if not, it's members consume water from rivers, streams and canals which are used for irrigation purposes. It needs to be mentioned that the respondents were vulnerable to the questions related to the drinking water, as illnesses were strictly connected to the topic.

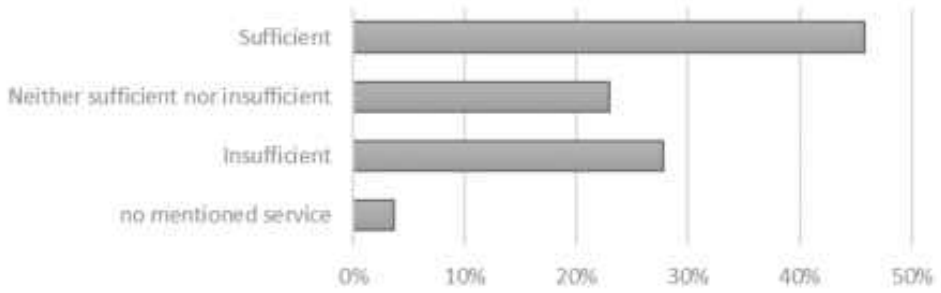


Figure 157: According to you is sufficient your irrigation water system?

Consequently, the question about sufficiency of irrigation water system was asked. Almost half expressed the abundance of irrigation water for doing agricultural activities. Another half told that irrigation water is not enough for cultivation. The respondents who answered "yes" to the question "Do you have agricultural activity?" mostly indicated sufficiency of water (see Figure 157). So, understandably water availability was reflected on involvement in agricultural activity.

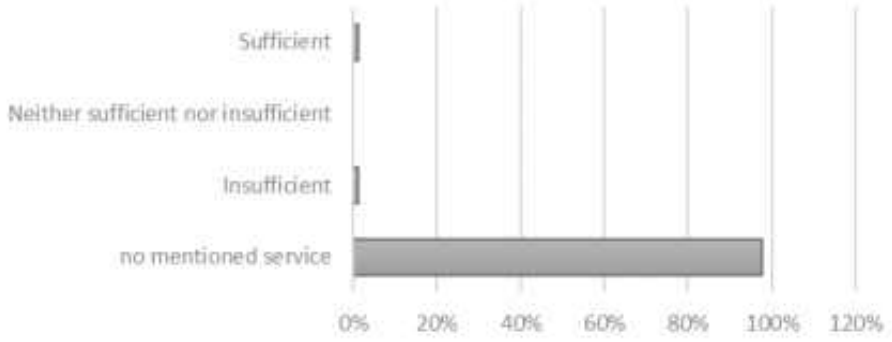


Figure 158: According to you is sufficient sewage water system?

After getting information in the district level on the sewage water system, it was clear that neither districts are covered with the system. Therefore, 98% of the respondents chose the option "no mentioned service". However, it was asked from two respondents who indicated as "sufficient" and "insufficient" to clarify the reason if the system is absent in general. Both respondents explained that they dug a sewer trench which for household use, not the centralized system (see Figure 158).

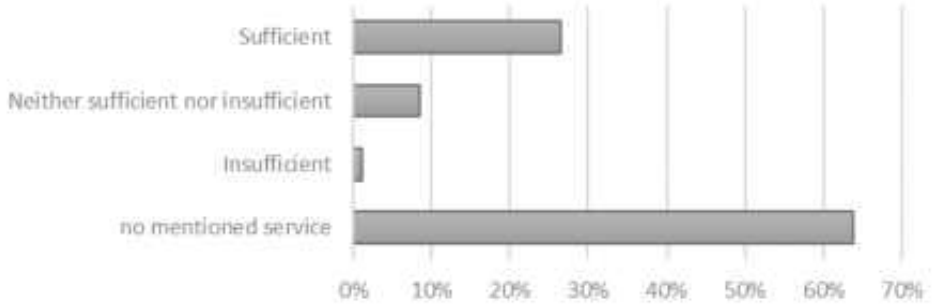


Figure 159: According to you is sufficient waste disposal system?

The respondents who claimed that waste disposal service "sufficient", reside in Termez, indicating that the district has the system. Even though there is "Bio Tehno Eko" LLC which has recently started its activity on waste management in Angor district, interviewees of Angor district said that the system is absent in their residential area (see Figure 159).

Telephone lines and internet are not available in the places according to the respondents' answers. People use only mobile telephones and cellular data for internet.

Some questions were related to roads and transport, in order to find out about the quality of services from the point of view of local residents. Almost 40% of the respondents expressed the dissatisfaction with the quality of the roads, while more than half of them said that roads are either acceptable or neutral (see Figure 160). The respondents who selected "no mentioned service" explained their choice by saying that roads were not paved with asphalt.

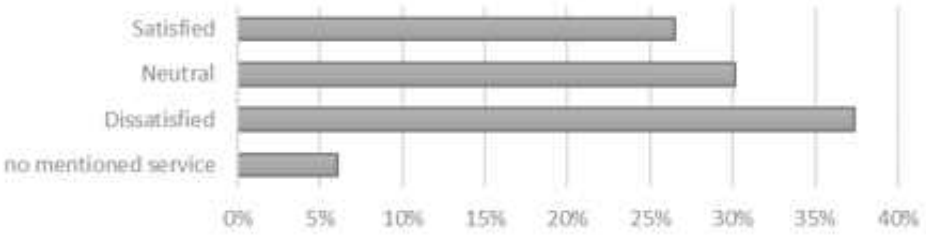


Figure 160: According to you what is the condition of the roads within the settlement?

Consequently, the public transport availability was asked by the question "According to you is sufficient transportation system?". 40% of the respondents said that there was no public transport in their residential area, and other respondents said that it was in sufficient conditions and some were even told that they never thought about it by indicating "neither sufficient not insufficient" (see Figure 161). As it has been stated in the *Transportation and Logistics* part of the report, in district level all transportation is organized by private companies, and local "damas" cars are used as public transportation.

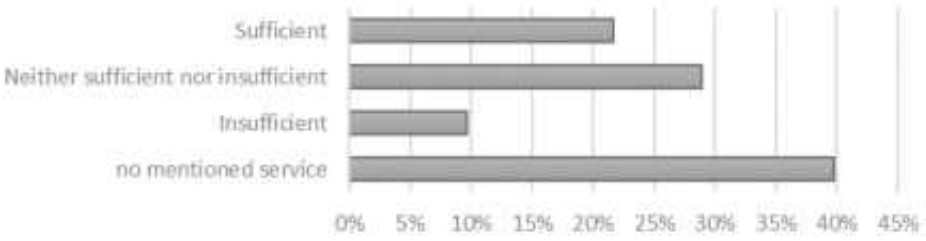


Figure 161: According to you is sufficient transportation system?

The level of educational background of respondent were provided in the LITERACY, EDUCATIONAL STATUS and BEING STUDENT part of the survey. Here, their satisfaction of educational services, particularly, quality of schools, colleges and universities in general was asked. More than 80% of the interviewees were either satisfied or neutral to the quality of schools, as it is the most common level of education (see Figure 162). Less than a fifth of people answered that the schools are not in adequate level of teaching. The reason of their response was that absence of sport facilities in the school, neither indoor or outdoor.

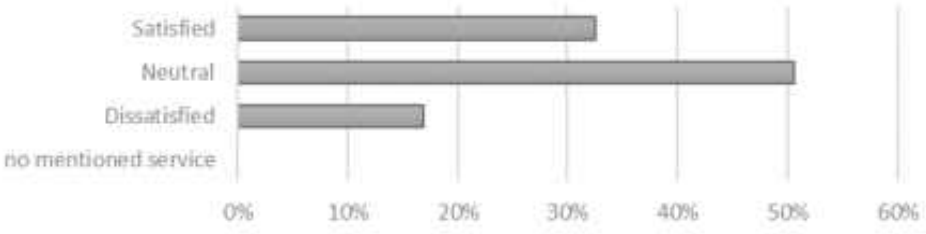


Figure 162: How satisfied are you with the educational services?

The last question related to satisfaction or sufficiency of services was related to presence of shopping services in the nearby area and their sufficiency. When the question was asked, most respondents ask about the type of shopping services – for consumer goods, apparel or drugstore. It was said that the question sought answer to general shopping service quality and additional comments were welcomed regarding for each type. More than half of the population indicated that services are sufficient in their area of residence (see Figure 163). The respondents of Angor district, especially, were inclined to answer either "insufficient" or "no mentioned service". Quarter of them stated that it is "neither sufficient or insufficient", saying that drugstores in rural areas are very few, and there only common medicines are on stock making people travel a long way to reach city drugstores.

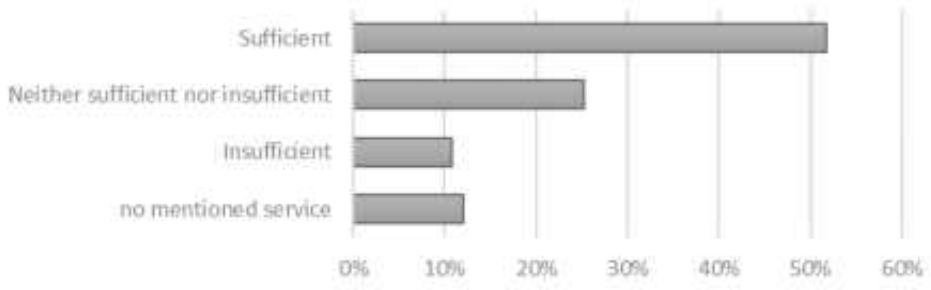


Figure 163: According to you is sufficient shopping service?

The respondents were also asked about the place that they go for shopping. 75% of the respondents who reside in mahallas of Angor district told that they visit Angor city on average once a week for doing a shopping. On the contrast, more than 60% of answerers expressed that they do not go to the city for purchasing of consumer products. Rather they buy products from the local markets. However, they both purchase clothing and medicine from the city bazaars.

Along with the question related with health service, there was a question "Where do you go for your general health problems? Please specify the name and location of the health institution." By this, it was aimed to know the availability and accessibility of medical centers to the residents of mahallas. The responses were better to analyze in the level of mahallas, as some of the villages do not have their medical centers in their area. For instance, Kattaqum and Dehqonbirlashuv mahalla residents go to either Qoraqir outpatient center or Angor city state hospital as they do not have their own centers. Villages such as Orol, Halqobod, Markaz, Talashkon, Qoshtegirmon and Madaniyat told that they visit regularly their village medical centers. Nevertheless, all respondents said that it is about the severeness of the illness that person has. Village medical centers are mostly for giving first aid, vaccination and for consultations. Therefore, they visit city medical centers if the situation is serious.

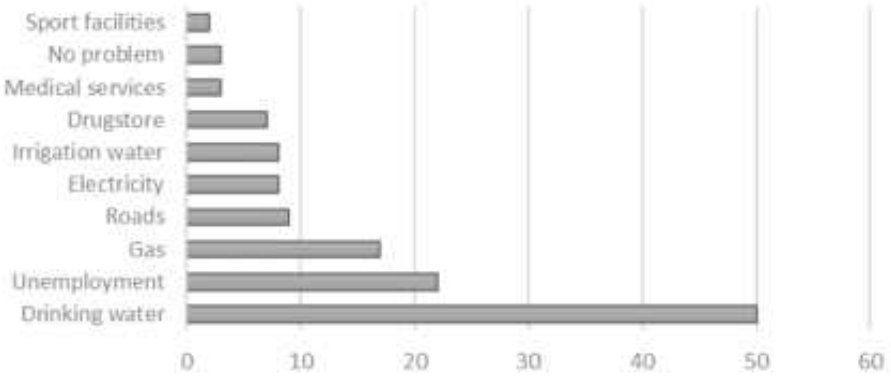


Figure 164: What is the most important problem according to your settlement where you live?

One of the last questions of the interview was "What is the most important problem according to your settlement where you live?". People started counting several challenges that they are facing in their everyday life. Recording all the answers, the frequency of each topic has been counted. The most frequent answer was the difficulty of drinking water in the area. Unemployment and lack of natural gas supply systems were another two key problems. The other problems were not paved roads, electricity blackouts due to the outdated transformers, lack of irrigation water for agricultural activities, absence of drugstores in village area with diverse medicines, inadequate quality of local medical services, and absence of sport facilities at schools (see Figure 164).

15.3.4.2 Local Administrative Survey Findings

Demography

In total, there are 36 mahallas in Angor and 29 mahallas in Termez district. The project impact area in 10 km covered 16 mahallas from Angor and partly Termez districts. As Figure 165 demonstrates, the total number of population is 59.8 thousand and an average 3,742 people live in each settlement. According to the collected data during the survey, an average number of households is 654 (see Figure 165). The largest number of households is located in the Kattaqum settlement (1,004 households), and the lowest - 342 households in the Zang Gilambop mahalla (see Figure 165).

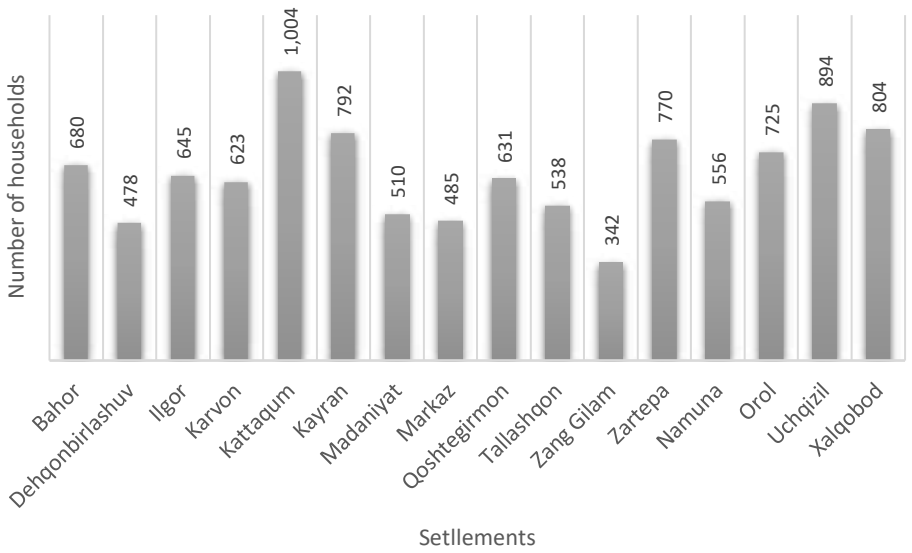


Figure 165: The number of households per settlement

As of July 2021, the total population living within 10 km of the project impact area is about 59.8 thousand people or 2.2% of the province. 51 % of household members are men, and accordingly 49 % are women. This gender distribution is close to the gender structure of the population of the surveyed areas.

Furthermore, research team asked local authority officials about the age distribution of the population in their settlement. Overall, the results of the question are presented in Figure 165. Age disaggregation of the population was carried out on the basis of data from local authorities (so called "passports of mahallas").

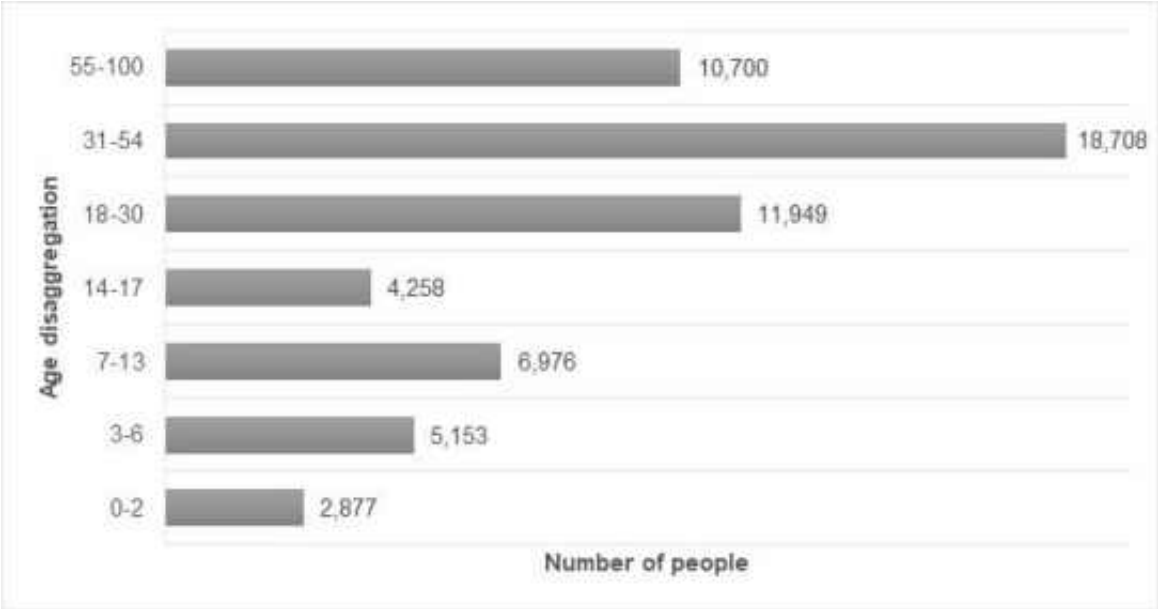


Figure 166: Age distribution of the population

The majority of the population, or 18.7 thousand people (30.9%), are middle-aged. Infants (0-2) in the project covered area are amounted to 2.8 thousand, or only 2.7% of the total. About 20 % of the total population are young generation under 18-30 age (see Figure 166).

Regarding the question "How has the settlement's population changed in last 5 years?", all 100% of the respondents answered that the population is increasing. Two factors were indicated as the reason, the first is a significant increase in the birth rate and another factor is an internal movements of people within the districts.

Economic Condition of the Settlements

According to the results of local authority survey, 24.3 thousand people (41.5% of the total) are employed and 3.2 thousand people (only 5,5%) are recognized as unemployed. There are about 5.7 thousand pensioners, representing 10% of the population. As shown in Figure 167, there are about 865 residents with disabilities and 420 students, which is the lowest indicator of all (0.7%). The remaining 58.9% of the population is considered others, which includes children below working age, housewives, seasonal workers and self-employed in agriculture.

It should be noted that the number of unemployed people is calculated based on the definition set out in the Law "On employment of the population", adopted on August 7, 2020. According to Article 3 of the aforementioned law, unemployment is the presence on the labor market of an unclaimed part of the able-bodied labor force. But, according to World Bank unemployment refers to the share of the labor force that is without work but available for and seeking employment. If the provided data were calculated based on international standards, then the unemployment rate in the project impact area would be significantly higher than the current value.

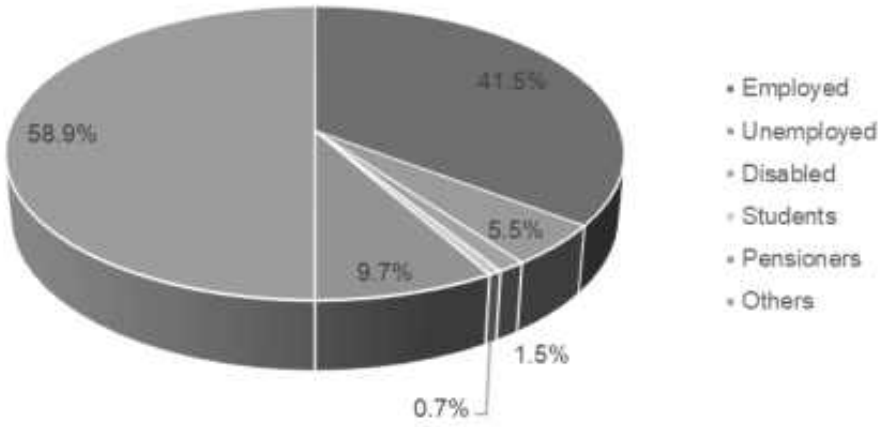


Figure 167: Employment status of the population in the project impact area

The highest number of unemployed people (283 people) was in the Kattaqum settlement and the lowest rate (117 people out of 2,242 population) was observed in the Zang Gilambop mahalla of Angor district (see Figure 168).

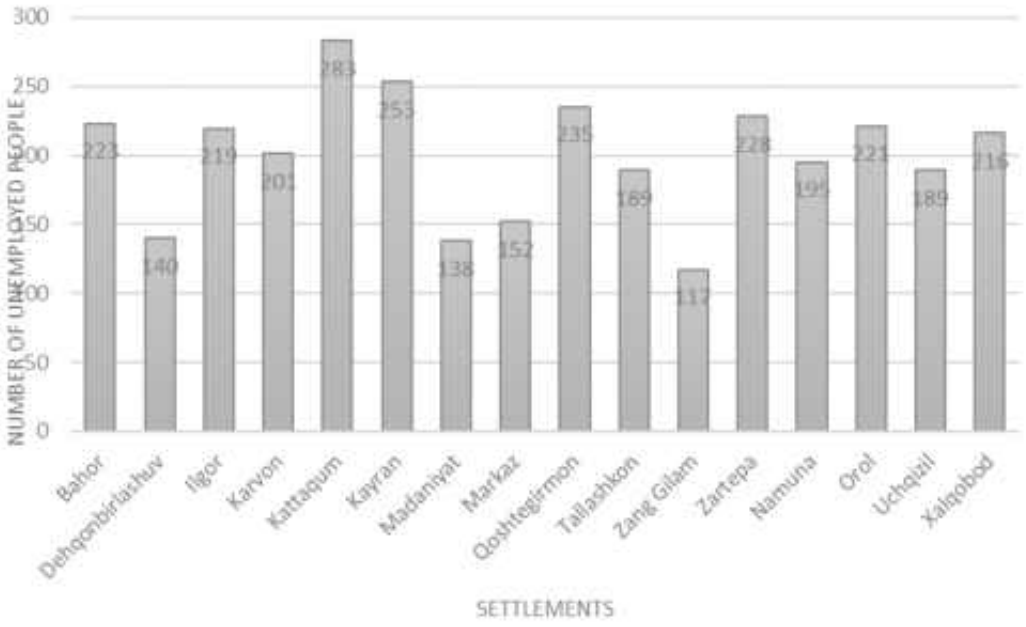


Figure 168: Distribution the number of unemployed people by the settlements

During the survey, the question was asked about primary and secondary income source of regular income owners.

The representatives of the local authorities, in particular the heads of the mahallas, answered this question on the basis of the information contained in the passport of their settlement. In total, 11 respondents answered correctly, in the remaining 5 settlements there was no data on this indicator.

According to the survey results, in each mahalla, on average 249.5 people have a regular and 156.4 secondary sources of income. Most people (on average 100 people) receive income from livestock and poultry farming. However, on average, only 3.5 people are engaged in craftsmanship (see Table 176).

But there is an opportunity to develop craftsmanship, since Surkhandarya is one of the most ancient places in Uzbekistan for tourists. The main reason of earning the low income is the lack of a manufacturing industry in this area. The construction of a thermal power plant can help create more jobs as well as increase the income of local residents.

Table 176: Status of regular income owners (number of people n=11)

	Regular income owners	Secondary income source	Entrepreneurship	Craftsmanship	Tradesmen	Stockbreeding, poultry and beekeeping	Others
Total	**2,744**	**1,720**	**187**	**38**	**238**	**1,106**	**151**
Mean (n=11)	**249.5**	**156.4**	**17.0**	**3.5**	**21.6**	**100.5**	**13.7**

Education

According to the data collected from district hokimiyats there are 21 preschools and 21 GSE schools operating in the selected area (Angor and Termez districts). Table 177describes the number of educational institutions located in mahallas which are within 10 km radius from the planned Project location. It should be noted that big settlements with a relatively bigger number of populations such as Kattaqum, Tallashqon, Kayran and Bobur have double more educational institutions rather than others (see Table 177). Another interesting fact is that all secondary school institutions cover almost 100 percent of the total school-age population. However, the situation with preschool education is different due to high birth and low enrollment rate. These and other reasons lead to preschool education system does not work well although the GoU aimed to reach 100 percent enrolment. The most of interviewees expressed their wish to have enough kindergartens for the locals in surveyed mahallas.

Table 177: Number of educational institutions in selected mahallas [24, 25]

Number of educational institutions in mahallas in Angor district	Preschool	General Secondary School
Bahor	**1**	**2**
Dehqonbirlashuv		**1**
Ilgor	**2**	**1**
Karvon		**1**
Kattaqum	**2**	**4**
Kayran	**2**	**2**
Madaniyat	**2**	**1**
Markaz	**1**	**1**
Qoshtegirmon	**1**	**1**
Tallashqon	**2**	**2**
Zang Gilambop	**1**	**1**
Zartepa	**1**	**1**
Total	***15***	***18***
Namuna	**1**	**0**
Orol	**1**	**1**
Uchkizil	**3**	**1**
Khalqobod	**1**	**1**
Total	***5***	***3***

Based on information received from the survey, the school located in Qoshtegirmon mahalla has the highest number of student while the lowest number in Karvon with 221 total pupils. According to the local officials (head of mahalla) even though school-age population is constantly increasing and it makes tension to the enrolment to the school another big issue still being not addressed which is a small number of the teacher in the rural areas.

Concerning secondary school facilities, the interviewers were asked to evaluate in three different conditions (Excellent, Good, Unsatisfactory) contains the condition of the building and adjacent infrastructure, material and technical equipment including education materials, teachers working condition and their salaries (see Table 178). The survey shows that from the eighth surveyed settlements five have been assessed as "good", two as "excellent" and only one as "unsatisfactory". The majority of respondents highlighted that schools need well-equipped sports centers so that the young generation could have an opportunity to participate in sports competitions.

Table 178: Number of students and school condition in surveyed mahallas

Number of educational institutions in mahallas in Angor district	Total number of students	GSE Condition (Excellent, Good, Unsatisfactory)
Dehqonbirlashuv	**443**	**Good**
Karvon	**221**	**Excellent**
Kattaqum	**631**	**Excellent**
Madaniyat	**557**	**Unsatisfactory**
Markaz	**535**	**Good**
Qoshtegirmon	**770**	**Good**
Tallashqon	**364**	**Good**
Khalqobod (Termez district)	**631**	**Good**

Health condition of the settlements

There is large network of medical facilities, single-disease hospitals and rural primary health care clinics in Uzbekistan. The country is heavily dependent on hospitals for health care services and there is a limited capacity to deliver services at community level and to ensure access for vulnerable populations contributed to serious health and financial inequities.

Local authorities highlighted that most of rural people go to the rural primary care unit so called qishloq vrachlik punkti. About 60% of the 16 mahallas have local hospitals, and the remaining 40% travel 5-7 km to reach the neighboring settlement hospital.

40% respondents claimed that most common primary disease is tension at community level. Climate change and stressful life are cited as reasons in the survey. In addition, hormonal diseases are common among the rural population, which was approved by 25% of respondents (see Figure 169).

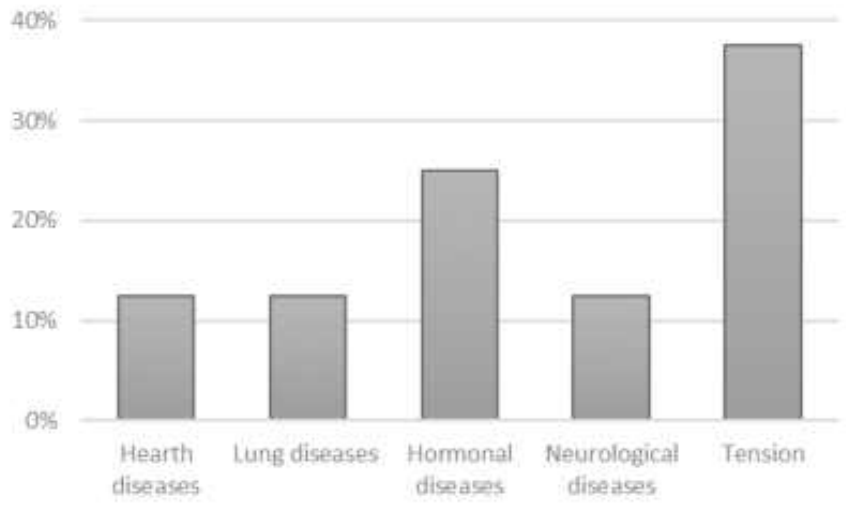


Figure 169: Most common primary disease in the settlement

Figure 170 illustrates most common secondary diseases in the project impacted area. According to 50% of respondents, kidney disease is most common in settlements due to inferior drinking water. The dry and hot climatic conditions of Surkhandarya region put pressure on the elderly and lead to age-related diseases (25% answers). The rest of the mahalla representatives cited diabetes and cancer as a secondary disease in their village.

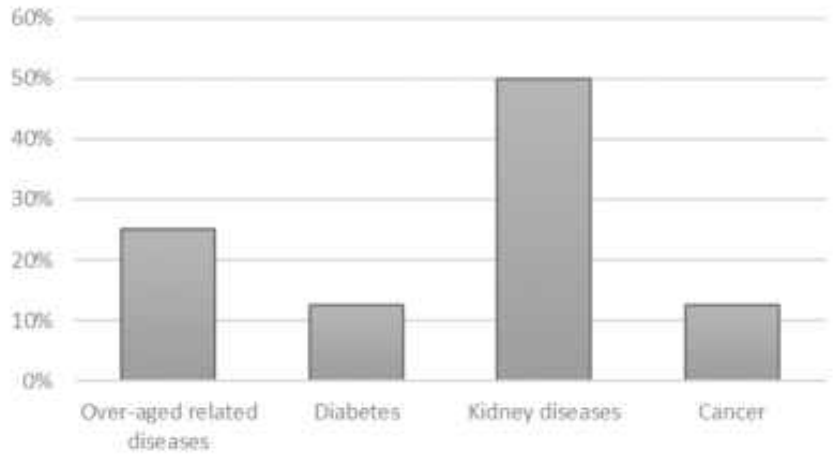


Figure 170: Most common secondary diseases in the settlements

Features of Social Infrastructure

To assess the overall characteristics of housing and social infrastructure, respondents answered questions about the availability of electricity, water supply, sewerage system, internet and telephone lines, hospital and school buildings.

As the survey showed, all mahallas has access to the electricity, while 20% of respondents stated that there is blackout once a per week or during heavy rains. Unfortunately, there is no centralized sewerage system and residential telephone line in the project impact area. According to 50% of village representatives, there is access to drinking water, but this is not a centralized system (see Figure 171). People buy water for 100 soums per liter or use artesian water for household needs. 60% of the 16 mahallas have local hospitals, and the remaining 40% travel 5-7 km to reach the neighboring settlement hospital.

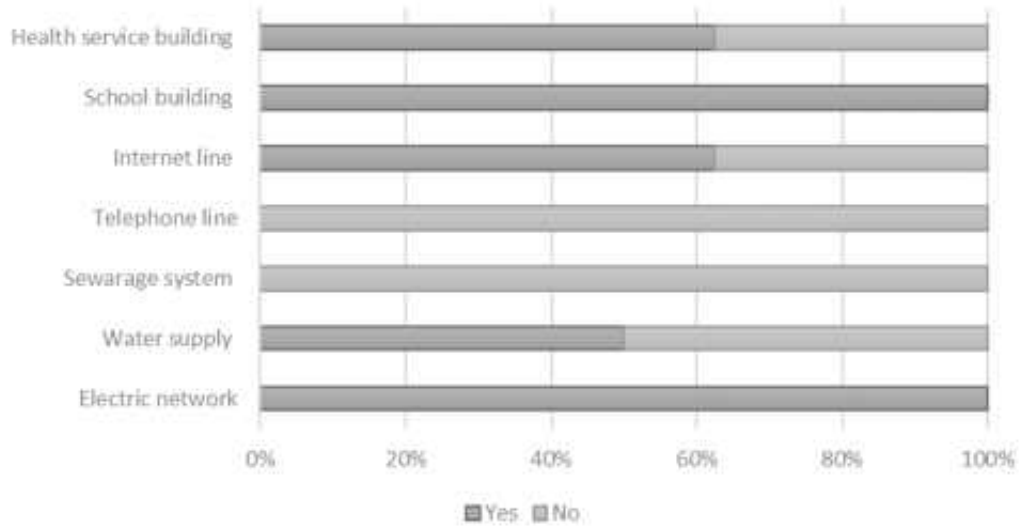


Figure 171: Question related to the housing and social infrastructure

Services

As for the quality of services, 88% of the respondents indicated that there is sufficient water for irrigation and they are satisfied with the shopping services, which is 75% of the positive answers. Unfortunately, there is no sewerage system in all settlements, and 63% of representatives of mahallas expressed dissatisfaction with the services of drinking water supply and public transport. About 40% of local government leaders found the education system, waste management and roads within the settlements to be insufficient (see Figure 172).

Infrastructure	*Sufficient*	*Neither sufficient nor insufficient*	*Insufficient*	*No mentioned service*
Shopping service	75%	25%	0%	0%
Health service	13%	50%	13%	25%
Education service	25%	38%	38%	0%
Transportation system	25%	13%	0%	63%
Access roads	25%	50%	13%	13%
Roads within the settlement	0%	63%	38%	0%
Waste disposal system	13%	13%	38%	38%
Sewage water system	0%	0%	0%	100%
Irrigation water system	88%	13%	0%	0%
Drinking water supply system	13%	13%	13%	63%

Figure 172: Quality of social and housing services

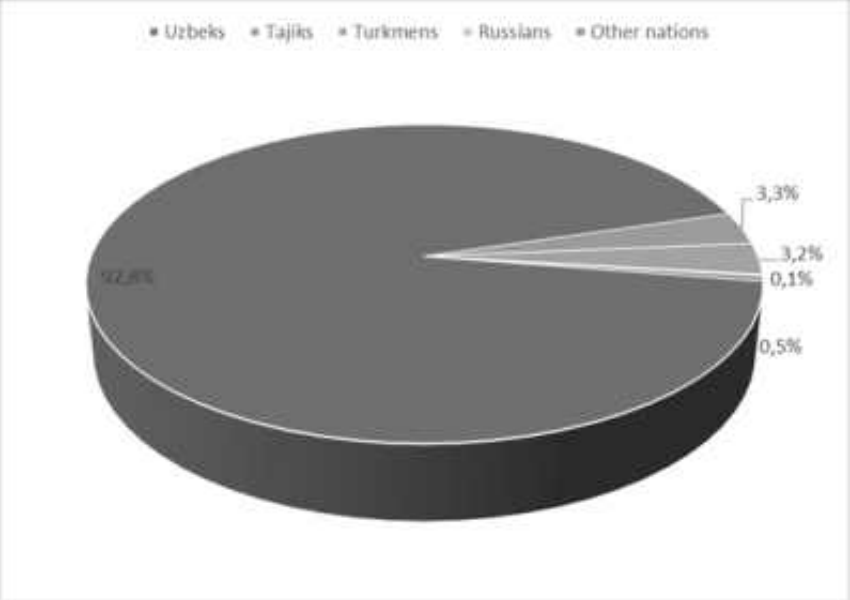


Figure 173: Distribution of population by the nationality

As Figure 173 shows that the nationality of the vast majority (92.8%) of population is Uzbek. Since Surkhandarya Province borders with Tajikistan and Turkmenistan, Tajiks make up 3.3% and Turkmen 3.2%. Number of Russians are very little in Angor and Termez districts representing only 0,1 % of the population.

15.3.4.3 Limitations

Limitations of the study are the characteristics of design and methodology that impacted or influenced the interpretation of the findings from the research. In the socio-economic study which was conducted in Angor and Termez districts of Surkhandarya province, several limitations were worth to be mentioned.

Sample size and access. Conducting a social survey in Termez and Angora districts from the calculated number of sample size of the households was accompanied by some challenges. Specifically, due to circumstances of COVID-19, some residents in these areas were wary of contact and risk of contracting or, in some cases, even infecting others with COVID-19 and refused to participate in a social survey and even refused to give contact numbers for a telephone survey. Conducting online survey was also impossible due to the limited usage of an Internet network in this area. Also, the current situation of Termez region on the border with Afghanistan can be attributed to the difficulties in conducting a social survey. At the time of the survey, local law enforcement agencies were working to ensure the protection of borders and keep calm in the border area, which limited the actions when conducting the survey in settlements. However, as the study aimed to gather mostly qualitative data, sample size is generally less relevant as it was mentioned in scientific papers [52, 53, 54].

Lack of available and/or reliable data. Data related difficulties are always seen in the research. In this case, collection of data was not difficult as before starting the survey, the communication with province and district hokimiyats were made for data sharing. However, reliability of them was under a doubt, as different sources indicated dissimilar statistical numbers. For eliminating this issue, the dissimilar data was verified by crosschecking with the relative authorities.

When conducting a social survey, a number of minor nuances were observed, precisely:

- some tenants did not always give proper information due to possible fear or reputation when their personal data including name was asked to be provided. They claimed that there were no problems in the area and that everything was enough for a comfortable life while others have described existing problems.
- gender specificities were observed. The survey responsiveness was different according to the gender of both interviewer and interviewee. Particularly, when the survey was conducted by a male interviewer in a male interviewee, the responses were quick and short and were not disclosed. Expressing a situation by answering income-related questions and revealing their illnesses may seem like a complaint to another man. Consequently, this could create a stereotype for those who considered themselves to be a dominant and powerful member of a cultured society. On the contrast, when a female interviewer conducted a survey in men, the opposite was observed, they opened more and openly discussed existing problems. Moreover, women respondents were more emotionally expressive both for gender interviewers.

15.3.5 General Social Impact Assessment

The Social Impact Analysis revealed the baseline and main socio-economic problems of Angor and Termez districts and households, their need for assistance in solving problems and improving the conditions for doing business, as well as expectations from the Project. In order to conduct socio-economic assessment of the project, 83 households or 472 people and 8 local authorities from both districts were surveyed and also desk study was done by analyzing the statistical data of the studied areas. One respondent from each household was interviewed by using Kobo Toolbox. The core results of the analysis can be depicted as followings.

15.3.5.1 Social Conditions

Social Structure

The authorized state structure in Government of Uzbekistan consists of three distinct levels: the republican level (first), province-level (second), and district-level (third). Although, the community self – governments are not a body of central public administration system but they exist and operate locally. Surkhandara regional hokimiyat is the main authorized executive body in the region. Tasks and functions of the Surkhandarya province hokimiyat (second level) include a comprehensive analysis of trends in socio-economic development of the Surkhandarya provice, Termez city and districts, analysis of the dynamics of the main economic indicators. Surkhandarya is divided into 13 districts and each has their own hokimiyats in a district (third level), which are highest state executive body that implements the government policy within their administrative borders. As for administrative management the district based hokimiyats (third level) operate identical manner as province hokimiyats (second level). Here also community of self-government (makhalla) plays important role. Mahalla defines as an organization which aims to resolving local issues according interests of local people, traditions, language and ethnic background. The study comprised Surkhandarya (second level), Angor and Termez (third level) and 16 makhallas.

Demography and Current Population

As of July 1, 2021, the resident population of Uzbekistan amounted to about 34,9 million people while the population of the Surkhandarya province is 2,693 thousand people. The permanent population growth rate of the republic was 1.9%. In district level, there are 134.7 thousand (5% of the region's population) people living in Angor, and 78.6 thousand people in the Termez District.

Migration

Uzbekistan has a significant demographic growth and large labor force which generates labor migration in the country. Total number of emigrants in Uzbekistan at mid-year 2020 was 2 million and net migration in the 5 years prior was minus 44.3 thousand.

At the country level, the number of immigrants reached 191.2 thousand people, and emigrants - 203.7 thousand people in 2020. At the regional level in the Surkhandarya Province in January 2020, 8.5 thousand people immigrated to the region, and 19.5 thousand people emigrated from the region. At the district level in Angor and Termez districts, 1,039 immigrants and 1,284 emigrants were registered.

Distribution of Population by Age Groups and Gender

In Uzbekistan, there are slightly more men - 50.4 % of the population, women, respectively - 49.6% of the total number of citizens in 2021. As for 2021, in the Surkhandarya Province the number of female population is 1.32 million (49.5%) and 1.35 million (50.5%) male population. In Angor and Termez districts, ratio of the number of male (50.1%) and female (49.9%) of the population are almost the same. The largest share comes to people who are between 25 to 29 years and children between 0 to 4 (10.3% and 12% of the total population respectfully).

Education

Based on statistics of 2020-2021 academic year, there are 6,960 preschools, 10,090 GSE (schools), 1,117 SSVEs (vocational colleges) and 119 HEs (universities) operating in the country. Particularly, data on provincial level illustrates that only 8 percent of the total number of preschool educations in

the republic falls on Surkhandarya region while proportions for GSE, SSVE and HE accounted at 9%, 3% and 6 % respectively.

In the case of district level, 32 preschools, 44 schools and 5 colleges are operating in Angor district, while the 31 preschools, 28 schools and colleges in Termez district. It should be noted that there is no higher education institute in Angor district while there are two branches of higher education in Termez province which makes Termez district more attractive in terms of created facilities for pursuing higher education.

The average student-teacher ratio in all levels of Uzbekistan's education is about 12:1, however ratio was observed in Surkhandarya region (nearly 11:1) in preschool, (nearly 9:1) in GSE and SSVE and (18:1) in higher education. As for district level, student ratio in both Angor and Termez districts' GSE and SSVE education indicates (about 12:1), while preschool sector increases this ratio up to (25:1) and (27:1) in Angor and Termez districts accordingly.

Overall, education facilities in Surkhandarya province, Angor and Termez districts are evaluated as in a good condition.

As a conclusion, the implementing by the government reforms have significant implications for improving student learning outcomes, but also pose relevant challenges for implementation and resource allocation. These challenges already appear at province and especially at the district level. Although preschool enrollment is increasing constantly in recent years, it remains at approximately 30 – 40 percent, which is low by international standards. Preschool is considered as the weakest part of the education in the selected districts because families who wish to enroll their children in public preschools must pay fees (around US$6 to US$28 per child per month in full-day groups), mostly to cover the costs of meals. The fees charged by nonpublic preschool education institutions are paid by families and can range from US$175 to US$300 per child per month. Unfortunately, due to the high rate of unemployment and low-income source the above-mentioned pay fees are not affordable for a population of selected districts. Another issue can be related to the physical conditions of the GSEs and SSVEs in the districts. For example, based on data collected for this report it was revealed that there are not enough sports facilities for the school and college-age students in both Angor and Termez districts which potentially can negatively impact on student health system and worsen their academic performance.

Health

As a conclusion, health sector in district level needs improvement. The common diseases in country, province and district level are diseases of blood and blood-forming organs, respiratory diseases, diseases of nervous system and circulatory diseases. In the district level, the people with disabilities was 2% of total population. As World Health Organization standard for doctor-population ratio is 1:1,000, Angor district does not follow the requirement having 0.7: 1,000, while Termez does 2.5: 1,000. Ambulance also needs vehicles for prompt service.

Social Services

Surkhandarya has wide range of cultural facilities, including cultural organizations and centers, theatres, worship areas, cultural heritage sites and museums. In the district level, Termez and Angor districts lead in having cultural heritage sites which has an ancient historical background. However, cultural institutions, like cinema and theaters are missing in the area. Finally, sport facilities are focusing more individual sport types like wrestling and boxing rather than team sports such as basketball and football.

15.3.5.2 Economic Conditions

General Economic Structure and Sectors

GDP of Surkhandarya makes up 4% of Uzbekistan's total GDP. The region is one of the most agriculturally developed regions and provides over 9% of total agricultural production of the country.

Livestock

Livestock is important part of sustaining the study area. There, three types of livestock farming are widely practiced and also employs the most labor share in Termez and Angor districts, namely fishery, cattle breeding and poultry. Most importantly, the impact of planned project to the fishing industry in the area needs to be focused specifically as fishery mostly depends on natural water reserve.

Transportation and Logistics

The roads which need repair prevails the roads with good conditions. Public transport is more used by Angor population than Termez. Understandably, population in Angor owns fewer private cars (11 : 1,000) comparing to Termez (83 : 1,000) even though its population is more than Termez for 60%.

Income sources

Angor and Termez together contribute to 15% of Surkhandarya's economy. However, Angor region is more focused on agriculture compared to Termez, while the former is less industrialized than the latter.

Energy, Drinking water and Sewage system

71% of the population have drinking water supply for everyday use. While in Angor it is only 11% while rest of the population consume water from springs, boreholes (except wells), rivers, streams and canals. Neither of the districts have sewerage supply system.

Both districts are entirely supplied with electricity. However, in Angor 48% of the electric power transformers and 42% of power lines require repair. In Termez, the situation is better requiring repair of 25% and 20% of transformer and power lines respectively.

Data of Angor and Termez Hokimiyats show 100% gas provision in both Angor and Termez, however, districts with 100% meant provision with gas no matter if it is from gas supply system or liquefied gas cylinders. In Angor 90% and in Termez 72% of total households do not use centralized gas supply system but provided with liquefied gas cylinders.

Labor Force

In the project districts, the unemployment rate is quite high, on average 11% of the workable population, for Angor district this figure is 11.2%. And in Termez district, the unemployment rate is 10.6%. Moreover, unemployment among women is 13.2%. It is worth to noting that an acute shortage of jobs, informal employment, low wages from one hand and bad working and labor conditions on the other hand forces rural area forces to become migrant worker in other countries.

The level of official employment is especially low among women, in Surkhandarya province only 7% of women have jobs in enterprises and organizations of the non-agricultural sector. There are also very few entrepreneurs among the employed population. The problems of high unemployment are relevant for both regions. In all areas, female unemployment prevails. Another negative feature of the labor market of these areas is the high level of the economically inactive population, especially among

women. In Surkhandarya province, every fifth woman did not work and did not look for a job. Perhaps some of these women stopped looking for a job, because they lost hope of finding a job.

15.3.5.3 General Assessment of Survey Findings

The results of the household survey indicate an extremely high relevance of issues of electricity and natural gas supply, unemployment and insufficient infrastructure. It is anticipated by the local population that future results of the project will improve living standards in the project impact area.

The socio-demographic characteristics of household members participating in the survey correspond to similar population indicators according to official statistics, which indicates a high level of representativeness of the data obtained.

There are 362 persons were in the age 16 and elder and can be considered as a potential labor force of population surveyed in selected areas. Out of this, slightly more than half surveyed population have no income sources while only 47 percent of the residents work for state organizations and private sector from where get a regular salary. In most cases, only one person from household has a regular income which, when divided by the number of people in the household (on average 5 people in each household), we get a miserable amount of money.

Most of the surveyed households do not have secondary income sources but those who have it, engaged in agriculture and husbandry sector.

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It should be noted that the majority of the population have a secondary school education and their involvement in construction and operation of Project is not possible without proper professional pieces of training.

Most respondents were suffering from tension and heart diseases. What is very frequent and individual for the area was having high frequency of kidney diseases in the residents with different age groups. The youngest persons among the surveyed with kidney illness was 8 and 13, with middle-aged 26 and 28 and as old as 82. One of the respondents said that kidney diseases are most common is Surkhandarya due to the lack of drinking water of an acceptable quality.

Mental disability is the most frequent illness in the area having about 40% of the total disability. As survey results show the main and only reason for having a mental disability is due to people let the consanguineous marriage take place.

All households in the project impact area have land plots at their disposal Among surveyed households (83 households), 63 are practicing agriculture. People cultivate different types of products on their land. They are vegetables (mostly, potato, onion, garlic, carrot, eggplant, green pepper, tomato, cabbage), fruits (especially, watermelon), cereal grains (wheat, maize), fodder (alfalfa) and legume (peanut and almond). People who commercialize their products mostly produce peanuts, tomatoes, cabbage and garlic. Similarly, to the number of involved households in agriculture, 63 out of 83 households are practicing livestock. However, research clearly shows that this activity does not bring profits, in the context of high food prices and lack of pasture.

Residents of the studied areas have poor access to the utilities. A centralized water supply service is not available for the vast majority of mahallas. A significant part of households experiences a shortage of drinking water. In many mahallas, people do not have a water supply line at house. As a result, they are forced to buy water or consume water from unsafe sources such, as the irrigation canals, "manual pumps. Although electricity was provided to all households, most respondents claim that it works intermittently.

According to the collected data, the largest number of households is located in the Kattaqum settlement (1,004 households), and the lowest - 342 households in the Zang Gilambop mahalla.

All surveyed local authority officials responded that the population in the selected area is increasing. Two factors were indicated as the reason, the first is a significant increase in the birth rate and another factor is an internal movement of people within the districts.

According to the greater number of respondents at mahalla level, the standard of living of the population is quite low, which is primarily due to the low level of family income due to the high level of employment in the informal sector.

According to the local officials (head of mahalla) school-age population is constantly increasing and it makes tension to the enrolment to the school. Another big issue which is still being not addressed is a small number of the teacher in the rural areas.

The majority of respondents at the local authority level highlighted that schools need well-equipped sports centers so that the young generation could have an opportunity to participate in sports competitions.

According to the results of the survey, none of the respondents is aware of the project, except for the district and regional hokimiyats. Local authorities would like to know about the negative impact of the project on the life of the population, flora and fauna. Due to the high level of unemployment, the respondents were very interested to get information about the required specialist and the number of employees.

15.4 POTENTIAL IMPACTS, MITIGATION, MANAGEMENT & RESIDUAL IMPACT MEASURES

15.4.1 Construction Phase

The research team identified several positive and negative impacts likely to arise during the construction of the Project. These included the following, respectively.

15.4.1.1 Employment and Economics

The primary economic impact during construction is likely to result from employment creation during this phase. This Project is expected to create employment opportunities during the construction phase for unskilled and applicably skilled workers. To prevent social conflicts between local employee and expats, should be paid attention to the balance between in the employment shares.

The inhabitants of the communities closest to the project area are of mixed ethnic origin and are predominantly Muslims with their own traditions and beliefs. The influx of workers and immigrants to the Project site may introduce new habits or practices that are inconsistent with the local culture. This can lead to potential conflicts with new workers or a decline in social cohesion among local communities.

Therefore, in order to have an idea about the employment opportunities in the local area, it is necessary to keep in touch with the local authorities, local employers and employment-related institutions. Long-term consultations with the aforementioned stakeholders may be required, especially for a qualified and unskilled workforce.

The Project has the potential to encourage the spread of construction and construction support skills from expatriate workers to the local workforce. This will open up job opportunities for the unemployed in the Region and increase their chances of securing similar jobs after the completion of the Project construction phase.

It is expected that the majority of workers' contracts (especially for temporary/contract staff) will expire with the completion of the construction phase of the project.

In addition to the direct monetary increase to the families of the employed, the money paid to the workers will also stimulate the local economy with a multiplier effect, so that the money earned from the locally spent Project will recirculate within the local economy.

Additional secondary impact on the local economy is likely to arise from spending on domestic and foreign goods and services during the construction process. The nature of the development and the specialized nature of the materials required, their construction materials will be sourced locally. There is also the potential to buy food products locally to stimulate the local economy, where local people can sell vegetables and daily products to workers.

Besides, the training of employers and employees will equip potential graduates with the tools and knowledge to support the local supply chain for the utilities and chemicals sectors in Uzbekistan.

15.4.1.2 Social Services

There is a poor condition on social services facilities such as educational institutions and healthcare institutions. As a result of the increasing population due to the employment opportunities provided by the construction phase, the demand for these services will increase. The growing demand for services can also put pressure on local authorities to improve existing facilities. As a result, the development of facilities and services will be a positive impact both for the local population and for immigrants from outside.

15.4.1.3 Indirect Impacts of Environmental Components

The construction works of the Project is most likely to be a noisy operation due to the moving construction machines and vehicles. This could be a potential source of disturbance in Termez and

Angor districts. Therefore, noise could be negatively impact the vulnerable groups with hearing handicapped. To minimize this negative impact, the movement of heavy vehicles during the night will be avoided wherever practical.

Dust is likely to occur excavation and spreading of the topsoil during construction of the Project. There is a small possibility that may affecting the site workers and even neighbors' health. Furthermore, dust emission can negatively affect on vegetation and agriculture within the project impact area. The yield loss that may occur in agricultural products due to dust may indirectly affect agricultural activities. To avoid dust based negative impact, where sand and other dusty materials are transported to the site, trucks will not be overloaded and will be appropriately covered/sheeted to avoid loses.

During construction of the Project, solid wastes such as packaging materials, plastics, scrap metal and timber could be generated. Dumping areas with the non-aesthetic condition, they can have a negative visual impact. Therefore, all wastes generated during the construction phase has to be transported off the site.

In addition, there are places for recreation on the shore of Uchkizil reservoir, including the Termez Marvaridi Recreation Area. Industrial design of the Project will interfere with the aesthetic status and landscape of the area.

Uchkizil reservoir may be sensitive to aquaculture stock when used in different ways within the Project construction. This sensitivity is related with fishery activities. Therefore, fishery as an income source of the adjacent settlements could be negatively impacted. So, domestic solid wastes must be segregated from the other waste streams into separate waste containers/bins clearly to facilitate recycling.

The plan of mitigation measures provided inTable 179, describes mitigation measures to minimizing or avoiding the negative impacts associated with the Project construction. The impacts are identified according to recent conducted study.

15.4.2 Operation Phase

Completion of the Project will result in an increase in electrical energy capacity for the population of the Region. As with the construction phase, an economic impact during operation can be employment generated by the Project. However, the operational phase will require significantly less staff than the construction phase. Besides management and technical operator positions, the majority of staff will be security teams and other office-based support personnel. Such non-technical personnel will likely be locally procured. While the size of the required workforce is significantly smaller, the type of work and increasing timescales present an opportunity for greater diffusion of skills. A targeted local recruitment system and investment in the human capital of the local workforce will improve this process and ultimately increase the benefit to the local economy. The plan of mitigation measures provided in Table 179.

Table 179:The plan of mitigation measures Operation Phase

Potential Impacts	Receptor	Severity	Probability	Potential Impact Significance (Pre Mitigation)	Mitigation and Management Measures	Residual Impacts (Post Mitigation)
Increase in electrical energy capacity	**Local energy demand**	**Positive**	**Very likely**	**Positive (P)**	Completion of the Project will result in an increase in electrical energy capacity for the population of the Region	**Positive (P)**
Employment generated by the Project	Management and technical operator positions	**Positive**	**Very likely**	**Positive (P)**	The operational phase will require significantly less staff than the construction phase. Management and technical operator positions, the majority of staff will be security teams and other office-based support personnel	**Positive (P)**

15.4.3 Cumulative Impacts

The purpose of a cumulative impact assessment is to determine how the potential impacts of a proposed development might combine cumulatively, with the potential impacts of other projects or human activities as well as natural stressors such as droughts or extreme climatic events. Summary of Cumulative Impacts of Socio& Economic, Labour & Working Conditions and Human Rıghts Impacts is presented in Table 180.

Table 180: Summary of Cumulative Impacts of Socio& Economic, Labour & Working Conditions and Human Rıghts Impacts

Environmental and Social Aspect	Construction	Operation
Socio-Economics		
Cumulative Impacts	**Development of the Projects at the same time will also lead to increase in local employment.**	**Positive impact in terms of increase in power generation and employment opportunities.**
Labour & Working Conditions		
Cumulative Impacts	**Labour and working conditions during the construction phase are expected to be Project specific and therefore cumulative impacts are not expected to be significant.**	**Project related impacts with regards to worker conditions and worker conditions (occupational health and safety) would mainly be those associated with operation and will depend on conditions within each Project site as well as depending on Project-specific operational activities.**
Human Rights Impacts		
Cumulative Impacts	**Human rights impact during construction are expected to be Project-specific and therefore cumulative impacts are not expected.**	**Human rights impact during operations are expected to be Project-specific and therefore cumulative impacts are not expected.**

16. PUBLIC CONSULTATION

16.1 REGULATIONS AND REQUIREMENTS

16.1.1 National Requirements

Article 29 of the Law on Environmental Protection states ensuring stakeholder participation is crucial for improving the efficiency of environmental monitoring in the implementation of state and other environmental programs. Uzbekistan, public hearings as part of the EIA is regulated by Appendix 3 of Decree of the Cabinet of Ministers No 541 dated September 07, 2020. According to the Decree all objects divided in four categories and public hearings are mandatory for categories I and II (almost similar to World Bank A and B categories). There are no requirements for public hearing or EIA disclosure for Category III and IV projects

There are two non-mandatory mechanisms for public participation in the EIA assessment procedure which include the public hearings. The law allows for independent expert groups to organise public environmental review (PER) but the findings are non-mandatory. However, there are no provisions for public hearings.

16.1.2 International Requirements

16.1.2.1 EBRD Requirements

All projects financed by EBRD shall be structured to meet the requirements of the EBRD Environmental and Social Policy which includes ten Performance Requirements (PRs) for key areas of environmental and social sustainability that projects are required to meet, including PR10 Information Disclosure and Stakeholder Engagement.

EBRD PR10 "recognises the importance of an open and transparent engagement between the client, its workers, local communities directly affected by the project and where appropriate, other stakeholders as an essential element of Good International Practice (GIP) and corporate citizenship.

16.1.2.2 IFC Performance Standards

All of the IFC Performance Standards include requirements for an amount of stakeholder consultation/engagement (either in the ESIA, or as part of the future ESMS) and therefore the Project will require a level of engagement. In particular, IFC Performance Standard 1 on "Social and Environmental Assessment and Management Systems" describes the stakeholder engagement requirements in more depth.

As Policy on Environmental and Social Sustainability and Access to Information Policy are directed towards Corporation itself, Performance Standards are directed towards clients, providing direction on risks and impacts identification. The standards are designed to assist in avoidance, mitigation, and management of risks and impacts of the project financed.

16.1.3 Public Consultation Timeline

16.1.3.1 Public Hearing

In line with Uzbekistan National Requirements, the Project belongs to facilities of the I category of environmental impact, the management of the combined cycle power plant under construction together with representatives of the Angora District Khokimiyat, the Ecology and Environmental Protection Inspectorate, the Kattakum Village Community Assembly in the prescribed manner, were organized and carried out public hearings on 17th of August 2021.

During the public hearings with the participation of the population, issues of the implementation of the planned project were discussed and relevant presentations were presented on the technological process and the impact of the power plant on the environment, as well as social and economic benefits for residents of the area where the facility is located.

16.1.3.2 Local Authority Disclosure

The disclosures were conducted among 8 local authority representatives in Angor and Termez districts from 22 to 29 July, 2021.

Table 181: List of settlements located within 10 km of the Project impact area (Source: Local Authority Survey, July, 2021)

#	Settlements (Mahalla)
1	Bahor
2	Dehqonbirlashuv
3	Ilgor
4	Karvon
5	Kattaqum
6	Kayran
7	Madaniyat
8	Markaz
9	Qoshtegirmon
10	Tallashqon
11	Zang Gilambop
12	Zartepa
13	Namuna
14	Orol
15	Uchkizil
16	Khalqobod

According to the results of the survey, none of the respondents is aware of the project, except for the district and regional Khokimiyats. Local authorities would like to know about the negative impact of

the project on the life of the population, flora and fauna. Due to the high level of unemployment, the respondents were very interested to get information about the required specialist and the number of employees (see Table 182).

Table 182:Opinions of Local Authorities on project

Questions	Answers of the respondents
Do you have any information about the Project?	***None of the respondents know about the project***
What do you want to know about the Project?	***Negative impacts of the project*** ***What specialists will be hired*** ***TPP operation year*** ***Job creation opportunities***
Who should give the information which do you want to know?	***Stone City, UzAssystem or Khokimiyat***
How should given the information which do you want to know?	***Via Telegram network***

16.1.3.3 Public Disclosure via Focus Group Discussion

The focus group discussions were conducted as part of the socio-economic assessment of the project impact area in Angor and Termez districts in Surkhandarya province.

The residents / population differentiated according to geographical location of the settlements for the study were involved in the FGD, as follows:

- 1 settlements and population within 5 km from proposed construction area,
- 2 settlements and population within 10 km from proposed construction area
- 3 settlements and population more than 10 km from proposed construction area.

All focus groups were conducted in Uzbek and lasted approximately 2 and half hours. Each focus group discussion was tape-recorded and later transcribed. Two focus group discussions were conducted at the two sides (Angor and Termez) on 28 of July, 2021. The number of participants and place of the event are given in the following Table 183.

Table 183: Focus group discussion details

Date	Location	Representatives from	Number
28.07.2021 (Morning)	**Small Hall of Termez hokimiyat, Uchqizil city.**	**Khokiyat, district statistic department, district health department, labor and social protection, mahalla etc.**	**24**

28.07.2021 (Afternoon)	**Conference Hall at Angor hokimiyat, Angor city.**	**Khokiyat, district statistic department, district health department, finance and investment department, labor and social protection, mahalla etc.**	**37**

17. LIVELIHOOD RESTORATION

The following items and brief explanations should be considered as preliminary information. If it is decided to implement an LRP program within the scope of the project, this framework is redesigned in detail according to local needs, possible impacts of the project and characteristics of stakeholders.

It should be emphasized that the preparation process of the LRP should also be handled within a project logic and it should be accepted that this process also needs a separate planning, budget and timeline.

17.1 LEGISLATION – INSTITUTIONAL FRAMEWORK & INTERNATIONAL STANDARDS

International lenders have international standards for managing social, economic and environmental impacts, such as World Bank (WB) has Operational Policy (OP) and Environmental and Social Standards (ESSs), European Bank for Reconstruction and Development (EBRD) has Performance Requirements (PR), and International Finance Corporation (IFC) has Performance Standards (PS).

The national and local legislation of Uzbekistan and Surkanderya region, where the project will be implemented, will bring many social, environmental and economic limitations and opportunities for the management of the impacts that will occur during and after the implementation of the project.

Conducting the analysis of national and international regulations and standards interact between the impact of the project and the people of the region can answer this question is important for the

beginning of the LRP study. Because laws and standards will provide new opportunities and limitations for the direct and indirect livelihoods of the people living in the region, and will function in minimizing their grievances, if any.

During these analyses, it is important to identify any gaps and contradictions, especially between the legislation of Uzbekistan and international standards.

In order to fill the gap that will arise due to these contradictions, the proposed actions and activities should be specified.

17.2 ASSESSMENT OF EXISTING SITUATION

Describing the socio-economic situations – baseline data, including demographic composition of project effected people; income & expenditure; income sources; perceptions on their livelihood; fishery & agriculture & husbandry activities of affected people; education, health, poverty, gender, natural environment, etc.

If the assessment of the existing situation is divided into two parts, regional and local, the data presented in the assessment process can be used as a more effective tool.

According to, conducted social impacted assessment surveys such as household, local authority and focus group discussion can gather information about existing situation.

17.3 IMPACT ON LIVELIHOODS

- Potentially Affected Assets and Values (properties, building – structures, settlement lands, agricultural lands, crops, products, forested areas, pasture lands, areas for aqua product, communal lands, roads, any kind of access, historical places, natural areas, natural resources, heritage sites, intangible assets & values, businesses.)
- Potential Impact on Livelihoods:
    - Analysis of the effects on assets and values by determining their direct and indirect relationships with the below listed livelihoods.
    - Loss of agricultural lands, products, grazing lands, forest and forest products, hunting and fishery.
    - Loss of infrastructure including transformation, sanitation, community facilities, commercial buildings, etc.
    - Businesses that will lose income
    - Employment, which includes job opportunities and loss of existing jobs
    - In particular, losses of people in fisheries and aquaculture production, who will experience loss of income due to changes in water quality and quantity.
    - Determining whether there will be income losses due to possible effects on livestock and agricultural production, soil and water resources, which are an important source of livelihood for the people of the region.
    - Identifying disadvantaged and vulnerable groups and identifying possible impacts on them, determining whether there is a need for specific LRP action.

- Preliminary investigation of whether there will be socio-economic inequality, conflict and unfair income distribution among the people of the region due to the opportunities that the power plant will create and determining the risks.

17.4 STAKEHOLDER ENGAGEMENT

Stakeholder Engagement is one of the key issues for LRP. While preparing the LRP strategy, it is important to prepare a stakeholder engagement and communication strategy in parallel.

The recommended steps for stakeholder engagement can be listed as follows:

- Identification of the stakeholders directly and indirectly affected by the project.
- Making analyzes of each group (expectations from the project, socio-economic levels, rivalries between groups, conflicts, development potentials, etc.)
- Identification of vulnerable and disadvantaged groups.
- Decisive traditions, cultural habits in local communities.
- Needs analysis.

Identification of needs for community-based and special groups.

In-depth studies can be done in the needs analysis according to the impact levels, it is important to determine the real need of the community in the groups where the impact is intense. For this reason, long-term, face-to-face household interviews can be conducted. Such analyzes help to direct the supports under the LRP to the real needs within the community. Quick and superficial analyzes can often reveal needs based on statements from authorities within the community.

- One of the most important elements of stakeholder engagement efforts (and the entire LRP strategy) is a development of a strong communication strategy. How will the LRP strategy be shared with stakeholders? What kind of language is needed? Can methods designed according to the characteristics of the communities be developed? A strong internal communication strategy, including the answers to such questions, should be based at the center of the LRP.
- The capacities approach and responsibilities of important corporate stakeholders (NGOs, cooperatives, unions, local governments, private sector organizations, etc.) should be determined, and cooperation opportunities in the LRP process should be explored.

The detailed information on Stakeholder Engagement will be provided as an appendix of the ESIA Report named as "Stakeholder Engagement Plan".

17.5 ELIGIBILITY

Eligibility is the preparation of a set of criteria and justifications for who can (and also who cannot) benefit from compensation or support in the LRP process.

It determines the rules regarding the compensation of immovable assets when necessary. For the implementation of a transparent and fair LRP between the parties, it is important that it is prepared in detail and in a language that stakeholders can understand.

In this section, the legal responsibilities of the parties are also noted. Relevant legal articles are used as a reference when necessary. Eligibility is an issue that stakeholders may doubt and may cause disagreements. Often the locals do not carefully read the criteria on this subject or long explanations can be tiring for them. For this reason, it is important to explain the eligibility criteria to stakeholders through face-to-face meetings describing the process.

17.6 LIVELIHOOD RESTORATION AND COMMUNITY DEVELOPMENT PROGRAMS

Various methods can be used in the application of LRP. Among these, there may be community-based LRP application for risk groups, household-based application or even support for individuals. Hybrid methods that include all of these may be functional in some cases. The method of LRP is determined during the preparatory work according to the characteristics of the target group, the size of the impact and the needs.

Community development program can be implemented as a support program other than LRP. This is an optional strategic decision. Long-term community development programs can be developed if the affected population density is high in the area and the extent of the impact is permanent. These programs may specifically target vulnerable – disadvantaged groups within the affected population. It is possible to prepare a sustainable development program for the people of the region and support it with rational development projects.

Such programs aimed at improving the living standards and livelihoods of the people of the region should include objectives that meet local needs and development and social development trends.

17.7 PRINCIPLES AND VALUES

The credibility of the work increases if the project implementing institution (or partnership) specifies the principles and values to be adhered to during the implementation of the LRP as a set of priorities and shares this with the stakeholders.

17.8 GRIEVANCE MECHANISM

Develop a grievance management mechanism that addresses and evaluates concerns and grievances raised by stakeholders. There should be a mechanism that is transparent, constructive, timely, has established its own confidentiality rules, is in harmony with the local culture, and has accessibility.

Appropriate archiving, documentation and communication systematics should be developed for the grievance management mechanism.

The detailed information on Grievance Mechanism will be provided as an appendix of the ESIA Report named as “Stakeholder Engagement Plan”.

17.9 MONITORING & EVALUATION

In order to monitor the whole process from the beginning, a monitoring program is established according to local conditions, time and budget. The objective of monitoring is to observe whether livelihoods are successfully restored and persistence.

A component of the monitoring program can also be established as monitoring of histories of identified individuals and families, if conditions permit, and if there is sufficient time. For this, stakeholders must trust the monitoring team, and dialogue based on sincerity must be established.

Performance indicators need to be determined beforehand for monitoring. These indicators can be updated when necessary during the LRP implementation.

Quantitative indicators (economic income, productivity, etc.) are relatively easy to detect and monitor. However, the effects on satisfaction are difficult to monitor. For this, it may be a good choice to follow the story with pre-determined stakeholders.

17.10 IMPLEMENTATION SCHEDULE AND BUDGET

An implementation schedule is created, taking into account possible risks and external factors (climate, holidays, intense work schedules of stakeholders). Preparing a flexible budget in accordance with this calendar and LRP implementation program will also allow unexpected expenses to be incurred during implementation.

18. LABOUR & WORKING CONDITIONS

18.1 STANDARDS AND REGULATORY REQUIREMENTS

18.1.1 National Requirements

Uzbekistan pursues a purposive policy of creating a legal framework for the protection of human rights and freedoms in accordance with international standards (ILO, 2008). Having joined the world community, the Republic has constitutionally sealed the priority of universally accepted norms of international law. As a fully-fledged member of the United Nations Organization, Uzbekistan accedes to international human rights acts thus assuming an obligation to comply with them and apply them in its state and legal practice.

The universal significance of international human rights acts means that its provisions should be embodied in national legislation. The Main Law of the Republic of Uzbekistan includes all the provisions of the Universal Declaration of Human Rights.

Uzbekistan has published several laws since foundation for protection of Human and worker rights. General information about these legal can be found below.

18.1.1.1 The Constitution of the Republic of Uzbekistan (December 8 1992)

Article 37 of the Constitution of Uzbekistan says that "each has the right to work, to free choice of work, fair terms of work and protection against unemployment under the law."

18.1.1.2 Labour Code of the Republic of Uzbekistan (1995 as amended in 2017)

The code treats labour legislation with due account of the interests of the employees, employers and the state and fair and safe labour conditions and the protection of the labour rights and health of the workers.

More than 30 articles of the Labour Code are directly linked with issues of occupational safety and health. They include:

- Occupational safety and health requirements (Article 211);
- Ensuring safe and healthy labour conditions (Article 212);
- Instruction and training in OSH matters (Article 215);
- Regulation of working hours in hazardous occupations for workers performing special work and workers under 18 (Articles 116, 117 and 118);
- Terms of recruiting invalids for various jobs (Article 220);
- Providing workers with milk, medicalpreventative nutrition, means of individual protection and hygiene (Article 217);
- Providing first medical aid to workers who have fallen ill at work (Article 221); and
- Registration and investigation of accidents, supervision of labour conditions (Article 222) and others.

18.1.1.3 The Law of the Republic of Uzbekistan on Occupational Safety and Health

In pursuant ft Article 37 of the constitution of the Republic of Uzbekistan, the Oliy Majlis(parliament) on May 6, 1993 passed the law of the Republic of Uzbekistan on Occupational Safety and Health that laid the legal groundwork for the functioning of all the branches in managing the activities of enterprises of any form of ownership aimed at improving labour conditions and well-being at production facilities, at forming a system of socio-economic, organizational, technical, sanitary and medical preventative measures and providing the legal groundwork for occupational safety and health.

The Law on Occupational Safety in Hazardous Production Facilities passed on August 25, 2006 sets down the legal, economic and social terms of ensuring safe exploitation of hazardous production facilities and is aimed at preventing accidents and building the capacity of enterprises to liquidate their aftermath.

Under the Law of the Republic of Uzbekistan On Occupational Safety and Health, the following are the main principles of the state OSH policy:

- Priority of the life and health of the worker over the results of the enterprise activities;
- Coordination of osh activities with other areas of economic and social policy;
- Establishment of uniform osh requirements for all the enterprises irrespective of their form of ownership and management;

- Ensuring environmentally safe labour conditions and systematic control of the environment in the workplace;
- Supervision and monitoring of universal compliance with osh requirements at enterprises;
- State participation in funding osh;
- Training of osh specialists at higher and secondary specialized education institutions;
- Poviding incentives for the development and introduction of safe technology and means of protecting workers;
- Wide-scale use of the achievements of science, technology and the best domestic and foreign practices in the field of osh;
- Free provision of workers with special work clothes and footgear, individual protection means and medical-preventative nutrition;
- The conduct of a tax policy that stimulates occupational safety and health at enterprises;
- Mandatory investigation and registration of each occupational accident and occupational disease case and on that basis keeping the public informed about the levels of occupational accidents and diseases;
- Social protection of the interests of the workers who have become victims of occupational accidents or diseases;
- All-aound support for the activities of trade unions and other non-governmen tal associations, enterprises and individuals in the field of osh; and
- International cooperation in dealing with OSH problems

Supporting legislation passed pursuant to individual articles of the law include:

- Decrees of the Cabinet of Ministers of the Republic of Uzbekistan:
- No.538 of November 7, 1994 On State Management of Occupational Safety and Health;
- No.58 of February 16, 1995 On Managing Occupational Safety and Health of the Labour Ministry of the Republic of Uzbekistan;
- No. 286 of July 6, 1997 Regulations on Investigation and Registration of
- Occupational Accidents and Other WorkRelated Impairment of the Health of Workers and other regulations:
- Model regulations on the organization of OSH;
- Model regulations on training in and testing the knowledge of OSH;
- Regulations on the OSH officer;
- Methodological guide to rational employment of invalids;
- Lists of hazardous jobs where work of persons under 18 is prohibited and where the use of women’s labour is fully or partially prohibited, etc.;
- Methodology of assessing labour conditions and workplaces in terms of labour conditions;
- Procedure of attestation of workplaces where the labour of invalids is used;
- Medical indications for the free provision of milk and similar foods to employees directly exposed to hazardous labour conditions; and
- Regulations on the development of OSH instructions, etc.

18.1.1.4 Ordinance No. 30-31 Elimination of child labour, protection of children and young persons

Ministry of Labour and Social Security and the Ministry of Health of the Republic of Uzbekistan approving the list of hazardous jobs mentioned in Article 355, for which the employment of persons under the age of eighteen years is prohibited.

18.1.1.5 Joint Decree of the Ministry of Labour and Social Protection of the Population (No. 7) and the Ministry of Healthcare (No. 1)

Dated 30 May 2001 to approve the list of occupations with unfavourable working conditions to which it is forbidden to employ persons under 18 years of age.

18.1.1.6 Decree of the Cabinet No. 133

Dated 11 March 1997 to approve normative acts necessary for the realization of the Labour Code of the Republic of Uzbekistan.

18.1.1.7 Decree of the Cabinet of the Ministers No. 1011 of 22 December 2017

Decre name is"On Perfection of the Methodology of Definition of Number of People in Need of Job Placement, including the Methodology for Observing Households with Regard to Employment Issues, also for the Development of Balance of Labour Resources, Employment and Job Placement of Population".It cover Employment policy, promotion of employment and employment services. The decree establishes, intrdıuces and set standards and procedures for;

- Form of the balance of labour resources, employment and job placement of population;
- Scheme of systematizing of information for the development of labour resources, employment and job placement;
- Scheme of organization of development of reporting and broadcasting balances of labour resources, employment and job placement;
- Methodology of calculation of unemployed people in need of job placement, also of development of the balance of labour resources, employment and job placement.

Decree of the Cabinet of the Ministers No. 965 of 5 December 2017 "On the Measures of Further Perfection of the Procedure of Establishment and Reservation of Minimum Number of Job Places for the Job Placement of Persons who are in need of Social Protection and Face Difficulties in Searching Employment and Incapable of Competing in Labour Market with Equal Conditions".

Decree No. 964 of 5 December 2017 "On the Measures for Perfection of the Activity of Self-Government Bodies Aimed at Ensuring Employment, Firstly for the Youth and Women".

18.1.2 Lenders Requirements

18.1.2.1 European Bank of Reconstruction and Development (EBRD)

Performance Requirement 2 is on Labour and Working Conditions and it recognises that t for clients and their business activities, the workforce is a valuable asset, and that good human resources management and a sound worker-management relationship based on respect for workers' rights, including freedom of association and right to collective bargaining, are key ingredients to the

sustainability of business activities. By treating workers fairly and providing them with safe and healthy working conditions, clients may create tangible benefits, such as enhanced efficiency and productivity of their operations.

Key objectives of the PR2 are;

- Respect and protect the fundamental principles and rights of workers
- Promote the decent work agenda, including fair treatment, non-discrimination and equal opportunities of workers
- Establish, maintain and improve a sound worker-management relationship
- Promote compliance with any collective agreements to which the client is a party, national labour and employment laws
- Protect and promote the safety and health of workers, especially by promoting safe and healthy working conditions
- Prevent the use of forced labour and child labour (as defined by the ILO) as it relates to project activities.
- The accommodation of workers shall be appropriate for its location and be clean, safe and, at a minimum, meet the basic needs of workers. In particular, the provision of accommodation shall meet good international industry practice. Workers' freedom of movement to and from the employer-provided accommodation shall not be unreasonably restricted.

Concerning the accommodation, the project shall meet the requirements set out in EBRD&IFC's Workers accommodation: processes and standards -2009 guideline. The project's Camp Management Plan shall be in line with above mentioned workers accommodation standards.

18.1.2.2 EBRD Covid-19 Resilience Framework (EBRD 2020)

The aftermath of the Covid-19 pandemic EBRD prepared a guidance note to cover risks derived from the pandemic. The pandemic created unprecedented pressure to safeguard the businesses. According to the document Issues to be considered the aftermath of the pandemic are as follows:

- Other options/alternatives should be assessed before the retrenchment of workers such as voluntary unpaid leave, reduced working hours etc.
- Decisions to reduce labour costs should be taken incrementally and revisited in light of rapidly changing circumstances and levels of support provided by the national government.
- Retrenchment planning should consider the options for re-employment of dismissed workers once the situation improves.
- Companies should consider applying positive discrimination criteria to dismissals, within bounds permissible under applicable labour and social protection laws and regulations in order to protect workers who are most vulnerable i.e. based on gender, ethnicity, age, economic situation, supply chain workers etc.
- Companies should engage with workers and their representatives during the consideration of the different options viable.
- Grievance mechanism will be essential to monitor staff morale, understand how workers are affected and what their concern are and address pressing matters promptly.

18.1.2.3 Equator Principles IV

Equator principles mentions about general framework on management of E&S risks of projects. EP IV refers to IFC performance standards for identification and addressing the social and economic impacts of a project. The key standard for addressing and identifying risks main regulation is;

- IFC Performance Standard 2 Labour and Working Conditions.
- IFC Performance Standards 2 has following objectives;
- To establish, maintain and improve the worker-management relationship
- To promote the fair treatment, non-discrimination and equal opportunity of workers, and compliance with national labor and employment laws
- To protect the workforce by addressing child labor and forced labor
- To promote safe and healthy working conditions, and to protect and promote the health of workers

In according to IFC PS2 there is a requirement to follow following conventions;

- ILO Convention 29 on Forced Labour;
- ILO Convention 87 on Freedom of Association and Protection of the Right to Organize;
- ILO Convention 98 on the Right to Organize and Collective Bargaining;
- ILO Convention 100 on Equal Remuneration;
- ILO Convention 105 on the Abolition of Forced Labour;
- ILO Convention 138 on Minimum Age (of Employment);
- ILO Convention 182 on the Worst Forms of Child Labour;
- ILO Convention 111 on Discrimination (Employment and Occupation);
- UN Convention on the Rights of the Child, Article 32.1; and
- UN Convention on the Protection of the Rights of all Migrant Workers and Members of their Families.

In addition to above conventions and standards, the Project will also be required to adhere to the United Nations Guiding Principles on Business and Human Rights to ensure that it complies with all applicable laws and to respect human rights

18.1.2.4 IFC Guidance on Gender Based Violence and Harassment (GBVH) in the Construction Sector

There is growing recognition that operators in the private, public and non-profit sector need to address gender-based violence and harassment (GBVH) more proactively. For the private sector, this is motivated by the need to prevent the physical, sexual, emotional and financial harm GBVH causes to individuals, as well as the financial, reputational and legal risks it poses to businesses and investors.

GBVH is widespread. It affects both men and women, but is most often perpetrated by men against women and girls, with more than one in three women having experienced some form of physical or sexual violence during their lifetime.1 GBVH is not inevitable, however, and can be prevented. When it does happen, it is important that it is responded to in a responsible and effective way.

Addressing GBVH in the private sector is a relatively new and complex area. CDC, the EBRD and IFC recognise the need for companies and investors to have access to practical guidance. All three organisations jointly commissioned this guidance note, which outlines emerging practices in addressing GBVH in operations and investments. These practices are drawn from recent experience

in the private sector, as well as a larger body of work from the non-profit sector. The guidance provides an opportunity to engage with stakeholders to refine practices as those in the private sector collectively gain implementation experience.

Steps to manage GBVH risks derived from workforce can be seen in Figure 174.

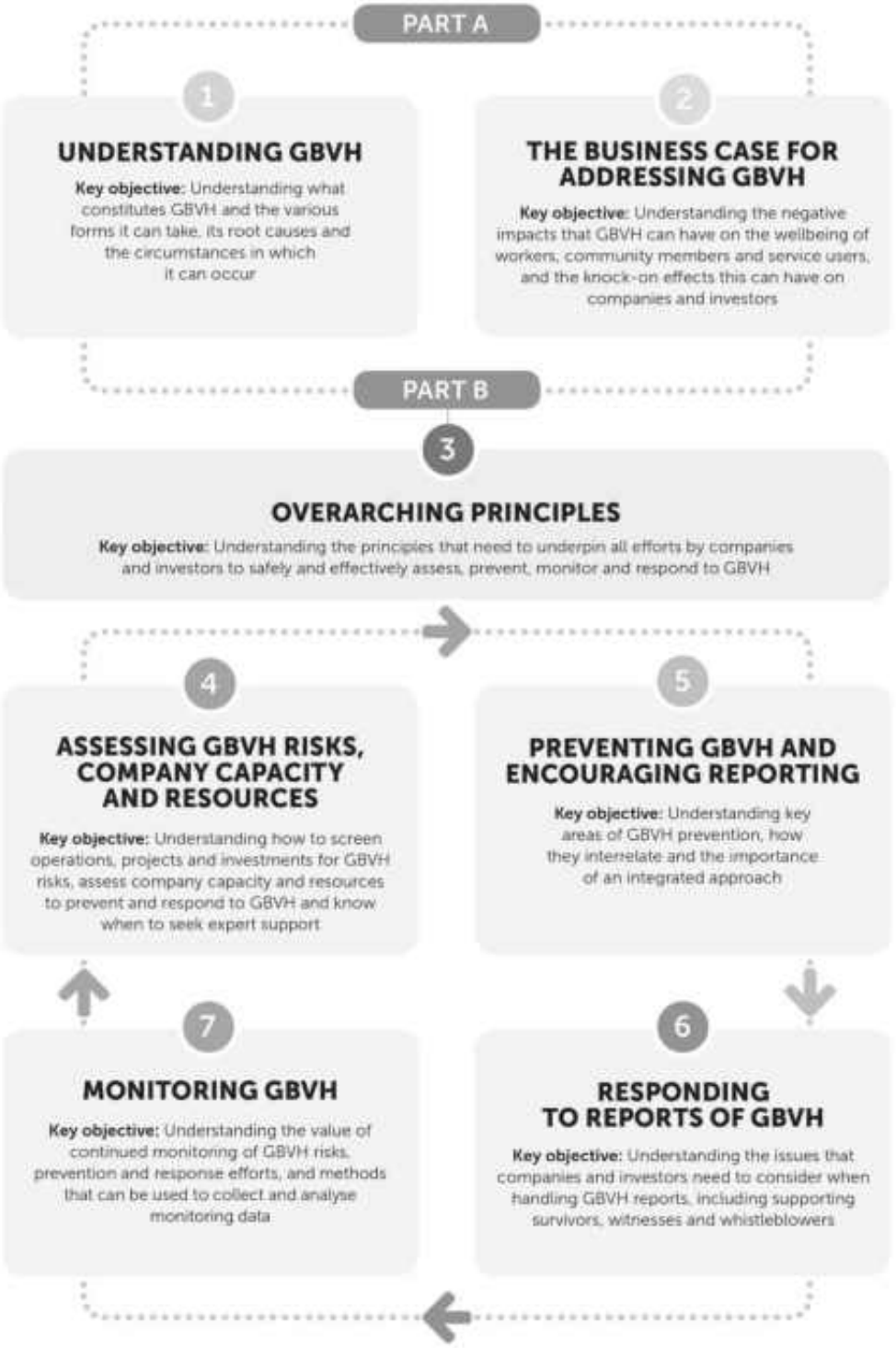

Figure 174: GBVH Risk Management Flow Scheme

The assessment, prevention, monitoring and response measures in regards to GBVH should be underpinned by the following principles:

- Survivor Centred: The rights of GBVH survivors need to be consistently prioritized and used as the starting point for all decisions on efforts to assess, prevent, monitor and respond to GBVH.
- Safe: Survivors, witnesses and those who report and seek to address GBVH can be at risk of retaliation, including threatening and violent behaviour, often from those who do not like their position of power being challenged. Companies should prioritise the safety of those who have experienced, witnessed and reported GBVH.
- Context specific: All measures need to be rooted in a thorough understanding of the local context. Investors and companies should understand the legal and social context and identify the support mechanisms that are in place.
- Collaborative: Companies should seek inputs from a range of internal and external stakeholders to increase the likelihood of broader buy-in and make GBVH prevention more effective.
- Inclusive: Companies should recognise the heightened risks of GBVH faced by certain groups who are subject to discrimination and marginalisation. High risk groups often include people with disabilities, single parents, migrants and ethnic minorities and sexual and gender minorities. The system should also account for illiterate or non-literate people who may not be able to access written information on GBVH reporting mechanisms.
- Integrated: Processes, efforts to assess, prevent, monitor and respond to GBVH needs to be integrated as much as possible into existing processes and management systems, such as occupational health safety, security management systems, environmental and social management systems (ESMS) and human resources (HR) policies and procedures.
- Non-discriminatory: All survivors need to be listened to and treated equally and promote diversity in the work place.
- Well-informed: Companies should draw on relevant expertise when developing prevention and response measures. The grievance mechanism and investigation procedures should be set up to ensure they are appropriate, relevant and safe in the local context.

According to the guidance, the benefits of addressing GBVH include:

- Improves workers' physical and emotional wellbeing and strengthens occupational health and safety.
- Avoids reputational damage, financial risks and legal liabilities for companies, investors and construction contractors.
- Builds relationships and social license to operate in communities. This can result from regular dialogue to understand and track project GBVH risks as well as the effective use of measures to prevent and respond to GBVH.
- Broadens the pool of potential workers that companies can draw upon, including women workers from nearby communities because of lower perceived risk of GBVH.

18.1.2.5 Equator Principles Guidance on Implementation of the Equator Principles During the Covid-19 Pandemic

The guidance recommends that the borrower should consider the following in the engagement of workforce and management of risks:

Engagement of Workforce

- Communicate its approach to COVID-19 management to its workforce (including contractors) and provide information and advice about the virus.
- Engagement methods should ensure the ability to provide frequent updates with a central information communication network that allows workers to access all the latest information and guidance.
- Consider the need for a 24-hr hotline.
- Design communication in a way that avoids risks of stigma associated with infection in line within available good practice.

Managing Health Risks

It is recommended that the borrower shall develop a range of actions/procedures to manage workers risks. These procedures must align with the latest guidance/requirements at national/regional levels and WHO guidelines. It should also ensure that up to date information is maintained at the Project level and liaise with national/local authorities as applicable.

Welfare and Livelihoods

Where travel restrictions lead to workers remaining on site for longer rotations, fatigue management procedures are recommended. The following measures are also recommended in instances where workforce reduction maybe required:

- Consultation with workers/representatives during the entire process of evaluating viable options.
- Options for avoiding redundancy should be considered in the first instance (e.g. paid/unpaid leave, reduced hours/pay) with retrenchment taken as the last option.
- Reduction in workforce should be undertaken incrementally where possible and regularly reviewed.

Consideration should also be given to risks posed to vulnerable workers i.e. casual workers, woman, workers with childcare issues, supply-chain workers and their needs and support provided as required.

18.2 OBSERVATIONS AND BASELINE CONDITIONS

Any construction project will introduce health and safety risks associated with the use of plant, machinery and construction processes. Risks can be severe depending on the type of activities required, materials used and site condition.

Due to an influx of workers in the Project area from other regions/countries consideration will be needed to be given in relation to accommodation facilities, worker welfare, sanitary provision, health care, hygiene, food and potable water etc.

Forced labour is a general practice in the country especially on cotton industry. Uzbekistan continued to demonstrate major progress in the eradication of child labour and forced labour in the 2020 cotton harvest. As in previous years, there were only isolated cases of minors below the legal working age picking cotton. The share of people experiencing forced labour during the harvest was reduced by 33 percent compared to 2019 (ILO 2020).

- The ILO continues to find that systematic child labour is no longer used during the cotton harvest in Uzbekistan. Schoolchildren and students were not mobilized for cotton picking; however, isolated cases of child labour still occurred.
- Systematic forced labour did not occur during the 2020 cotton harvest. Reforms are implemented step-by-step and continue to have a significant positive impact; yet there are still challenges with uneven implementation in certain provinces and districts. The monitors could work unhindered and in confidentiality.
- The nation-wide share of forced pickers declined by 33 percent in 2020. The vast majority of pickers participated in the harvest voluntarily but about 4 percent were subject to direct or perceived forms of coercion. Some provinces and districts had very few or no forced labour cases in 2020.

According to the same ILO report there are cases of forced labour outside of cotton industry. In total, 106 forced labour cases were recorded in 2020 across the country covering primarily landscaping, cleaning and construction works. The trend of identifying forced labour cases outside the cotton harvest is positive and speaks to increased awareness and attention to the issue. 22 representatives of private employment agencies were brought to justice for violations of legislation on recruitment of people for work abroad in line with the articles 168 and 228 of the Penal Code.

The Uzbekistan government has already got a hotline for reporting forced labour incidents. Namangan, Jizzakh, Tashkent and Surkhandarya provinces had the most cases in the Ministry of Employelement and Labour Relations (MELR) Feedback Mechanism.

Beside the above mentioned ILO report, a news channel reports that there were a large scale riot in a thermal power construction project in Qashqadarya Viloyat (state) which is neighbor of Surkhandarya region due to unpaid salaries and weak food services and accommodation (RFERL, 2020).

Common activities undertaken during construction such as the movement of heavy machinery, excavation, handling of chemicals, works undertaken at height etc. can all introduce significant risk to the health and safety for the associated work force. In particular, risks are more likely to be apparent for those who are not familiar with the type of works undertaken and/or the associated hazards.

The type of hazards attributable to a construction site will vary significantly depending on the construction methods employed and the degree of control implemented by the contractor and affiliated sub-contractor. It is therefore of the utmost importance that the contractor and affiliated sub-contractors demonstrate consideration of health and safety risks as part of their chosen construction methods and that these risks are appropriately mitigated.

General risks expected during the construction phase are;

- Over exertion
- Slips and fallas
- Work in heights
- Struck by Objects

- Moving Machinery
- Dust
- Confined Spaces and Excavations
- Other Site Hazards (Chemicals, hazardous materials)

As occupational health and safety is a risk rather than a potentially defined impact, its significance has not been assessed further in this ESIA. Health and safety risks to the site force will be managed through effective project specific risk assessment, development and implementation of an Occupational Health & Safety Plan

18.3 POTENTIAL IMPACTS, MITIGATION, MANAGEMENT & RESIDUAL IMPACT

18.3.1 Construction Phase

18.3.1.1 Health Risks Associated with Covid-19

The current COVID-19 pandemic poses potential risks to the health and safety of the workers and the development of the Project. It is expected that there will be approximately 2000 workers at the peak of the Project construction Phase. These workers will be sourced locally but will also include migrant workers from other regions of Uzbekistan and from other countries and thus heightening the risk of infection (i.e. some workers may come from regions/countries with higher COVID-19 infection cases). Such a high number of workers working in close proximity or confined spaces increases the risk of infection. Risk of exposure will also be potentially high in shared accommodation areas, canteens and transportation buses. The contractor will therefore be required to conduct a COVID-19 Construction Risk Assessment which must be regularly updated in line with national/local and WHO requirements and guidance.

18.3.1.2 Working Conditions

Labour exploitation on construction sites unfortunately has become a reality in some parts of the world. Inequalities in income, education and opportunities has led to opportunistic immoral practices with labourers and site staff suffering as a consequence of the exploitation.

To ensure the wellbeing of the staff associated with the project, the EPC and associated subcontractors will need to plan for necessary provisions relative to the requirement of the required workforce. This includes appropriate labour accommodation plans and mechanism for inspections and corrective actions.

The EPC Contractor shall adhere to good practice measures regarding worker welfare on and off site particularly in terms of sanitation facilities on site, and having adequate checks and balances regarding timely payment of salaries and having necessary redressal access in case of forced retrenchment.

Due to the ongoing COVID-19 pandemic, movement of workers to their families or home region/countries may be restricted which could leave some feeling isolated, fatigued and could lead to mental health issues if not properly addressed. In addition, some workers may be required to work from home in cases where schools are closed in order to take care of their children. In such instances, women may be more disproportionately affected than the men.

As with occupational health & safety risk, worker conditions are a defined aspect of site planning rather than a potentially environmental impact as such, its significance is not assessed further in this ESIA. Risks associated with worker welfare during construction will be managed through effective project planning, and the enforcement of fair and just treatment throughout the construction phase.

18.3.1.3 Gender Based Violence and Harassment (GBVH)

Influx in workers from outside the Project region will increase the likelihood of Gender Based Violence (GBV). The constructions workers are likely to be predominantly young male coming from other regions of Uzbekistan and outside the country. These workers will be away from their families and removed from their normal social spheres. This could potentially result into peer pressure and involvement in unlawful behaviour such as harassment of local women, young girls and boys or women within the Project workforce. Such behaviour can lead to increase in exploitative sexual relationships and unwanted aggressive advances and harassment. This could also lead to disintegration of relationships in local households impacted by GBV.

During the construction phase, workers will also be vulnerable to various forms of harassment, exploitation and abuse, aggravated by traditionally male working environment. GBVH is likely to be committed by co-workers or construction supervisors and can be attributed to gender stereotypes about the sexual availability of female construction workers. In addition, income earning opportunities for women through direct employment during the construction phase or through indirect employment has the potential to increase household tensions and expose women to harassment and violence in their homes or communities.

Some of the male workers who will be transporting Project machinery and equipment and goods will also be involved in long distance travel which in some cases will be between different countries. There is a risk that they can also be involved in GBVH on the routes they use and at track stops associated with the Project even if it is outside the Project boundary.

18.3.1.4 Employment and Procurement

The Project shall develop a Human Resources Policy, Labour and Employment Plan as well as specific recruitment policies and procedures, specifically:

The Project should prioritise the recruitment of workers and procurement of goods and services from within the Districts then to national companies.

This will not apply to the provision of highly technical equipment. The Project should develop a fair and transparent employment and procurement policy and processes to avoid any potential for nepotism or favouritism. The policy should be shared with the local community members and leadership.

18.3.1.5 Occupational Health and Safety

Common activities undertaken during construction such as the movement of heavy machinery, excavation, handling of chemicals, works undertaken at height etc. can all introduce significant risk to the health and safety for the associated work force. In particular, risks are more likely to be apparent for those who are not familiar with the type of works undertaken and/or the associated hazards.

The type of hazards attributable to a construction site will vary significantly depending on the construction methods employed and the degree of control implemented by the EPC and affiliated sub-contractor. It is therefore of the utmost importance that the EPC and affiliated sub-contractors demonstrate consideration of health and safety risks as part of their chosen construction methods and

that these risks are appropriately mitigated. As occupational health and safety is a risk rather than a potentially defined impact, its significance has not been assessed further in this ESIA. Health and safety risks to the site force will be managed through effective risk assessment, development and implementation of an Occupational Health & Safety Plan

A structured Grievance Redress Mechanism (GRM) shall be implemented at the plant level in multiple languages anonymously (online and hardcopy) so that workers have access to express their concerns. The human resources department shall be responsible for implementing the GRM for the facility.

Table 184: Impacts Significance of the Labour and Working Conditions during– Construction Phase

Potential Impacts	Receptor	Severity	Probability	Potential Impact Significance(Pre Mitigation)	Mitigation and Management Measures	Residual Impacts (Post Mitigation)
Occupational Health and Safety	**Project Employees**	**Severe**	**Very Likely**	**High(H)**	**Workers will be provided with a safe and healthy work environment, taking into account inherent risks and specific classes of hazards associated with the project.** **The contractor will set, implement and maintain an Occupation Health and Safety (OHS) system. The risks associated with project specific locations, and processes should be assessed by competenet OHS professionals in the project. Legal requirements and duty of care should be considered.** **The Contractor will be responsible for ensuring that all sub-contractors, sub-sub-contractors and suppliers comply with the OHS management system of the project. The OHS management system will be in-line with recognised international best practice and as a minimum, this plan will include:** **Means of identifying and minimising, so far as reasonably practicable, the causes of potential H&S hazards to workers.** **Provision of preventive and protective measures, including modification, substitution, or elimination of hazardous conditions or substances.** **Provision of appropriate equipment to minimise risks, and requiring and enforcing its use.** **Training of workers, and provision of appropriate incentives for them to use and comply with H&S procedures and protective equipment.** **Documentation and reporting of occupational accidents, diseases and incidents.** **Emergency prevention, preparedness and response arrangements**	**Moderate (M)**
Risks Associated with Covid- 19	**Project Employees and Stakeholders**	**Critical**	**Very Likely**	**High (H)**	**Covid-19 construction phase risk assessment should be developed during the mobilization phase. The risk assessment should be evaluated regularly by the project management and risks and measures should be updated in line with international and national legal requirements, WHO guidelines.** **Develop a COVID-19 specific communication procedure for the workforce.** **Set up a 24/7 hotline** **Infected employee must be isolated and cared in specific rooms. Free rooms for covid infected personnel should be ready at construction camp.** **Identification of any vulnerable groups (i.e. those with pre-existing conditions) working in the Project site (for the contractor and sub contractors) and taking precautionary measures in accordance with the national and WHO guidelines.** **Providing testing for staff as required at no cost to them.** **Ensuring that social distancing measures are put in place i.e. allowing some of the office staff to work from home, working in shifts etc.** **Promotion of personal hygiene among the workers and providing training, posters remind workers to wash their hands regularly, cleaning their work areas and equipment, proper sanitation etc.** **Masks should be free for project at all times and proper PPE for health personnel should be provided at no cost.** **While designing the accommodation facilities, social distancing, proper ventilation and hygiene must be considered.**	**Moderate (M)**

Potential Impacts	Receptor	Severity	Probability	Potential Impact Significance(Pre Mitigation)	Mitigation and Management Measures	Residual Impacts (Post Mitigation)
					The transportation of workers and access to the site shall be coordinated and regulated i.e. through reduced bus occupancy, temperature and PPE checks etc. **The Contractor will provide a flexible or hybrid working regime for those workers who may prefer to work from home due to health issues, child care, home schooling etc without fear of victimisation.**	
Employment, non-discrimination and Equal Opportunities	**Project Employees**	**Marginal**	**Very Likely**	**High (H)**	**The contractor shall submit a plan showing how the terms and conditions of employment comply with national labour, social security and occupational health and safety legislation.** **The employment relationship shall be based on the principle of equal opportunity and fair treatment and shall not discriminate with respect to any aspect of the employment relationship, including recruitment, remuneration (including wages and benefits), terms and conditions of employment, including maternity/paternity leave provisions, access to training, promotion, termination of employment or retirement, and discipline.** **The contractor will not make recruitment decisions on the basis of personal characteristics such as gender, race, nationality, ethnic origin, religion or belief, disability, age or sexual orientation which are unrelated to the inherent job requirements.** **Sexual violence or harassment will not be tolerated and the Contractor will include this in the Worker Code of Conduct, which will be made available in local languages.** **The Contractor will document and communicate to all workers their terms and conditions of employment, including their entitlement to wages, hours of work, overtime rules and overtime pay, and any benefits (such as sick leave, maternity/paternity leave or holiday).** **The contractor will base the employment relationship on the principle of equal opportunity and fair treatment and will not discriminate in relation to any aspect of the employment relationship, including recruitment and hiring, remuneration (including wages and benefits), terms and conditions of employment, accommodation, access to training, promotion, termination of employment or retirement and disciplinary action.** **Special measures of protection or assistance to promote local employment opportunities or selection for a particular job based on the inherent requirements of the job which are in accordance with national law, will not be deemed discrimination.**	**Moderate (M)**

Potential Impacts	Receptor	Severity	Probability	Potential Impact Significance(Pre Mitigation)	Mitigation and Management Measures	Residual Impacts (Post Mitigation)
Forced Labour and Child Labour	**Minors, Project Employees and Stakeholders**	**Severe**	**Likely**	**High (H)**	**The contractor will not use forced labour, which is any work or service that is not voluntarily performed and is required of a person under threat of force or punishment. This includes any type of involuntary or forced labour, such as indentured labour, debt bondage, or similar labour contracts.** **The policies and procedures of HR will be adapted to the size of the workforce required for the project. Policies and procedures shall be developed to comply with the requirements of national legislation and IFC PS 2.** **HR Policies shall include the ability of workers to join a Trade Union and ensure workers' right to collective bargaining.** **The contractor will comply with all relevant national legislation, the requirements of the lender and ILO regulations relating to the employment of minors.** **In all cases, the contractor will not employ children in a manner that is economically exploitative or that risks interfering with the child's education or harming the child's health or physical, mental, spiritual, moral or social development.** **Young people under the age of 18 will not be employed in hazardous work and all work undertaken by persons under the age of 18 will be subject to an appropriate risk assessment.**	**Moderate (M)**
Wages, Benefits and Retrenchment	**Project Employees**	**Marginal**	**Very Likely**	**Moderate (M)**	**HR Policies and procedures shall be reasonably adapted to the size of the work force required for the project. Policies and procedures shall be developed to comply with the requirements of national legislation and IFC PS 2 and shall include a code of conduct on GBVH.** **The overall wages, benefits and working conditions offered should be comparable to those offered by equivalent employers in the relevant region of the country/area and sector. Wages for all workers (skilled and unskilled) must be such as to ensure a living wage for all workers.** **If the Contractor anticipates mass layoffs related to the proposed project, the Contractor will develop a plan to mitigate the adverse effects of layoffs that complies with national laws and good industry practise and is based on the principles of non-discrimination and consultation. Without prejudice to more stringent national legislation, workers' representatives and, where appropriate, the competent authorities shall be informed of the changes in employment within a reasonable period of time so that the redundancy plan can be jointly considered with a view to mitigating the adverse effects of the redundancy on the workers concerned. The outcome of the consultations will be incorporated into the final job reduction plan.** **Where workers need to be made redundant due to the economic impact of COVID -19 this will be done in a phased manner and options to avoid redundancies will be considered, with redundancies being the last option.** **Employees/representatives will be involved in all downsizing actions, including those related to COVID -19.**	**Moderate (M)**

Potential Impacts	Receptor	Severity	Probability	Potential Impact Significance(Pre Mitigation)	Mitigation and Management Measures	Residual Impacts (Post Mitigation)
Sub-contractors, Suppliers, Sub-sub- contractors	**Employees of Sub-contractors, Suppliers, Sub-sub-contractors**	**Critical**	**Very Likely**	**High(H)**	**The Contractor shall establish a supply chain management system to ensure that the above measures are implemented by all subcontractors.** **Assess any high risk supply chain at risk in relation to the COVID -19 pandemic and ensure appropriate involvement of key suppliers in the supply chain.** **The Contractor will require its suppliers and subcontractors to provide GBVH training to their staff in accordance with the Code of Conduct.** **Applicants will not be required to make payments if they apply for or obtain employment under the proposed project.** **The project will ensure that recruitment processes are transparent and monitored to ensure that individuals hired declare their actual experience, geographic location, health status, and age, and that local employment requirements are met.** **The project will develop and implement a programme of worker education, training, and development to help workers access opportunities associated with the project and find employment after their contracts end.** **The Project will provide training on health and safety and quality standards required by the Project for the provision of goods and services to the Project to ensure that local businesses have the opportunity to benefit.** **The project will ensure that contracts are unbundled so that multiple small businesses can supply goods and services rather than a single large subcontractor monopolising supply.**	**Moderate (M)**
Worker's Grievance Mechanism	**Project Employees**	**Marginal**	**Likely**	**Moderate (M)**	**The contractor will establish a grievance mechanism for workers to raise legitimate workplace concerns. The contractor will inform the workers about the grievance mechanism at the time of recruitment and make it easily accessible to them. The mechanism should involve an appropriate level of management and address the concerns promptly. It should use an understandable and transparent process that provides feedback to those affected without retaliation. The mechanism should not impede access to other judicial or administrative remedies available under the law or through existing arbitration procedures, nor should it replace grievance mechanisms provided for in collective agreements.** **The grievance mechanism is intended to monitor employee morale, understand how employees are affected and what concerns they have COVID -19 and address urgent matters promptly.** **The grievance mechanism provides for confidential reporting and a support system for all workers who report issues related to GBVH. The grievance mechanism also allows for verbal reporting for those who cannot write.**	**Minor (L)**

Potential Impacts	Receptor	Severity	Probability	Potential Impact Significance(Pre Mitigation)	Mitigation and Management Measures	Residual Impacts (Post Mitigation)
Human Rights	**Project Employees**	**Critical**	**Likely**	**Moderate (M)**	**In addition to adhering to the national human rights requirements, the Contractor will put in place a human right's policy in line with the UN Guiding Principles on Business and Human Rights. The statement policy will:** **Be approved at the most senior level of the company;** **Informed by relevant internal and external expertise;** **Stipulate the EPC's human rights expectations of personnel, local communities, sub-contractors and other suppliers directly linked to the construction of the project;** **Be publicly available and communicated internally and to the relevant stakeholders;** **Be reflected in the other policies and procedures to embed it throughout their construction phase activities.**	**Moderate (M)**
Gender Based Violation and Harassment	**Project Employees, Local community**	**Severe**	**Very Likely**	**High (H)**	**Workers shall be provided, as part of their employment contract, with information on the Workers' Code of Conduct in the local language, which includes provisions for reporting, investigation, termination, and disciplinary action against those who engage in gender-based violence and harassment.** **The contractor shall conduct mandatory periodic training and sensitization of the workforce on gender-based violence and harassment against members of the local community and their colleagues, especially women, and shall indicate the availability of a grievance mechanism for reporting GBVH cases.** **Educate staff on the laws and regulations that make sexual harassment and gender-based violence a criminal offence subject to prosecution.** **Ensure balanced representation of women in the HSE team who are easily approachable by the female employees.** **Provide appropriate training to project staff responsible for receiving complaints of gender-based violence on how to deal with such complaints. It is recommended that staff be trained where available.** **Female workers will be included in the grievance committee to assist female workers and host community members to voice their complaints.** **The contractor will provide safe and separate living quarters and sanitary facilities for male and female workers (lockable sanitary facilities are mandatory for women).** **The contractor will endeavour to find a suitable local workforce to minimise the need to bring in large numbers of workers from other regions or countries. This could also help the contractor to reduce the cost of providing accommodation if the majority of workers are employed locally.** **Provide opportunities for workers to return regularly to their families who may be located far from the project site.** **The Contractor will provide opportunities for workers to access entertainment opportunities outside of the host communities.** **The contractor will allow for the filing and investigation of anonymous complaints of sexual harassment by workers and members of host communities and will protect the confidentiality of complainants.** **The Contractor will work in close coordination with local authorities in investigating complaints of gender-based violence and harassment in host communities where project staff are involved.** **The contractor will provide targeted training (including on life skills such as leadership and decision making) and awareness raising for vulnerable workers such as women.**	**Moderate (M)**

18.3.2 Operational Phase

18.3.2.1 Occupational Health and Safety

The risks associated with the operational phase of the project are anticipated to be significantly less than during the construction phase due to reduced site activity and requirements for heavy plant and machinery.

There will be occupational health and safety risks attributable to the operational phase associated with maintenance and inspection requirements. Maintenance and inspection will also require the use of site vehicles and activities that pose risks to human health and safety.

A structured Grievance Redress Mechanism (GRM) shall be implemented at the plant level in multiple languages anonymously (online and hardcopy) so that workers have access to express their concerns. The human resources department shall be responsible for implementing the GRM for the facility.

The severity and likelihood of risks during the operational phase will be dependent on the frequency and requirements for planned and unplanned maintenance. The operation and maintenance team will need to ensure that a robust plan is in place to appropriately manage these risks.

18.3.2.2 Health Risks Associated to Covid-19

Even though the number of workers expected during the operational phase of the Project will be much lower, the risk of COVID-19 infection cannot be ruled out. Based on the prevailing conditions, the contractor will be required to conduct a COVID-19 Operational Risk Assessment which will be regularly reviewed based on new information and guidelines/requirements provided by the national government and WHO.

18.3.2.3 Workers Conditions

No long-term accommodation requirements are anticipated for the project. However, as with construction, operational activities will need to plan for and enforce just and just and fair treatment of operation and maintenance staff (including any engaged sub-contractors) in accordance with lender requirements and relevant Uzbekistan national requirements. Allowance will also need to be made for site staff welfare facilities including sanitation, rest, recreational and medical facilities.

Even though there will be reduced workforce during the operational phase of the project, the risk of gender-based violence and harassment will remain. There will still be a limited level of interaction between the operational phase team and the host communities. As a result, measures will be put in place to ensure that exploitative sexual relationships and unwanted aggressive advances and harassment are prevented and addressed.

Table 185: Impacts Significance of the Labour and Working Conditions during – Operation Phase

Potential Impacts	Receptor	Severity	Likelihood	Potential Impact Significance (Pre Mitigation)	Mitigation and Management Measures	Residual Impacts (Post Mitigation)
Occupational Health and Safety	**Project Employees**	**Severe**	**Likely**	**High(H)**	**Workers will be provided with a safe and healthy work environment, taking into account inherent risks and specific classes of hazards associated with the project.** **The contractor will set, implement and maintain an Occupation Health and Safety (OHS) system. The risks associated with project specific locations, and processes should be assessed by competenet OHS professionals in the project. Legal requirements and duty of care should be considered.** **The Contractor will be responsible for ensuring that all sub-contractors, sub-sub-contractors and suppliers comply with the OHS management system of the project. The OHS management system will be in-line with recognised international best practice and as a minimum, this plan will include:** **Means of identifying and minimising, so far as reasonably practicable, the causes of potential H&S hazards to workers.** **Provision of preventive and protective measures, including modification, substitution, or elimination of hazardous conditions or substances.** **Provision of appropriate equipment to minimise risks, and requiring and enforcing its use.** **Training of workers, and provision of appropriate incentives for them to use and comply with H&S procedures and protective equipment.** **Documentation and reporting of occupational accidents, diseases and incidents.** **Emergency prevention, preparedness and response arrangements**	**Moderate (M)**
Risk Associate with Covid-19	**Project Employees and Stakeholders**	**Critical**	**Very Likely**	**High (H)**	**The Contractor shall develop a COVID -19 Operational Risk Assessment at the beginning of the operational phase, which will be periodically reviewed in accordance with evolving national and WHO requirements/guidelines.** **Develop a COVID -19 specific workforce communication procedure.** **Provide a 24-hour emergency hotline.** **Isolate/care for ill and potentially infected staff and employees.** **Identify all vulnerable groups (i.e., individuals with pre-existing conditions) working on the project site and take precautions in accordance with national and WHO guidelines.** **Providing testing to employees at no additional cost to them.** **Ensuring social distancing measures i.e. allowing some of the office staff to work from home, shift work etc.** **Promoting personal hygiene among workers and providing training, posters reminding workers to wash their hands regularly, clean their work areas and equipment, proper sanitation facilities, etc.** **Provide COVID -19 PPE to all workers.**	**Moderate (M)**

Potential Impacts	Receptor	Severity	Likelihood	Potential Impact Significance (Pre Mitigation)	Mitigation and Management Measures	Residual Impacts (Post Mitigation)
					Worker transportation and access to the site will be coordinated and regulated, e.g. reduced bus occupancy, temperature and PPE controls, etc. **The contractor will provide a flexible working system for those workers who wish and are able to work from home for health reasons, childcare, home schooling etc without fear of harassment.** **Mental health issues are addressed during induction and information is provided on how to seek help from local professionals.** **There is regular review and updating of information/requirements in the ever changing situation, including a daily cheque of COVID -19 updates from WHO, national/regional health authorities etc.**	
Employment, Non Discrimination and Equal Opportunities	**Project Employees**	**Margin**	**Very Likely**	**Moderate (M)**	**The contractor shall submit a plan showing how the terms and conditions of employment comply with national labour, social security and occupational health and safety legislation.** **The employment relationship shall be based on the principle of equal opportunity and fair treatment and shall not discriminate with respect to any aspect of the employment relationship, including hiring, compensation (including wages and benefits), terms and conditions of employment, including maternity/paternity leave provisions, access to training, promotion, termination of employment or retirement, and discipline.** **The Contractor shall not make hiring decisions based on personal characteristics such as gender, race, nationality, ethnic origin, religion or belief, disability, age or sexual orientation that are unrelated to the inherent job requirements.** **The Contractor shall document and notify all employees of their terms and conditions of employment, including their entitlement to wages, hours of work, overtime arrangements and overtime pay, and any benefits (such as sick leave, maternity/paternity leave or holiday).** **The Contractor will base the employment relationship on the principle of equal opportunity and fair treatment and will not discriminate in relation to any aspect of the employment relationship, including recruitment, remuneration (including wages and benefits), working conditions, accommodation, access to training, promotion, termination of employment or retirement and disciplinary action. Special protective or supportive measures to promote local employment opportunities or selection for a particular job on the basis of the requirements associated with the job, in accordance with national law, shall not be deemed to be discrimination.**	**Minor (L)**

Potential Impacts	Receptor	Severity	Likelihood	Potential Impact Significance (Pre Mitigation)	Mitigation and Management Measures	Residual Impacts (Post Mitigation)
Child Labour and Forced Labour	**Minors, Project Employees and Stakeholders**	**Severe**	**Likely**	**High (H)**	**The contractor will not use forced labour, which is any work or service that is not voluntarily performed and is required of a person under threat of force or punishment. This includes any type of involuntary or forced labour, such as servitude, debt bondage, or similar labour contract arrangements.** **The policies and procedures of HR shall be adapted to the size of the workforce required for the project. Policies and procedures must be developed to be consistent with the requirements of national legislation and IFC PS 2 and include a code of conduct on GBVH.** **HR policies must include the ability of workers to join a Trade Union and ensure workers' right to collective bargaining and comply with the requirements and ILO provisions related to the employment of minors.** **In all cases, the Client will not employ children in a manner that is economically exploitative or likely to be hazardous or detrimental to the child's education or harmful to the child's health or physical, mental, spiritual, moral or social development. Young people under the age of 18 will not be employed in hazardous work and all work undertaken by persons under the age of 18 will be subject to an appropriate risk assessment.**	**Moderate (M)**
Wages Benefits and Retrenchment	**Project Employees**	**Marginal**	**Likely**	**Moderate (M)**	**Wages, benefits and working conditions offered should be comparable overall to those offered by equivalent employers in the relevant region of the country/area and sector. Wages for all workers, including unskilled workers, must be sufficient to provide a living wage.** **If the contractor anticipates mass layoffs related to the proposed project, it will develop a plan to mitigate the adverse effects of layoffs that complies with national laws and good industry practise and is based on the principles of non-discrimination and consultation. Without prejudice to stricter national legislation, employee representatives and, where appropriate, the competent authorities will be informed of the changes within a reasonable period of time so that the redundancy plan can be jointly considered with a view to mitigating the adverse effects of the redundancy on the affected employees. The outcome of the consultations will be incorporated into the final job reduction plan.** **Where workers need to be made redundant due to the economic impact of COVID -19 this will be done in a phased manner and options to avoid redundancies will be considered, with redundancies being the last option.** **Employees/representatives will be involved in all downsizing actions, including those related to COVID -19.**	**Minor (L)**

Potential Impacts	Receptor	Severity	Likelihood	Potential Impact Significance (Pre Mitigation)	Mitigation and Management Measures	Residual Impacts (Post Mitigation)
Worker's Grievance Mechanism	**Project Employees**	**Marginal**	**Likely**	**Moderate (M)**	**The Contractor will establish a grievance mechanism for workers to raise reasonable workplace concerns, including GBVH. The client will inform the workers about the grievance mechanism at the time of recruitment and make it easily accessible to them. The mechanism should involve an appropriate level of management and address concerns promptly. It should use an understandable and transparent process that provides feedback to those affected without retaliation. The mechanism should not impede access to other judicial or administrative remedies available under the law or through existing arbitration processes, nor should it replace grievance mechanisms provided for in collective agreements.** **The grievance mechanism should be used to monitor employee morale, understand how employees are affected and what concerns they have COVID -19 and address urgent matters promptly.**	**Minor (L)**
Human Rights	**Project Employees**	**Marginal**	**Likely**	**Moderate (M)**	**In addition to complying with national human rights requirements, the contractor will adopt a human rights policy in accordance with UN Guiding Principles on Business and Human Rights. The policy statement will:** **Be approved at the highest level of the company;** **Be supported by relevant internal and external expertise;** **Set out the contractor's expectations in relation to the human rights of staff, local communities and other suppliers directly associated with the operational phase of the project;** **Be publicly available and communicated internally and to relevant stakeholders;** **Be reflected in the other policies and procedures to embed them in all operations phase activities.**	**Minor (L)**
Gender Based Violation and Harassment	**Project Employees, Local community**	**Critical**	**Very Likely**	**High (H)**	**Workers shall be provided, as part of their employment contract, with information on the Workers' Code of Conduct in the local language, which includes provisions for reporting GBVH (either in person or anonymously), the investigation process, termination, and disciplinary action against persons who commit gender-based violence and harassment.** **The contractor shall conduct mandatory periodic training and sensitization of the workforce on gender-based violence and harassment against members of the local community and their colleagues, especially women.** **Workers are educated on the laws and regulations that make sexual harassment and gender-based violence a criminal offence punishable by law. Mandatory and regular training for workers on required lawful conduct in host communities and the legal consequences for non-compliance, including dismissal.** **Contractor shall provide safe and separate living quarters and sanitary facilities for male and female workers (lockable sanitary facilities are mandatory for women).** **Provide opportunities for workers to return to their families on a regular basis.** **The contractor shall allow for the filing and investigation of anonymous complaints of sexual harassment by workers and host community members and protect the confidentiality of complainants.** **The Contractor will investigate, in close coordination with local authorities, all complaints of gender-based violence and harassment in host communities as they relate to project workers.** **The Contractor will identify local GBVH organisations that can provide support to those experiencing violence or harassment.**	**Moderate (M)**

19. COMMUNITY HEALTH, SAFETY AND SECURITY

The Project may change the community exposure to safety risks and impacts arising from construction activities and operations activities, such as equipment accidents, traffic accidents, collisions, structural failures, releases of hazardous materials, and pedestrians crossing the railway line. To minimize these potential impacts on the community, Contractor should develop and implement a Community Safety Management Program in line with the requirements of the "IFC EHS Guidelines for Thermal Power Plants", to identify, assess and manage the potential risks to Community Health, Safety and Security, during the design, construction and operations phases of the Project. Standards and Regulatory Requirements

19.1 NATIONAL REQUIREMENTS

SANPIN № 0350-17

Chapter 6 "Sanitary-technical classification of production enterprises, thermal power plants, storage facilities and the sizes of the minimum sanitary protection zones (SPZ) for them". Thermal power plants having an equivalent electric capacity of 600MW or more, operating on gas or gas-oil fuel, are classified as Class II and must create a 500m health protection zone (HPZ) around each stack, according to the law.

Resolution of the Cabinet of Ministers No.555 Dated 2.07.2019:

This law states that security guards of all other legal entities' agencies, organizations and industrial facilities are allowed to use weapons under the category of "civilians". Where any entity wants to protect the life and health of the employees, property and natural resources, the special contract can only be provided by the National Guard in the Republic of Uzbekistan.

Other relevant national legislations include:

- SanPiN № 0224-07 dated 29.03.2007 "On sanitary standards for using PC, video displays and office equipment"
- SanPiN 0203-06 dated on 24.05.2006 "Sanitary standards for the microclimate of industrial premises."

19.2 LENDERS REQUIREMENTS

EBRD PR 4

Throughout the project, the project will create adverse H&S impacts. Project activities, equipment and infrastructure are expected to increase the potential for worker and community exposure to health and safety risks and impacts, including those associated with construction, operations and decommissioning, or of transport of raw and finished materials

Performance Requirement 4 recognizes the importance of avoiding or mitigating adverse health and safety impacts and issues associated with project activities on workers, project-affected communities and consumers.

The objectives of EBRD PR4 are:

- To protect and promote the safety & health of workers by ensuring safe and healthy working conditions and implementing a health and safety management system, appropriate to the relevant issues and risks associated with the Project.
- To anticipate, assess and prevent or minimize adverse impacts on the health and safety of project affected communities and consumers during the project lifecycle from both routine and non-routine circumstances.

International Finance Corporation Performance Standard 4 (IFC PS4)

IFC Performance Standard 4 expects project activities, equipment and infrastructures can increase community exposure to risks and impacts related with community health and safety. And aims to safeguard local communities from potential risks associated with the Project including impacts associated with introduction of communicable disease, site access and operation, material use etc.

The key objectives of PS4 are:

- To anticipate and avoid adverse impacts on the health and safety of the Affected Community during the project life from both routine and non-routine circumstances.
- To ensure that the safeguarding of personnel and property is carried out in accordance with relevant human rights principles and in a manner that avoids or minimizes risks to the Affected Communities.

In terms of community security aspects PS4 requires companies to do the followings (IFC,2017);

- Assess the security risk their operations may have or could create for communities;
- Develop ways to manage and mitigate these risks;
- Manage private security responsibly;
- Engage with public security; and
- Consider and investigate allegations of unlawful acts by security personnel.

IFC Guidance on Gender Based Violence and Harassment (GBVH)

According to the guidance, addressing GBVH can build relationships and provide a Project with a social license to operate in communities. This can result from regular dialogue to understand and track project GBVH risks as well as the effective use of measures to prevent and respond to GBVH. In addition, it broadens the pool of potential workers that companies can draw upon, including women workers from nearby communities because of lower perceived risk of GBVH.

World Bank Good Practice Note on Addressing Sexual Exploitation and Abuse and Sexual Harassment (SEA/SH) In Investment Project Financing Involving Major Civil Works

The World Bank GPN is structured around three key steps that cover project preparation and implementation. These steps include:

- Identifying and assessing the risks of SEA/SH, including social and capacity assessments.
    - Undertaking social risk assessment of community-level risks.
    - Assess capacity and availability, safe and ethical services of survivors.
    - Review ability of the client to respond to SEA/SH risks.
    - Rate project for overall risk using several Bank tools including the SEA/SH Risk
    - Assessment Tool.
    - Establish procedures to review and update risk assessment during the project implementation.
- Establishment of mitigation, reporting and monitoring measures.
    - Based on risks identified, identify the corresponding mitigation measures and
    - Implement actions suggested to mitigate project related risks of GBV in the project area.
    - Monitor effectiveness of the mitigation measures and adapt as appropriate.
- Project response actions for GBV cases.
    - Provide essential services for survivors.
    - Report case through the GM as appropriate keeping survivor information confidential and anonymous.
    - Document and close cases brought through the GM.

United Nations Guiding Principles on Business and Human Rights

In addition to adhering to human rights requirements under the Uzbekistan laws and lenders requirements, the project construction and operational phases will be required to adhere to the United Nations Guiding Principles on Business and Human Rights. The Guiding Principles are grounded in recognition of the role of business enterprise as specialized organs of society required to comply with all applicable laws and to respect human rights.

Equator Principles Guidance on Implementation of the Equator Principles During the Covid-19 Pandemic

The guidance recommends that the borrower should:

- Review potential risks on local communities, including direct and indirect impacts of COVID-19 and other impacts relating to worker interfaces and how any Project changes during this period might affect the community.
- Assess its mitigation approach to Project related impacts.
- Identify opportunities to support communities mitigate wider COVID-19 risks/impacts either through new initiatives or building on existing programs i.e. provision of food for vulnerable people in isolation, test kits medical facilities and equipment etc.

Voluntary Principles on Security and Human Rights

Created in 2000, the Voluntary Principles is a multi-stakeholder initiative that promotes the implementation of a set of principles that guide companies on providing security for their operations while respecting human rights.

Through the VPs Initiative, companies are better able to align their corporate policies, procedures, and internal assessments with internationally recognized human rights principles in the provision of security for their operations. In so doing, companies communicate to employees, contractors, shareholders, and consumers their commitment to the Principles: (1) through sharing of best practices and lessons learned with one another, and (2) by collaborating on difficult issues.

19.3 OBSERVATIONS AND BASELINE CONDITIONS

Project related activities might result in the increase of risks associated with those who live near the Project site or may visit areas in and around active Project sites.

There is not any settlement within the sanitary buffer zone (500m around the project area) according to drawings provided by the project owner. The closest residential receptors to the project site are about 1.8 kms away from the project's north west border. Beside settlements, project is expected to has direct impact on Uchkizil lake's water quality during construction, commissioning and operation phases.

10 km radius around the project area is expected to project's social impact area. Due to project activities following villages are expected to be impacted;

- Uchkizil
- Bahor
- Dehqonbirlashuv
- Ilgor
- Karvon
- Kattaqum
- Kayran
- Madaniyat
- Markaz
- Qoshtegirmon
- Tallashqon
- Zang Gilambop
- Zartepa
- Namuna
- Orol
- Khalqobod

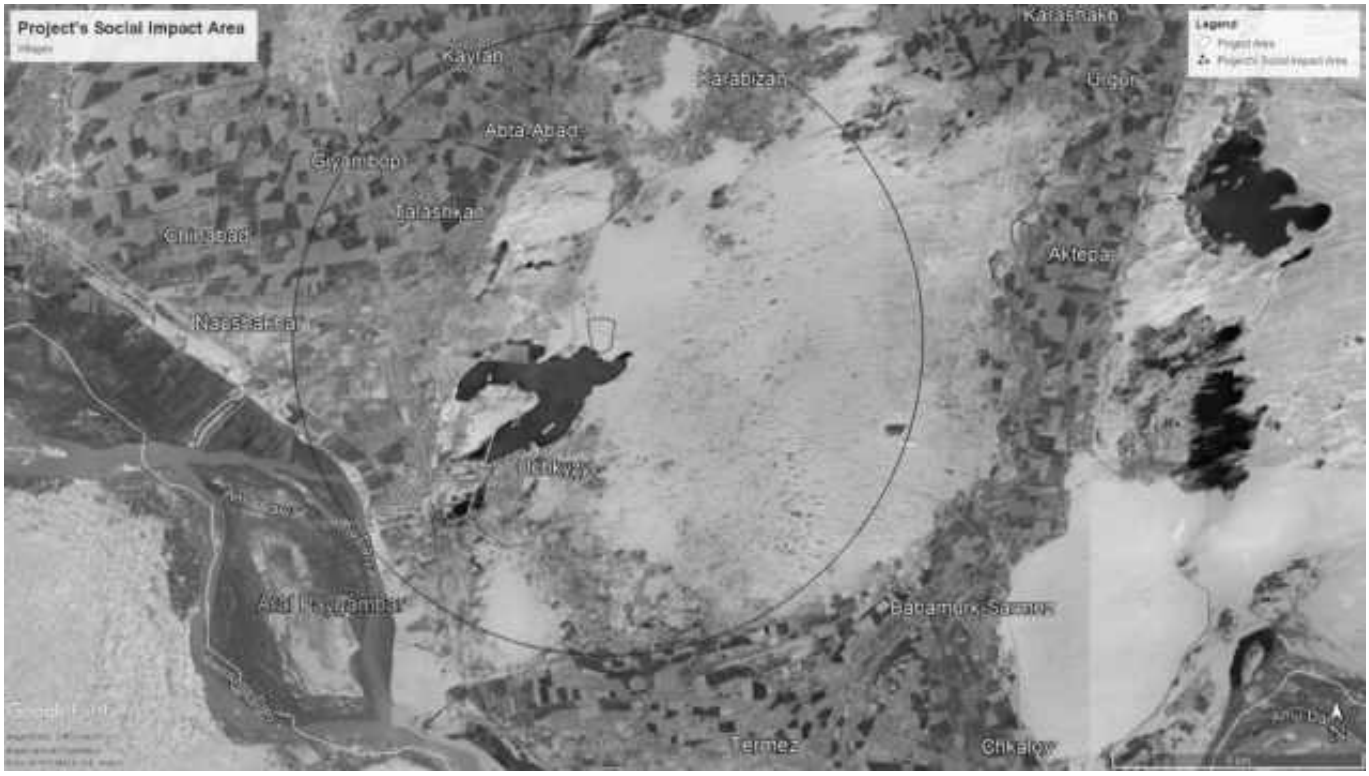

Figure 175: Project's Social Impact Area

19.3.1 Sanitary Protection Zone

To fulfil the requirements, set out in SanPiN No 0350-17 of establishing a 500m health buffer zone, consultation letters shall be sent out to the Director of the Agency for Sanitary and Epidemiology Surveillance of the Ministry of Health of the Republic of Uzbekistan. The health buffer zone for the Project site is as given in Figure 13.

19.4 POTENTIAL IMPACTS, MITIGATION, MANAGEMENT & RESIDUAL IMPACT

19.4.1 Construction Phase

Permanent staff including contractors, sub-contractors, specialists, supply chain personnel will be hired during construction phase of the project. During construction, this need is expected to lead an increase in the population as it is the case on such sites.

During the construction phase, safety fencing, security and equipment associated with the construction phase will be fenced and trespasses will be restricted to the project area. The project area will occupy only 0,3 kms of reservoir's shore. There may be informal tracks or pathways used by

community members to access reservoir or for recreational purposes such as fishing and swimming. These activities will be limited for users.

19.4.1.1 Worker Influx, Community Health and Crime

The presence of the workforce of non-local workers both from Uzbekistan and third-party nationals and expectations regarding job opportunities creating influx of workers has the potential to create an increase in Sexually Transmitted Diseases (STDs) and other sexual related diseases prevalence in the communities, due to worker-community interactions with young women seeking to better their lives through income generation, or relationships with the workforce. The project might be a precursor of incidents of HIV/AIDS due to the influx of people into the project area to seek for jobs and income. The situation can result in increase in the incidence of diseases including STD, and HIV/AIDS.

19.4.1.2 Accommodation

Construction phase of the project is will need large amount of skilled and un-skilled workforce. And related to that accommodation areas for this workforce. During the construction phase, the contractor is expected to bring skilled labor from abroad. Unskilled labor might be sourced locally. The provision of accommodation for self-sufficient worker accommodation will be responsibility of the contractor. All worker accommodation facilities will be designed and operated in accordance with IFC Workers Accommodation Guidance.

In the construction phase, camps will typically include preparation and installation of dormitories, canteens/mess halls, material storage, water tanks, clean water treatment plant, generators, workshops and maintenance areas, laboratories, fuel storage, offices, clinics, recreation areas, parking areas, and a precast and work area. provision of worker's accommodation is often associated with the importation of an external workforce into an area.

Some of project workers are expected to be non-local such as people other regions of Uzbekistan except Surkhan darya, International experts, third party nationals etc. Temporary migration of such work force might lead conflicts between local community and project workers due to cultural, religious and behavioral issues.

19.4.1.3 Illnesses and Diseases

Due to expected increase in local population and close-knit mixing of workers on sites and in accommodation facilities, there is a great risk of increase in number of communicable diseases and illnesses within the project. This may also impact upon communities where interactions take place. Such diseases include Sexually Transmitted Illnesses (STIs), skin infections, waterborne diseases. Vector borne diseases are not expected to see in the project. Since 2011, zero autochthonous malaria cases were reported in the Uzbekistan. In 2016, the country requested WHO's technical assistance to prepare for the certification of malaria elimination (WHO,2014). There will also be a potential risk of transmitting COVID-19 between the workers and the communities near the project site and off-site accommodation areas.

There is also potential for construction excavation activities on the site to create breeding grounds for bacteria and parasites which will not only affect the workers but the local communities too. Any potential contamination from the site such spillage of raw sewage or hazardous materials could potentially result into water related and water borne diseases through contamination of surface and groundwater.

19.4.1.4 Sexually Transmitted Diseases

The increase in population due to the influx of a large number of employees into the project area could lead to an increase in the transmission rate of sexually transmitted diseases. It is expected that employees will come from different regions of Uzbekistan and some international employees will be separated from their families, posing a health risk to both employees and the community. Therefore, during the construction, testing, commissioning and operation phases of the project, the contractor will launch several campaigns for the community and project staff to avoid negative impacts of STD influx. Free condoms will also be provided to the project workers

19.4.1.5 Community Health and Safety

The Project may change the community exposure to safety risks and impacts arising from construction activities and operations activities, such as equipment accidents, traffic accidents, collisions, structural failures, releases of hazardous materials, and pedestrians. To minimize these potential impacts on the community, Contractor should develop and implement a Community Safety Management Programme in line with the requirements of the "IFC EHS Guidelines for Thermal Power Plants", to identify, assess and manage the potential risks to Community Health, Safety and security, during the design, construction and operations phases of the Project.

Risks associated with hazardous materials or chemical storages will be managed during construction phase according to good international industrial practices on HAZMAT management, Environmental and Social Emergency Response Procedure and as defined in ESMP. Environmental and Social Emergency Response procedure shall have Environmental and Social Emergency scenarios including but not limited to flood, fire, accidental spills, accidents and public protests and traffic accidents involving community members.

19.4.1.6 Community Security

The project area will require site-based security at the gates and on patrol around the site and access road during construction in order to prevent the public from trespassing to the construction areas. This is so as to minimize the potential for construction site incidents or damage of construction machinery.

There is also a risk that the security personnel who are mandated with providing protection to the workers can abuse their position of power and status and become perpetrators of GBVH either to the members of the workforce or the community.

Following suitable security risk assessment by the EPC Contractor, the security arrangements will require to be guided by UN Code of Conducts for law enforcement officials, the IFC's Good Practice Handbook on the Use of Security Forces: Assessing and Managing Risks and Impacts, IFC's and the UN Basic Principles on the use of Force and Firearms by law enforcement officials in case security at the site will be armed and Voluntary Principles on Security and Human Rights.

In addition to this, security personnel will receive internal training in regard to receiving grievances, reporting such grievances and conduct for dialogue with any members of the local community. The workers on the project site will additionally receive cultural awareness training with regard to local customs as such guidance can provide a ready resource on the do's and don'ts of culture centred behaviour.

19.4.1.7 Sexual Harassment and Sexual Exploitation and Abuse

The infrastructure sector presents a high-risk environment for incidents of sexual exploitation and abuse and sexual harassment.

Gender Based Violation (GBV) is an umbrella term for any harmful act that is perpetrated against a person's will and that is based on socially ascribed (that is, gender) differences between male and female individuals. GBV includes acts that inflict physical, mental, or sexual harm or suffering; threats of such acts; and coercion and other deprivations of liberty, whether occurring in public or in private life (IASC, 2015). Manifestations of GBV includes, but is not limited to, physical violence, such as slapping, kicking, hitting, and the use weapons; emotional abuse, such as systematic humiliation, controlling behaviour, degrading treatment, insults, and threats; sexual violence, which includes any form of non-consensual sexual contact; forced marriage, which is the marriage of an individual against her or his will; and denial of resources, services, and opportunities, also known as economic abuse, such as restricting access to financial, health, educational, or other resources with the purpose of controlling or subjugating a person (Arango et al. 2013). Trafficking, abduction and coerced transactional sex may also constitute forms of GBV.

Sexual exploitation and abuse (SEA) is a facet of GBV that is defined as any actual or attempted abuse of a position of vulnerability, differential power, or trust for sexual purposes, including but not limited to, profiting monetarily, socially or politically from the sexual exploitation of another. Sexual abuse is further defined as "The actual or threatened physical intrusion of a sexual nature, whether by force or under unequal or coercive conditions" (IASC, 2016). In the context of Bank-supported projects, SEA occurs against a beneficiary or member of the community.

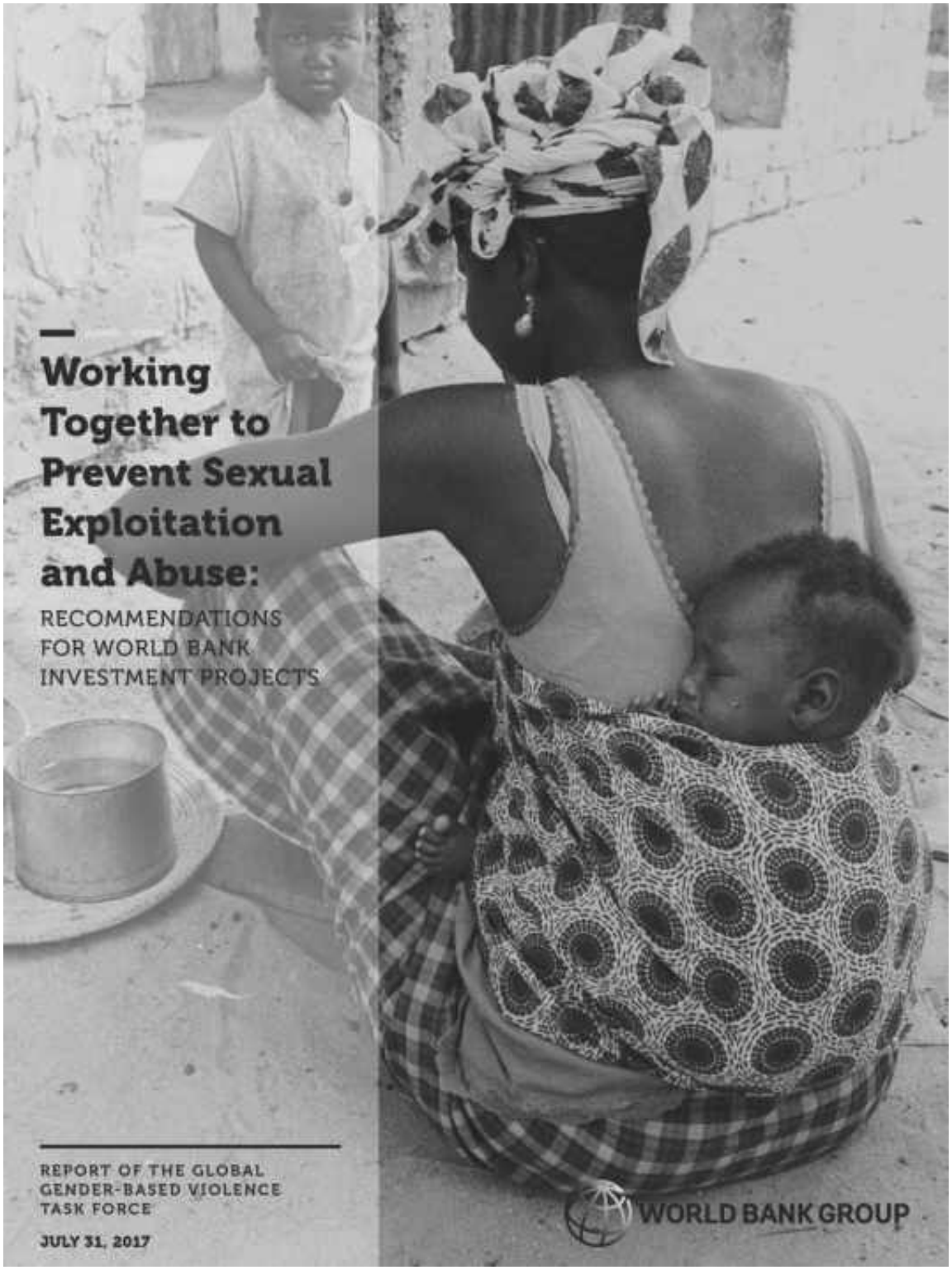

Figure 176: Recommendations for Prevention of Sexual Abuse WB

The proposed project will lead to an influx of workers during the construction phase majority of whom will be young men who will be away from their families. This may increase the demand for sex workers and put women from other regions in Uzbekistan at the risk of being trafficked to the Project area for the purposes of sex work. Influx of workers could pose a risk to young adolescent girls who may be at risk of being forced into early marriages to project workers who are perceived to have better wages. It could also increase the risk of violence and sexual abuse against the children in the community who have no ability to give consent, are not empowered to refuse any sexual advances made towards them or anticipate the implications of any actions against them.

In addition, the presence of young men in the project area could also lead to shift in the community's power dynamics and within households. This may be manifested through male jealousy if the workers are believed to be interacting with the women in the community triggering violence towards the women.

Table 186: Impacts Significance of the Community Health, Safety and Security during– Construction Phase

Potential Impacts	Receptor	Severity	Probability	Potential Impact Significance(Pre Mitigation)	Mitigation and Management Measures	Residual Impacts (Post Mitigation)
Labor Influx	**Project Affected Community**	**Marginal**	**Very Likely**	**Moderate (M)**	**Worker accommodation areas will be managed in accordance with the EBRD and IFC Workers' Accommodation: Processes and Standards.** **The provision of good quality living accommodation, services and amenities will likely reduce the need for mixing with local communities.** **Project induction training will include a section on code of conduct when engaging with local community members. This will include an overview of culturally and religious appropriate measures and etiquette to bear in mind.** **Sexual harassment or violence in and out of the Project site will not be tolerated and the EPC Contractor will work with local community leaders, gender-based organizations and government officials to ensure that any complaints are addressed in accordance with the law.** **The Contractor will develop a Worker Influx Management Plan to provide a clear set of actions that will be undertaken for the management and mitigation, monitoring and evaluation of impacts related to worker influx in the Project area.** **Additional management and mitigation measures will be in accordance with the World Bank guidance note on Managing the Risks of Adverse Impacts on Communities from Temporary Project Induced Labor Influx (WB, 2016).**	**Moderate (M)**
Community Health	**Project Affected Community**	**Critical**	**Likely**	**Moderate (M)**	**The Project should develop an STD Management Plan designed to minimize the spread of HIV infection and other STDs. The plan should be prepared with the assistance of a specialist in sexually transmitted diseases. A typical plan would include, among other things, the following measures:** **An HIV/AIDS training course and on-going education on transmission of HIV/AIDS and STDs, to employees, through workshops, posters and informal information sessions;** **Encouragement of employees to determine their HIV status;** **Supply of condoms/ femidoms at the construction site(s)/ Construction Camp; and** **Development of a comprehensive Construction Camp Management Plan, including rules for on-site behavior, entrance and exit policies and prohibition of sex workers on site.** **As part of STD Management Plan, information should be provided to workers on STD prevalence rates in Uzbekistan and/ or the relevant Counties as well as the expectations of local communities if a woman is made pregnant by a worker (e.g., marriage, financial implications etc.).** **Workers should have access to confidential health care for the treatment of STDs through medical facilities/ health care at Project sites.** **Workers will be thought on how to access testing in public hospitals.**	**Moderate (M)**

Potential Impacts	Receptor	Severity	Probability	Potential Impact Significance(Pre Mitigation)	Mitigation and Management Measures	Residual Impacts (Post Mitigation)
					Information regarding the transmission of HIV/AIDS will be prepared and disclosed in a culturally sensitive manner and targeted towards young adults of consenting age. **A Grievance Mechanism should be developed, whereby affected people can raise issues and concerns associated with social vices, prostitution and the behavior of workers and drivers.** **As part of the SEP, the Project should consult with local leaders such as Area leaders and village elders, amongst others. The consultations should be aimed at finding ways of ensuring social vices such as prostitution are minimized either through punitive or rehabilitative measures.** **During construction, staff will have access to medical professionals and suitable medical facilities, which will aim to prevent the spread of diseases internally and externally. Site personnel will only be cleared for work after with a medical fitness certificate from an authorized medical center.** **Any reportable disease will be diagnosed by the authorized occupation health center doctor. Diagnosis includes identifying any new symptoms, or any significant worsening of existing symptoms.** **Any external and internal spreading diseases will be diagnosed and taken the precautions as per the instructions from the national/ local medical authority.** **The potential for exposure to water-borne, water-based, vector-borne diseases and communicable diseases as a result from project activities will be avoided or minimized.** **Potholes within the site, access road and wells excavated in the area will be filled immediately to prevent the breeding of bacteria and parasites that may pose a risk to the health of the communities near the site.** **The Contractor in coordination with the local authorities will conduct awareness campaigns regarding the transmission of STIs in the communities near the Project site.** **The Project shall prepare a site Community Response Action Plan which shall define the site action to support community stakeholders in planning, responding and recovering from the COVID-19 outbreak especially when outbreaks are directly linked to the Project workers.** **Due to the health risk posed by COVID-19, workers will be screened in accordance with the Uzbekistan guidelines and WHO. They will also be provided with PPE and training on how to safely use them during induction and as part of the toolbox talks.** **If any cases of COVID-19 are reported on site, the Contractor will notify the relevant health officials and isolation of concern individuals performed immediately.** **The workers will ensure minimal interaction with community members as long as COVID-19 continues to be a health risk. In addition, community members working on the site will be trained on how to ensure proper hygiene when working on the site and when they go home.**	

Potential Impacts	Receptor	Severity	Probability	Potential Impact Significance(Pre Mitigation)	Mitigation and Management Measures	Residual Impacts (Post Mitigation)
Community Safety	**Project Affected Community**	**Critical**	**Very Likely**	**High (H)**	**The employees during the construction phase shall undergo a Code of Conduct training to ensure smooth coordination with the neighboring community.** **Risks to public safety will be appropriately addressed and prepared for in the construction phase 'Emergency Preparedness and Response Plan' and training.** **The plan will include the appropriate procedure to respond to any such incidents, as well as site specific contact details and details of external agencies who may be required.** **Project induction training will include a section on code of conduct when engaging with local community members. This will include an overview of culturally appropriate measures and etiquette to bear in mind.** **All high-risk areas including fuel storage areas will be secured with internal fencing and will be patrolled by security throughout the day.** **Smoking will be prohibited at chemical and fuel storage areas.** **Appropriate mechanisms for emergency control (e.g. well-equipped firefighting equipment) will be placed at suitable positions around the site.**	**Moderate (M)**
Community Security	**Project Affected Community**	**Marginal**	**Very Likely**	**Moderate (M)**	**The project will employ its own security staff who will provide 24/7 security control across the Project site and dedicated security staff at gatehouses.** **The security personnel will be regularly trained on GBVH code of conduct including how to handle grievances related to GBVH from the community.** **All vehicles entering the site will require pre-approved clearance and will need to be registered. Project security will record all instances of incoming vehicles.** **CCTV will be installed at key locations around the site and at gatehouses.** **Appropriate lighting will be provided at gatehouses for security personnel to prevent unauthorized access.** **Project personnel will only be provided access to the construction site with valid ID cards and permits to work in line with HSE requirements.** **Security risk based on** **Project security personnel must be trained based on Voluntary Principles on Security and Human Rights (VPSHR, 2021). The training program must cover following topics;** **Global human rights framework and security practices** **Human rights and ethics** **Roles and responsibility of security personnel** **Use of force** **Crowd control** **Background check must be done for any security personnel to be hired during hiring process. In case any criminal record finds of applicant, hiring process should be canceled.**	**Minor (L)**

Potential Impacts	Receptor	Severity	Probability	Potential Impact Significance(Pre Mitigation)	Mitigation and Management Measures	Residual Impacts (Post Mitigation)
"	Severe	Critical	Very Likely	High (H)	**The contractor will conduct a SEA/SH risk assessment in consultation with relevant stakeholders including women leaders and those working with young adolescent girls and boys. This will also include the identification of potential interventions and risk mitigation measures.** **Awareness training will be mandatory for all Project workers regarding the SE/SH risks and the workers responsibilities and the legal consequences of being a sexual or violence perpetrator.** **Training will be provided to the community members on the risks of SEA/SH and information provided on how to report any cases of SEA/SH and the services that will be made available to offer support to any of the survivors.** **Approach towards SEA/SH prevention, mitigation and response will be survivor centered and ensure confidentiality, dignity and respect to them.** **The Project staff will be trained on how to preserve the safety of the women, girls, boys when interviewing them and collecting information about their experiences on SEA/SH.** **The Project will provide essential services for survivors such as access to counselling services, support groups, legal support etc. at no cost to them.** **All identified cases of SEA/SH will be referred to relevant legal entities in the Project area for further investigation and prosecution.** **The project grievance mechanism will be made available to project workers and community members and will ensure that survivors' information is confidential and kept anonymous.** **All cases relating to SEA/SH shall be documented and closed.** **The Project will prepare and implement a SEA & SH Prevention and Response Action Plan which will put necessary protocols and mechanisms to address the risks of SEA/SH and how to address any allegations that may arise in accordance with the World Bank Good Practice Note on Addressing SEA/SH in Investment Project Financing involving Major Civil Works.**	Moderate (M)
Grievance Mechanism	Project Affected Community	Marginal	Very Likely	Moderate (M)	**The project will implement an appropriate system to allow external parties to raise grievances in regard to the Project.** **The Grievance Mechanism will be clearly defined, transparent and accessible to identified stakeholders.** **Contractor will appoint a community liaison officer preferably from the local community who will maintain communication with the local leaders and community members.** **The grievance mechanism will be confidential and provide referral and support system for any workers reporting cases of GBVH**	Minor (L)

19.4.2 Operation Phase

19.4.2.1 Community Safety

During the operation phase, the project will have various risks that might has negative impact capability on the receiving communities. These impacts might be transferred to the outside of the project due to nature of the risks. Such impacts might be fires, NOx in exhaust gases, explosions, security breaches or spillage of pollutants.

In some of above-mentioned impacts, third party company involvement for the solution might be needed such as fire department, police department, consultants etc.

Public risks during operation have the potential to result in incidents, which could have a significant impact upon neighboring communities and populations. Risks to public safety will be appropriately addressed and prepared for in the operational phase 'Emergency Preparedness and Response Plan' and via appropriate training of staff.

19.4.2.2 Community Security

Due to the generation of power, the project is considered a vital facility. Site-based security will be present at the project's main entrance and on patrol throughout the site.

As is consistent with the construction phase, the Contractor will undertake a security risk assessment to determine the appropriate level of security required at the facility. Security arrangements should be guided by UN Code of conducts for law enforcement officials, Voluntary Principles on Security and Human Rights and UN basic principles on the use of Force and Firearms by law enforcement officials if security personnel will be armed.

Beside the requirements set in above guidelines and principles, security personnel will have in house training in regards of grievance and reporting such grievances and dialogue with any members of the local community

19.4.2.3 Sexual Exploitation and Abuse (SEA) and Sexual Harassment (SH)

Even though the Project's employment will be reduced throughout the operational phase, the risk of sexual exploitation and abuse, including sexual harassment, will persist, particularly for women, children, and boys. The operational phase team and the host community will still have a limited amount of interaction.

As a result, measures will be taken to avoid and address exploitative sexual relationships, as well as undesired aggressive advances and harassment.

Table 187: Impacts Significance of the Community Health, Safety and Security during – Operation Phase

Potential Impacts	Receptor	Severity	Probability	Potential Impact Significance(Pre Mitigation)	Mitigation and Management Measures	Residual Impacts (Post Mitigation)
Community Security	**Project Affected Community**	**Marginal**	**Likely**	**Moderate (M)**	**The project will employ its own security staff who will provide 24/7 security control across the Project site and dedicated security staff at gatehouses.** **The security personnel will be regularly trained on GBVH code of conduct including how to handle grievances related to GBVH from the community.** **All vehicles entering the site will require pre-approved clearance and will need to be registered. Project security will record all instances of incoming vehicles.** **CCTV will be installed at key locations around the site and at gatehouses.** **Appropriate lighting will be provided at gatehouses for security personnel to prevent unauthorized access.** **Project personnel will only be provided access to the construction site with valid ID cards and permits to work in line with HSE requirements.**	**Minor (L)**
Community Health and Safety	**Project Affected Community**	**Critical**	**Likely**	**Moderate (M)**	**Risks to public safety will be appropriately addressed and prepared for in the operational phase 'Emergency Preparedness and Response Plan' and training.** **The plan will include the appropriate procedure to respond to any such incidents, as well as site specific contact details and details of external agencies who may be required.** **The employees during the operational phase shall undergo a Code of Conduct training to ensure smooth coordination with the neighboring community.** **Appropriate mechanisms for emergency control (e.g. firefighting equipment) will be placed at suitable positions around the site.** **Grievance Redressal Mechanism shall be made accessible to the community to ensure that community members raise grievances to the Project leadership.** **Sexual harassment or violence in and out of the Project site will not be tolerated and the O&M Company will work with local community leaders and government officials to ensure that any complaints are addressed in accordance with the law.** **The Health and Safety teams on site will provide advice during training/inductions on exposure to disease including preventative measures e.g. TB, STDs and HIV/AIDS.**	**Moderate (M)**

Potential Impacts	Receptor	Severity	Probability	Potential Impact Significance(Pre Mitigation)	Mitigation and Management Measures	Residual Impacts (Post Mitigation)
Human Rights	**Project Affected Community**	**Critical**	**Likely**	**Moderate (M)**	**In addition to adhering to the national human rights requirements, the contractor will put in place a human right's policy in line with the UN Guiding Principles on Business and Human Rights. The statement policy will:** **Be approved at the most senior level of the company;** **Informed by relevant internal and external expertise;** **Stipulate the Contractor's Human rights expectations of personnel, local communities and other suppliers directly linked to the operational phase of the project;** **Be publicly available and communicated internally and to the relevant stakeholders;** **Be reflected in the other policies and procedures to embed it throughout the operational phase activities.**	**Minor (L)**
Sexual Exploitation and Abuse (SEA) and Sexual Harassment (SH)	**Project Affected Community**	**Critical**	**Likely**	**Moderate (M)**	**The Project Company and the contractor will conduct a SEA/SH risk assessment in consultation with relevant stakeholders including women leaders and those working with young adolescent girls and boys. This will also include the identification of potential interventions and risk mitigation measures.** **Awareness training will be mandatory for all Project workers regarding the SEA/SH risks and the workers responsibilities and the legal consequences of being a sexual or violence perpetrator.** **Training will be provided to the community members on the risks of SEA/SH on culturally sensitive manner and information provided on how to report any cases of SEA/SH and the services that will be made available to offer support to any of the survivors.** **Approach towards SEA/SH prevention, mitigation and response will be survivor centered and ensure confidentiality, dignity and respect to them.** **The Project staff will be trained on how to preserve the safety of the women, girls, boys when interviewing them and collecting information about their experiences on SEA/SH.** **The Project will provide essential services for survivors such as access to counselling services, support groups, legal support etc. at no cost to them.** **All identified cases of SEA/SH will be referred to relevant legal entities in the Project area for further investigation and prosecution**	**Minor (L)**

20. HUMAN RIGHTS IMPACT ASSESSMENT

20.1 OVERVIEW

With new additions to Equator Principles 4, assessment of adverse Human Rights impacts become mandatory as part of ESIA. Human rights standards of the project shall be in line with the United Nations Guiding Principles on Business and Human Rights (UNGPs)

Human Rights are described in international standards aimed at securing dignity and equality for all. Every human being is entitled to enjoy them without discrimination. As a minimum, relevant human rights are those expressed in the International Bill of Human Rights – meaning the Universal Declaration of Human Rights, the International Covenant on Civil and Political Rights and the International Covenant on Economic, Social and Cultural Rights and the principles concerning fundamental rights set out in the International Labor Organization's Declaration on Fundamental Principles and Rights at Work.

The project should respect human rights within its area of influence and shall be ensure that third party companies are respecting human rights too, including sub-contractors, sub-sub-contractors and suppliers. This means that they should avoid infringing on the human rights of others and should address adverse human rights impacts with which they are involved.

20.2 STANDARDS AND REGULATIONS

20.2.1 National Context and Regulations

Uzbekistan, as a UN member, supports and implements all of the UN's major international instruments relating to the protection of human rights and freedoms, including the UN Universal Declaration of Human Rights, Human Rights Council Resolution No. 30/15 on human rights and preventing and countering violent extremism, and the Convention on the Elimination of All Forms of Discrimination.

The State Policy on Human Rights in Uzbekistan aims to prevent infringement of human rights and freedoms, as well as to develop the necessary organizational, legal, social, economic, spiritual, and moral grounds for human rights protection

20.2.1.1 Constitution of the Republic of Uzbekistan (1992)

The constitution asserts that "democracy in the Republic of Uzbekistan shall be based upon common human principles, according to which the highest values shall be the human being, his life, freedom, honor, dignity and other inalienable rights."

Also, the constitution has a dedicated chapter for "Guarantees of human rights". The chapter X Guarantees of human rights and freedoms has following articles;

- Article 43. The state shall safeguard the rights and freedoms of citizens proclaimed by the Constitution and laws.

- Article 44. Everyone shall be entitled to legally defend his rights and freedoms, and shall have the right to appeal any unlawful action of state bodies, officials and public associations.
- Article 45. The rights of minors, the disabled and the single elderly shall be protected by the state.
- Article 46. Women and men shall have equal rights.
- The Oily Majlis (parliament) has an elected and authorized person to deal with human rights issues. The authorized person is a part of republic of Uzbekistan's Legislative Chamber.

20.2.1.2 The Protection of Women Against Harassment and Violence Act (2019).

- The Act defines the various forms of violence - sexual, physical, economic, psychological against women. Protection from harassment and violence is defined as a system of urgent measures of economic, social, legal, organizational, psychological and other nature in order to eliminate the danger to women's life and health, to ensure their safety and to prevent repeated illegal actions against them.
- Other relevant legislations include:
- The National Human Rights Strategy was approved by Presidential Decree on 22
- June 2020. No. PD-6012;
- Law on guaranteeing equal rights and opportunities for women and men (2019);
- The Law on Mediation (2018);
- Law on Public Control (2018); and
- Law on Administrative Procedures (2018)

20.2.2 Lender Requirements

20.2.2.1 Equator Principle IV

The equator principles states;We, the EPFIs, have adopted the Equator Principles in order to ensure that the Projects we finance and advise on are developed in a manner that is socially responsible and reflects sound environmental management practices. EPFIs acknowledge that the application of the Equator Principles can contribute to delivering on the objectives and outcomes of the United Nations Sustainable Development Goals (SDGs). Specifically, we believe that negative impacts on Project-affected ecosystems, communities, and the climate should be avoided where possible. If these impacts are unavoidable they should be minimized and mitigated, and where residual impacts remain, clients should provide remedy for human rights impacts or offset environmental impacts as appropriate. In this regard, when financing Projects:

- We will fulfill our responsibility to respect Human Rights in line with the United Nations Guiding Principles on Business and Human Rights (UNGPs) by carrying out human rights due diligence;
- We support the objectives of the 2015 Paris Agreement and recognize that EPFIs have a role to play in improving the availability of climate-related information, such as the Recommendations of the Task Force on Climate-related Financial Disclosures (TCFD) when assessing the potential transition and physical risks of Projects financed under the Equator Principles; and

- We support conservation including the aim of enhancing the evidence base for research and decisions relating to biodiversity.

In addition to above preamble related with Human rights, other principles related with human rights, corporate social responsibility and responsibilities of corporates responsibilities on community according to EP are as following;

- Principle 11: Business enterprises should avoid infringing on the human rights of others and should address adverse human rights impacts with which they are involved.
- Principle 12: The responsibility of business enterprises to respect human rights refers to internationally recognized human rights – understood, at a minimum, as those expressed in the International Bill of Human Rights and the principles concerning fundamental rights set out in the International Labor Organization's Declaration on Fundamental Principles and Rights at Work
- Principle-13: The responsibility to respect human rights requires that business enterprises avoid causing or contributing to adverse human rights impacts through their activities, and address such impacts when they occur;
- Principle-14: The responsibility of business enterprises to respect human rights applies to all enterprises regardless of their size, sector, operational context, ownership and structure. Nevertheless, the scale and complexity of the means through which enterprises meet that responsibility may vary according to these factors and with the severity of the enterprise's adverse human rights impacts
- Principle-15: Business enterprises should have policies and processes appropriate to their size and circumstances in place, including:

The following Operational principles should also be taken into consideration.

- Principle-16: Policy commitment
- Principle-17 to 21: Human rights due diligence
- Principle 22: Remediation

20.2.2.2 United Nations Guiding Principles on Business and Human Rights (UNGP)

The UNGP is the key framework for the project's assessment of human rights and to set management system.

The responsibility to respect human rights is a global standard of expected conduct for all business enterprises wherever they operate. It exists independently of States' abilities and/or willingness to fulfil their own human rights obligations, and does not diminish those obligations. And it exists over and above compliance with national laws and regulations protecting human rights.

Addressing adverse human rights impacts requires taking adequate measures for their prevention, mitigation and, where appropriate, remediation.

Business enterprises may undertake other commitments or activities to support and promote human rights, which may contribute to the enjoyment of rights. But this does not offset a failure to respect human rights throughout their operations.

Business enterprises should not undermine States' abilities to meet their own human rights obligations, including by actions that might weaken the integrity of judicial processes.

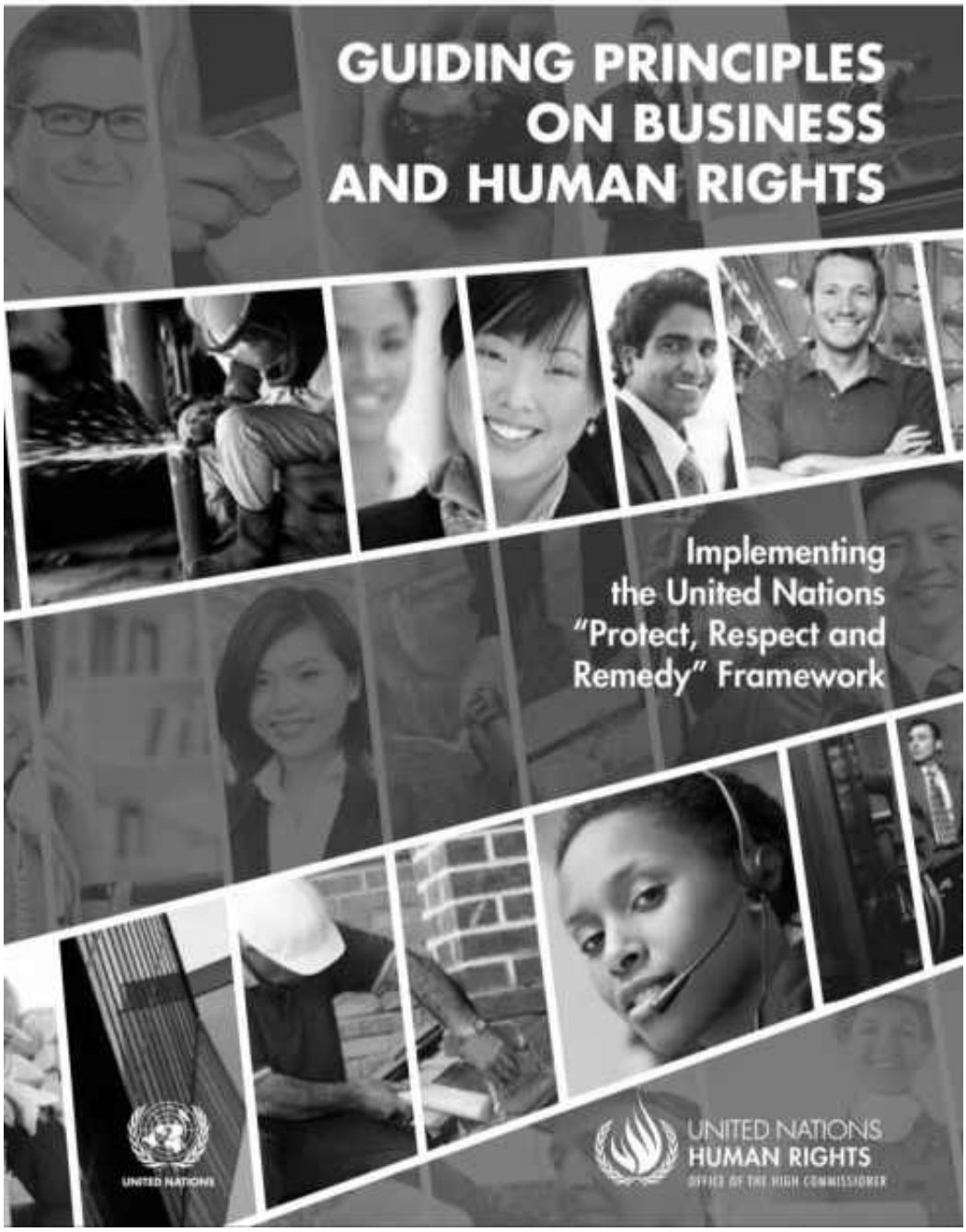

Figure 177: UN Guiding Principles on Business and Human Rights

20.2.2.3 European Bank of Reconstruction and Development

The EBRD E&S policy committed to respect Human Rights in the projects they financed. EBRD based their Human Rights framework on the International Nill of Human Rights and the the eight convention of the International Labour Organization.

EBRD PR1 states;

"it may be appropriate for the client to complement its environmental and social assessment with further studies focusing on specific risks and impacts such as human rights."

EBRD PR5 on Land Acquisition on Land Use and Involuntary Resettlement states;

Application of this Performance Requirement (PR) supports and is consistent with the universal respect for, and observance of, human rights and freedoms and specifically the right to adequate housing and the continuous improvement of living conditions.4 In cases where there has already been displacement as a result of conflict, this PR is guided by the Guiding Principles on Internal Displacement

20.3 POTENTIAL IMPACTS UPON HUMAN RIGHTS

20.3.1 Construction

Note: Several of the potential impacts on Human Rights, in particular, those affecting workers have already been assessed with mitigation included in section 18 "Labor and Working Conditions".

20.3.1.1 Indigenous Peoples

Under the UN Guiding principles, the rights of indigenous people should be protected. This includes ensuring prior, free informed consent is provided before any Project development is allowed to take place on their land.

Uzbekistan is Central Asia's most populous country. The last census was conducted in 1989, but according to official estimates updated in 2017, out of a total of 32.1 million people, the ethnic Uzbek majority totaled just over 26.9 million (83.8 per cent of the population) while ethnic Tajiks made up 1,544,700 (4.8 per cent). Other sizable minorities include Kazakhs 803,400 (2.5 per cent), Russians 750,000 (2.3 per cent), Karakalpaks 708,800 (2.2 per cent), Kyrgyz 274,400 (0.9 per cent), Tatars 195,000 (0.6 per cent), Turkmens 192,000 (0.6 per cent), Koreans 176,900 (0.6 per cent) and Ukrainians 70,700 (0.2 per cent). (MRGI, 2021)

Other minorities include Meskhetian Turks and Jews.

The bulk of citizens are at least nominally Sunni Muslim while most of the Russian minority is nominally Orthodox Christian; in practice many citizens of all ethnicities identify with smaller movements like Sufism, Ahmadiyya and various forms of evangelical Christianity.

While the nominally autonomous republic of Karakalpakstan occupies 37 per cent of the country's territory, ethnic Karakalpaks represent about a third of the Karakalpakstan's population, and a very slight proportion of the country's total population.

The ethnic Tajik population is widely thought to be much greater than official statistics indicate, given that many Tajiks and Tajik speakers may classify themselves as Uzbeks to improve their career opportunities.

Uzbekistan is made up of a number of traditional populations of Turkic (Uzbeks, Kazakhs, Karakalpaks), Semitic (Bukhara Jews), and Iranian origins (Tajiks), as well as more recent minorities which arrived in the country during the Russian and Soviet domination (Russians, Crimean Tatars, Meskhetian Turks, Koreans and some Jews).

Since 1991 however, there has been a two-way flow of population which is continuing the dramatic change to the country's demographics. While there are thousands of ethnic Uzbeks who had been working outside of the country have been returning to Uzbekistan from Russia and other neighboring countries, other minorities which are of more recent origin such as the Russians, Crimean Tatars and others have also been emigrating in large numbers.

Only ethnic group known in the area are Ethnic Turkmens. There are over 150,000 ethnic Turkmen live in border regions of Uzbekistan including Khorezm, Surkhandarya and Karakalpakstan. (IWPR, 2010)

However, as part of the consultation process, desktop researches, no indigenous people or ethnic minorities have been identified in or nearby the Project location. Therefore, no further assessment has been undertaken in regards to indigenous people or ethnic minorities.

20.3.1.2 Local Communities

The Project site is located nearby in a lake. The closest settlements are at least 0.9kms away from project border. Based on the Project's area of influence (as per potential impacts upon different environmental and social parameters), there are expected to be specific Project impacts to communities relating to health, safety and security etc. Impacts on community health and safety and mitigation measures are discussed in previous chapter 19 Community Health and Safety. The impacts related with human rights on community will be kept under control by implementing and improving maturity of grievance redress and stakeholder engagement processes.

20.3.1.3 Project Workers

The project will have several parties during the construction and test and commissioning phases. As mentioned in the preamble of this section, many human rights impacts on project personnel are covered in the "Section 18 Labor and Working Conditions". There will likely be various internal processes and protocols related to HR and worker management for each party. The project shall be ensure that compliance to Human rights issues are achieved in sub-contractors, Sub-contractor's sub-contractor and suppliers.

Certain parties will also engage contract staff (e.g. from agencies), where additional manpower is required. There will also be suppliers/service providers (e.g. for deliveries, waste management) who will have access to the site and will be exposed to certain risks of exploitation.

ILO's "2020 third-party monitoring of child labour and forced labour during the cotton harvest in Uzbekistan" (ILO, 2021) reports have shown that there were instances of forced labor, labor with poor contracting conditions, or lacking processes in 2020. As previously assessed, this is a potential impact for the Project, especially for contract staff, or those of sub-contractors. Such risks will need to be carefully safeguarded through policy and internal processes (including monitoring and audit) including sub-contractors, sub-sub-contractors and suppliers.

20.3.2 Operational Phase

It is approximated that there will be limited workers compared with construction phase during operational phase of the Project which will be a big reduction compared to the construction phase. As a result, the only potential impact on human rights that could potentially be expected is the exploitation of workers.

20.3.2.1 Local Community

No adverse impact to the community Human Rights is expected during the operation phase. However, the company shall be in touch with local community elders, leaders and local governments to collect grievances efficiently as explained in "Chapter 19 Community Health and Safety" of this report

20.3.2.2 Project Workers

As the vast majority of staff will be direct employees of the Project Company the potential risks associate with worker exploitation are expected to be limited due to consistent processes in place as part of the respective HR management systems, assuming they are appropriately designed and have adequate resources. However, where there is an agency/contract staff the risks of exploitation (particularly forced and child labour) may be more prevalent.

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22. ATTACHMENTS

ATTACHMENT A – LETTER & CONCLUSIONS FROM STATE COMMITTEE ON ECOLOGY & ENVIRONMENTAL PROTECTION

ATTACHMENT B – OVERALL PROJECT LAYOUT

ATTACHMENT C – WATER BALANCE DIAGRAM

ATTACHMENT D – LIST OF ARCHEOLOGICAL & CULTURAL SITES WITHIN THE SURKHANDARYA REGION

ATTACHMENT E – LABORATORY ANALYZES RESULTS

ATTACHMENT F – STAKEHOLDER ENGAGEMENT PLAN (SEP)

ATTACHMENT G – SOCIO-ECONOMIC ANNEX

ATTACHMENT H – ENVIRONMENTAL SOCIAL ACTION PLAN (ESAP)

ATTACHMENT I – ENVIRONMENTAL SOCIAL MANAGEMENT PLAN (ESMP)

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STONE CITY ENERGY (1600 MW) CCPP PROJECT

ATTACHMENTS (A-I)

OF THE ENVIRONMENTAL & SOCIAL IMPACT ASSESSMENT REPORT

ASE-UZA-571-REP-ESA-0001-02

Rev	Date	Purpose of issue	Issuer	Checker	Approver
02	16/12/2021	Initial	U. GÜNGÖR	M. ACIRLI	F. SATTAROV

UzAssystem

STONE CITY ENERGY (1600 MW) CCPP PROJECT

ATTACHMENTS (A-I)

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Rev	Date	Purpose of issue	Issuer	Checker	Approver
02	16/12/2021	Initial	U. GÜNGÖR	M. ACIRLI	F. SATTAROV

ATTACHMENT A - LETTER & CONCLUSIONS FROM STATE COMMITTEE ON ECOLOGY & ENVIRONMENTAL PROTECTION

STATE COMMITTEE OF THE REPUBLIC OF UZBEKISTAN ON ECOLOGY AND ENVIRONMENTAL PROTECTION
100047, Tashkent, Yashnobod district., Toy-tepa street, 2a, phone.: 71-207-11-03, faks: 71-236-02-32
web page: http://www.eco.gov.uz, e-mail: info@uznature.uz

29.09.2021 No. 04-01/10-08-16-55 Tashkent c.

CONCLUSION

State Environmental Review

For Facility	Environmental Impact Assessment (EIA) of the organization of the construction a combined-cycle power plant with a capacity of 1600 MW in Angor district of the Surkhandarya region (EIS project).
CUSTOMER:	LLC «SCE-QUVVAT»
TAX ID NUMBER	308286398
Category	I, item 32, CMR of RUz No. 541 dated 07.09.2020
Vendor:	JV" UzAssystem" LLC
Expert	A.V. Zhdanov

to: Mr. Karimbaev Sh.K.
the Director of
LLC «SCE-QUVVAT»

copy to: **Department for Ecology and Environmental Protection of the Surkhandarya Region**

The materials of the first stage of the environmental impact assessment of construction planning of a combined-cycle power plant with a total capacity of 1600 MW in Angor district of Surkhandarya region were submitted for the State ecological expertise.

The implementation of this project is carried out on the basis of the President Decree of the Republic of Uzbekistan dated July 24, 2021, No. PD-5193 "On measures for construction planning of a combined cycle power plant with a capacity of 1500-1600 MW in Surkhandarya region."

The main activity of the planned enterprise is the generation and supply of electricity to industrial enterprises, social facilities, and the population of Angor, Muzrabad, Termez districts and part of the territory of Termez city, Surkhandarya region.

The design capacity of the planned combined cycle power plant of the planned enterprise is 1600 MWh.

Administratively, the planned combined-cycle power plant will be located on the territory of the village community assembly Kattakum in Angor district of Surkhandarya region, 14 km North of Termez city and 2.7 km North-East of the urban-type settlement Uchkyzyl, on the right the shore of the lake "Uchkyzyl".

The boundaries of the territory of a combined heat and power plant are: - from the North, West and East - uncultivated and unused lands in agriculture; from the West - at a distance of

550 meters "Zang" canal flows, flowing into Uchkyzyl Lake; from the South - Lake Uchkyzyl is located. From the North, North-Eeast, along the border from the site of thea combined heat and power plant, there is the M-39 main road; from the South, at the distance of 7 km - the main railway line "Kagan-Termez-Dushanbe".

By the decision of the Khokim of Angor district No. 131–8–0–Q dated 30.09.2021, a land plot in Kattakum village community assembly, with a total area of 73.4 hectares, was allocated for the implementation of the planned project, of which: 80,000 m^2 - for building; 25800 m^2 - for a hard surface; 21500 m^2 - for green spaces; 382700m^2- ground cover, other areas 22400 m^2.

The coordinates of the selected site for construction of a combined heat and power plant

1.	37°22'25.33”North Latitude	67°14'54.80"East longitude
2.	37°22'54.68"North Latitude	67°14'50.03"East longitude
3.	37°22'54.70"North Latitude	67°14'49.93"East longitude
4.	37°22'55.63"North Latitude	67°14'56.58"East longitude
5.	37°22'56.17"North Latitude	67°15'1.55"East longitude
6.	37°22'56.21"North Latitude	67°15'5.65"East longitude
7.	37°22'20.01"North Latitude	67°15'1.14"East longitude

The distance of the designed combined cycle power plant to the border of the nearest residential buildings of the village Uchkyzyl, located to the south, is 1.5 km, to private residential buildings located to the west of the allocated site - 1.35 km.

In accordance with the requirements of SanPiN No. 0350-17 "Sanitary standards and rules for the protection of atmospheric air in populated areas of the Republic of Uzbekistan", taking into account the capacity of the planned combined cycle power plant - 1600 MW, the activities of the planned power plant belong to the first class of sanitary classification (clause 6.2) , where the size of the sanitary protection zone is set at 1000 m.

The closest surface watercourse is Lake Uchkizil, which is located 70 meters south of the allocated site for the construction of a combined cycle power plant with a useful volume of 80.0 million m^3, which does not contradict the requirements of the Regulation “On the Procedure for Establishing Water Protection Zones and Sanitary Protection Zones water bodies of the Republic of Uzbekistan ", approved by the Resolution of the Cabinet of Ministers of the Republic of Uzbekistan No. 981 dated 11.12. 2019, where the width of water protection zones around reservoirs and reservoirs with a volume of less than 0.1 billion m^3 is 50-100 meters.

In terms of compliance with the requirements of the resolution of the Cabinet of Ministers of the Republic of Uzbekistan, the enterprise will ensure the implementation of appropriate measures to ensure the protection of waters from pollution, clogging and depletion, as well as improve the state and regime of water use in Lake Uzkyzyl.

In particular, in the water protection zone with a width of at least 70 meters from industrial buildings and structures to the water edge of Lake Uchkyzyl, tree and shrub plantations will be planted with the exception of any economic and other activities.

The number of personnel of the designed power plant during operation will be 300 people, of which: 45 - engineering staff and employees; 255 - workers. The production mode is round-the-clock, 8 hours per shift, 365 days a year.

Resolution of the Cabinet of Ministers of the Republic of Uzbekistan No. 541 dated 07.09.2020 "On further improvement of the mechanism for assessing environmental

impact", objects of I and II categories of environmental impact are subject to the procedure for passing public hearings about environmental impact.

Considering that the combined cycle power plant with a capacity of 1600 MW belongs to the objects of the I category of impact on the environment, the management of the enterprise under construction together with representatives of Authorities of Angor District, the Inspectorate for Ecology and Environmental Protection, "Kattakum" village community assembly on 17.08.2021 public hearings were organized and held in accordance with the established procedure. During the public hearings, residents of the Kattakum village community assembly did not have any objections to the construction of a combined cycle power plant.

The climate of the region under consideration belongs to the arid desert climate and is characterized throughout the year by high air temperatures and low precipitation. The average annual air temperature is 17.3 ° C, the maximum temperature is + 46 ° C, and the minimum is -12.2 ° C.

The duration of winter is 1.5 months on average. The coldest month is January with an average monthly air temperature of minus 2.1 °C, the average duration of the frost-free period is 246 days, the longest is 309 days. Summers are long, hot and dry. The hottest month of the year is July, with an average monthly temperature of + 32 ° C.

The prevailing winds throughout the year in the designated area are northeastern and west-south-west, in summer, west-south-west and west, and in winter, north-north-east. The average wind speed is 2.9 m/s. The territory under consideration is dominated by increased wind speeds. So the repeatability of wind speeds of 2-3 m/s is 46,93%, for wind speeds of 4-5 m/s it is 17,6%. Such wind speeds contribute to the dispersion of gaseous impurities in the atmospheric air and the transport of dust over long distances.

The construction site for a new power plant is located on the shore of the Uchkyzyl artificial lake. Uchkyzyl reservoir is located in the lower reaches of the river. Surkhandarya, 18 km north-west of the city of Termez. The reservoir basin occupies a natural horseshoe-shaped hollow within the Kattakum natural boundaries in the area of Uchkyzyl crossing loop. The reservoir is seasonal filling, wwhere the useful volume of water is 80 million m^3, and serves to accumulate the autumn-winter runoff of the river. Surkhandarya. It is filled from the main channel "Zang" through the lower Zang lateral canal, and the feeder drain.

The water in Lake Uchkyzyl is characterized by an increased salt content (1.2 MPC), including sulfates (3 MPC), and increased hardness (mainly due to the content of hydrocarbonates and sulfates). Regardless of the distance from the shore, the water in Lake Uchkyzyl in the area of the construction site for a combined-cycle power plant with a capacity of 1600 MW is characterized as water with a relatively high salinity (salt content 0.5-1.0 g/l) and hard (hardness more than 8.0 mg-equal/L).

Groundwater within the site was discovered at a depth of 1.0 to 11.8 m from the earth's surface. In terms of chemical composition, groundwater is sulfate-chloride sodium-potassium, with a dry residue from 610 to 11450 mg/l.

There are no green spaces (woody and herbaceous vegetation) on the construction site of a combined heat and power plant. Arboreal plantations (from decorative – thuja, pine, mulberry, from fruit-flavored, and stone fruits - apple, apricot, walnut, almond), as well as grapes are found on the territory of the nearest village "Uchkyzyl".

According to the EIS draft, during the construction of the combined cycle power plant on the territory of the Kattakum village community assembly of Angor district of Surkhandarya region, no transplantation or cutting of trees is planned.

Construction of a new combined heat and power plant in Surkhandarya region with an installed capacity of 1600 MW with two gas turbine units of 551 MW each and a steam turbine

of 538 MW will make it possible to optimally use the country's fuel resources using advanced combined-cycle technologies.

The proposed combined-cycle power plants are the most promising in the energy sector and differ from traditional TPPs by a reduction in fuel consumption at times and high efficiency, where the Efficiency output of electric power production is 60%.

At present, in world practice, to save fuel and energy resources, the production of electrical and thermal energy is carried out by utilizing the heat of the exhaust steam in steam turbine plants and gas in gas turbine plants.

When lay out of combined-type power plants with steam turbine plants, labor productivity is also increased, operating costs are reduced, the environmental situation in the zone of influence of the combined-cycle power plant is improved, and energy efficiency is generally increased.

The combined cycle combined cycle power plant has in its design the corresponding blocks, separate from each other - new generation combined cycle power plants of the type - 2 units. (manufacturer "Siemens", Germany), i.e. the efficiency of double action is achieved by obtaining secondary electrical energy using a steam turbine of 1 unit. ("Siemens" manufacturer Germany).

The proposed combined-cycle plants are designed to obtain the maximum (primary and secondary from hot exhaust gases) amount of electricity.

As a result, the specific consumption of the equivalent fuel used to produce 1 kWh of electricity will decrease by 164.3 gr. reference fuel kWh (at traditional TPP 500-600 gr. reference fuel), which will save 488.6 million cubic meters of natural gas per year and, accordingly, a significant reduction in the amount of pollutant emissions into the atmosphere.

The main fuel for the operation of power plant is sulfur-free natural gas. The consumption of natural gas at the new combined heat and power plant as a whole will amount to 2.264 million m^3/year.

The production of electricity at the first stage will occur due to the combustion of the supplied gaseous fuel into the cylindrical combustion chamber of steam-gas plants, which contributes to the combustion of gaseous fuel at a constant pressure. Combustion products enter the gas turbine, where the kinetic energy of the gas flow is converted into mechanical work of the turbine rotor spinning, where electrical energy is obtained. The gas temperature in front of the gas turbine, depending on the turbine series, is in the range of 1100-1500 °C.

After the CCGT units, the exhaust gases at a temperature of 670 °C are fed into a heat recover steam generator (HRSG), where steam is generated by transferring thermal energy from gases from the gas turbine to feed water and steam. The gases from the heat recover steam generator are discharged into the atmosphere through the chimney at a temperature of about 85-140 °C.

The generated steam in two heats recover steam generators enters a steam turbine, where the kinetic energy of the steam drives the turbine, generating secondary mechanical energy and, according to the receipt of additional (secondary) electrical energy.

The combined-cycle gas turbine consists of two separate units: a steam power unit and a gas turbine unit. In combined-cycle gas turbines, the first generator is located on the same shaft as the gas turbine, which, due to the rotation of the rotor, generates an electric current. Passing through the gas turbine, the combustion products give it only part of their energy and still have a high temperature at the outlet of the turbine. Further, the combustion products enter the steam power plant, into the HRSG, where water vapor is heated. The temperature of the combustion products is sufficient to bring the steam to the state necessary for the rotation of the steam turbine and to produce additional electrical energy.

Gas will be supplied to the territory of the section of the combined cycle power plant with a total capacity of 1,600 MW through newly constructed pipelines. Fuel gas enters to the gas conditioning point, equipped with coarse filters and a commercial gas flow meter, and then to the gas control point, where it is cleaned for subsequent throttling before afterburning (if necessary), then to the gas booster compressor station, where it is cleaned, compressed and supplied into the main body for combustion in the combustion chamber of the gas turbine.

The maximum consumption of natural gas at each CCGT unit is 141,500 m^3/h or 283,000 m^3/h for two CCGT units. The consumption of natural gas at the new combined heat and power plant will amount to 2.264 million m^3/year.

Flue gases from the installed CCGT units containing nitrogen oxides, carbon monoxide and sulfur dioxide, will be discharged through two individual chimneys with a height of 65 m and a mouth diameter of 8.24 m.

Within the framework of the EIS project, calculations of pollutants emitted during the construction of the power plant were made. According to the calculations, the emissions of temporary pollutants during the construction of the power plant from 7 emission sources will amount to 12,087 tons / year.

During the construction of the facility, emissions of pollutants enter the atmospheric air: inorganic dust - 3.071 t / year (25.4%); carbon monoxide - 2.824 t/year (23.3%); nitrogen dioxide - 2.785 t/year (23.0%); cement dust - 0.982 t/year (8.1%); hydrocarbons - 0.781 t/year (6.4%); others - 1,644 t/year (13.8%).

During the period of operation of combined-cycle plants, the emission of natural gas combustion products into the atmosphere occurs. The emission of natural gas combustion products is carried out through the stacks of two combined-cycle plants (Emission sources No. 1, 2).

During the compressor operation and the emergency diesel generator, methane and ethane are released into the atmospheric air, as well as the product of diesel fuel combustion during the operation of the diesel generator (Emission sources No. 3, 4).

Also, during the operation of the express laboratory, battery, lathe and milling machine, as well as gas welding and electric welding machines, a small amount of various pollutants enter the atmospheric air (Emission sources No. 5, 6).

When diesel fuel and technical oils (turbine oil) are stored in tanks, hydrocarbon emissions are released into the atmospheric air (Emission sources No. 7, 8).

The expected gross emission of pollutants from the direct production of electricity from 8 stationary sources will amount to 24165.427 t/year.

The contribution of pollutants during the operation of the combined-cycle power plant will be: carbon monoxide - 18714.541 t/year (77.4%); nitrogen dioxide - 4514.256 t/year (18.6%); methane - 1022.832 t/year (16.8%); nitric oxide - 733.527 t/year (3.03%); formaldehyde - 199.241 t/year (0.8%); sulfur dioxide - 3.748 t/year (0.01%); others - 0.114 t/year (0.16%).

The analysis of the calculations of the dispersion fields of the surface concentrations of pollutants shows that the maximum concentrations of all pollutants outside the enterprise and in the residential area do not exceed the established quotas for Surkhandarya region.

In particular, the maximum concentration of pollutants in the area of the facility will be nitrogen dioxide - 0.23 MPC (0.25 MPC for Surkhandarya region); soot - 0.17 MPC (0.33 MPC for Surkhandarya region). The concentration of other pollutants will not exceed 0.1 MPC.

Thus, the impact on the atmospheric air from the emission sources of the projected steam and gas power plant, with a capacity of 1600 MW on the territory of Angor district of Surkhandarya region after the completion of construction will be constant, but insignificant in terms of the amount of load on the atmospheric air.

During construction and installation works, water is used to prepare mortar, watering the territory in order to reduce dusting, as well as for the household needs of builders. Water supply during construction works is imported.

For the drinking needs of builders, imported bottled water is partly used, which is purchased independently by the construction contractor. Drinking water storage meets sanitary and hygienic requirements.

Water consumption for production needs during the construction (preparation of concrete and cement mortar) of the combined cycle power plant will be 8.773 m^3/day. or 3202.5 m^3/year.

Water consumption for household and drinking needs will amount to 31.412 m^3/day. or 11465.38 m^3/year and irrigation of the territory - 146.8 m^3/day or 14680.0 m^3/year.

Then, the total water consumption during the construction of the combined cycle power plant will be 168.98 m^3/ day or 29347.88 m^3/ year.

The total water disposal (effluent) of household wastewater during the construction of a combined cycle power plant will be: 31.412 m^3/year or 11465.38 m^3/day. Household wastewater generated during construction is planned to be directed to a temporarily installed storage tank (a waterproof cesspool) with subsequent removal to the nearest treatment facilities in Termez city.

Water consumption during the operation of a combined heat and power plant for industrial and household needs will be carried out from the Boz-su canal and the city water supply network of the Kibray region.

Water consumption for production needs is made up of water consumption: for feeding the circulating cooling system of auxiliary equipment; to make up the steam-water cycle; for the need for additional water of the chemical water treatment system No. 1 and No. 2.

The annual consumption of water for production needs at a combined-cycle power plant with a capacity of 1600 MW will be 11340.42 m^3/ day or 4139275.2 m^3/year.

Household and drinking needs consist of the consumption of water for the drinking needs of the working personnel, the consumption of water for showers for the working personnel, the needs of the canteen for cooking, wet cleaning of the premises, watering the territory.

The total water consumption (water consumption) for household, drinking and irrigation needs of the power plant during the operation period is 150.6 m^3/day 16171.39 m^3/year, of which: drinking needs – 0.677 m^3/сут. 2464.575 m^3/year; showers - 3.0 m^3/day. 1095.0 m^3/year; household needs (sink, toilet) - 0, 678 м^3/day. 247.47 m^3/year; cooking - 3.6 m^3/day. 1254.6 m^3/year; flow washing - 0.75 m^3/day. 273,75 m^3/year; for watering the territory and green spaces - 141,9 m^3/day. 10836.0 m^3/year.

Then, the total water consumption for the power plant during the operation period will amount to 11491.025 m^3/day. 4,155,446.59 m^3/year, of which: for production needs - 11340.42 m^3/day. 4139275.2 m^3/year; for household and drinking needs - 150.6 m^3/day. 16171.39 m^3/year.

Domestic wastewater with a total volume of 7.955 m^3/day or 5061.645 m^3/year, generated during the operation of the CCGT, is planned to be sent to a temporarily installed storage tank (waterproof cesspool) with a volume of 20 m^3 with subsequent removal to the nearest treatment facilities in the city of Termez.

Conditionally clean water generated in the blowdown of boilers (485.52 m^3/day or 177214.8 m^3/year), household water supply and heating 1 activity (1761.6 m^3/day or 642984.0 m^3/ year), water treatment (240,0 m^3/ day or 87600.0 m^3/ year) in a total volume of 2487.12 m^3/day. or 907,798.8 m^3/year is planned to be sent to Lake Uchkizil.

At the projected power plant, with a capacity of 1600 MW in the Tashkent region, after commissioning, 18 types of waste will be generated, both of an industrial and household nature.

Calculations showed that during the construction of the facility, 8 types of waste are generated in the amount of 437.56 tons/year. The temporarily generated waste includes ferrous metal scrap - 5.0 t/year, welding rod stub - 1.3 t/year, cleaning rags - 1.2 t/year, worn-out overalls - 0.78 t/year, food waste - 4.38 t/year, SHW - 20.0 t/year, estimates - 382.7 t/ear.

After commissioning, the projected power plant with a capacity of 1600 MW in Angor district Surkhandaryo region after commissioning, 22 types of industrial and household waste will be generated in the amount of 2432.037 tons per year, of which: 29.335 t/year of hazard class 2 (3 types of waste); 1,221 t/year of hazard class 3 (2 types); 2310.960 t/year of 4 hazard classes (14 types); 90.518 t / year, 5 hazard class (3 types).

Household, construction, and industrial wastes generated during the construction of the facility, as well as during operation, are planned to be exported in the prescribed manner by specialized organizations, in particular, the State Unitary Enterprise "Toza Hudud" in the Surkhandarya region in accordance with the concluded contracts.

The adopted technical and technological solutions during the operation of a combined heat and power plant correspond to the best existing technologies to produce electrical energy, based on the latest technological advances, aimed at reducing the consumption of fuel and energy resources and, accordingly, reducing environmental pollution.

The State Environmental Review of the project showed that the submitted materials meet the requirements of environmental legislation for the first stage of environmental impact assessment.

The State Committee of the Republic of Uzbekistan on Ecology and Environmental Protection approves the draft Statement on the environmental impact of the organization for the construction of a combined-cycle power plant with a total capacity of 1600 MW in Angor district of Surkhandarya region.

The conclusions of the state environmental expertise on the admissibility of the project does not replace or cancel the need to obtain the relevant permits in the manner prescribed by law.

The conclusions of the state environmental expertise on the admissibility of the project is legally valid for three years, the conclusion of the state environmental impact assessment is terminated in the following cases: non-compliance by the customer with the requirements specified in the conclusion of the state environmental impact assessment, and in other cases in the manner prescribed by law.

SCE Quvvat LLC is required:

- to develop and submit for consideration by the state ecological expertise a Statement of Environmental Effects (SEE), containing environmental standards for all types of impact of the projected enterprise on the environment MPE, PDO, MPW in the manner prescribed by law;
- in order to improve and increase the efficiency of the monitoring system for compliance with environmental standards on the basis of the CMR of RUz dated 5.09.2019, No. 737 "On improving the environmental monitoring system in the Republic of Uzbekistan", ensure the introduction of automated control systems;
- to ensure the implementation of the President Decree of the Republic of Uzbekistan No. 4845 dated 29.09.2020 "On measures to further improve the management system of activities in the field of handling household and construction waste";
- when carrying out construction work, pay special attention to the timely removal and disposal of waste generated from the operation of equipment and the life of personnel, as well as collection and disposal of wastewater, provide for dust suppression of the site and access

roads, refueling of road construction equipment in specially designated areas with a waterproof coating;

- to draw up and submit relevant agreements related to the removal of waste and effluents;
- to develop and obtain a "Permit for special water use" (PSWU) for the intake of water from a surface watercourse - Lake "Uchkyzyl" in the manner prescribed by law;
- to provide a water protection zone with a width of at least 70 meters from the production sites to the water edge of Lake Uchkyzyl with the planting of trees and shrubs in compliance with the conditions of shore protection structures in the coastal strip of Lake Uchkyzyl.

In the water protection zone of Lake Uchkyzyl (70 meters wide from production sites to the water edge of Lake Uchkyzyl), any economic activity is prohibited, including the placement of: sewage treatment facilities and various types of containers (accumulators) for waste water; livestock and poultry farms; landfills for production and consumption waste; parking lots, filling stations of fuels and lubricants, places of technical maintenance, repair and washing of vehicles and other equipment; felling of tree and shrub plantations, with the exception of felling for forest maintenance and sanitary felling.

The Department for Ecology and Environmental Protection of the Surkhandarya Region should take control over the implementation of “SCE Quvvat” LLC design solutions and environmental protection measures provided for in the draft EIS with the drawing up of an act in which the following information should be reflected:

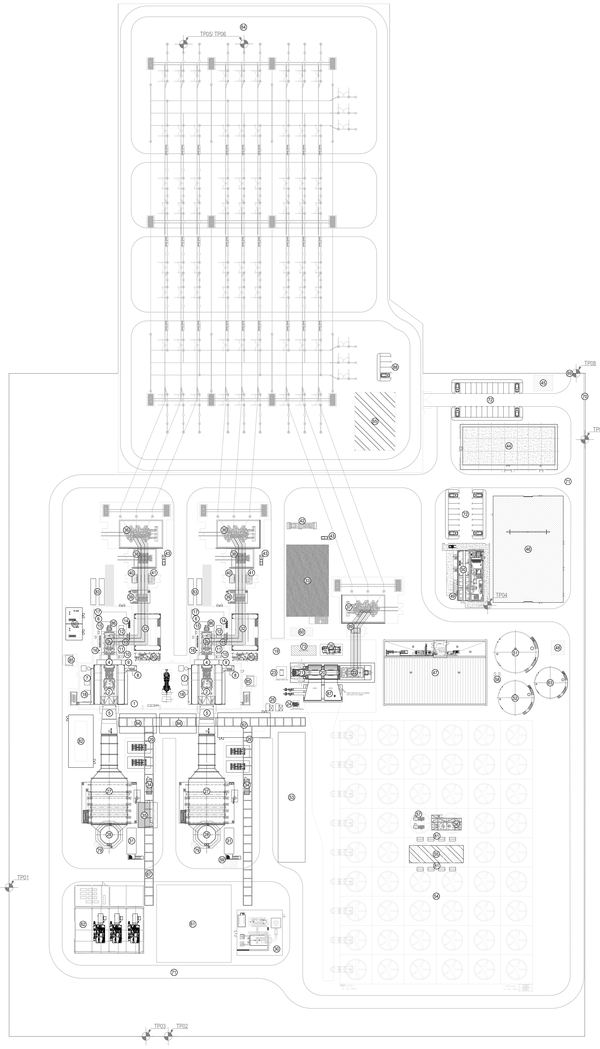
- during the construction of the facility, the implementation of the decree of the President of the Republic of Uzbekistan No. 4845 dated 09.29.2020 "On measures to further improve the management system of activities in the field of handling household and construction waste", item 5 availability of contracts for the removal of construction waste;
- availability at the enterprise "Permit for special water use or water consumption" (PSU) for the intake of water from a surface watercourse - Lake "Uchkyzyl";
- availability of a program for monitoring the state of the environment in the area where the facility is located;
- the state of landscaping of the territory of the enterprise and the territory adjacent to the enterprise, the sanitary protection zone of the enterprise.

The commissioning of this facility should not be allowed without a positive conclusion of the state environmental expertise for the Statement of Environmental Consequences.

Vice-chairman (signature) I. Bokizhonov.

Contact: Zhdanov A.V.
phone 203 00 22 (intr.1008).

ATTACHMENT B - OVERALL PROJECT LAYOUT



SCALE BAR

PRELIMINARY FOR PROPOSAL

LEGEND:
1. GAS TURBINE BUILDING
2. GAS TURBINE
3. GAS TURBINE GENERATOR
4. AIR INTAKE DUCT
5. DIFFUSOR
6. GENERATOR BEARING EXHAUSTER
7. GT WASH WATER COLLECTING TANK (FOR GAS TURBINE)
8. FUEL GAS PURGE AIR COMPRESSOR AND TANK
9. GT WASH WATER COLLECTING TANK (FOR AIR INTAKE)
10. H2 SKID
11. SEAL OIL SKID
12. STATOR WATER UNIT
13. ARGON CENTRAL SUPPLY RACK
14. ARGON BOTTLE RACK
15. DAS DRYER
16. SEAL OIL STORAGE TANK
17. FIRE FIGHTING DELUGE STATION
18. THERMAL MANAGEMENT SYSTEM BLOWER
19. STEAM TURBINE BUILDING
20. LP STEAM TURBINE
21. HP/IP STEAM TURBINE
22. STEAM TURBINE GENERATOR
23. HYDRAULIC SUPPLY UNIT
24. GLAND STEAM CONDENSER
25. CLOSED COOLING WATER PUMPS
26. LUBE OIL MODULE
27. HEAT RECOVERY STEAM GENERATOR - HRSG
28. MAIN EXHAUST STACK
29. FEEDWATER PUMPS
30. AUXILIARY STEAM BOILER
31. HRSG ELECTRICAL AND CONTROL CONTAINER
32. GT PCC
33. ELECTRICAL BUILDING
34. SAMPLING CONTAINER
35. CHEMICAL DOSING SKID
36. GT GENERATOR STEP-UP TRANSFORMER
37. ST GENERAOTOR STEP-UP TRANSFORMER
38. UNIT AUXILIARY TRANSFORMER
39. GENERATOR CIRCUIT BREAKER
40. EXCITATION TRANSFORMER GT
41. START-UP TRANSFORMER
42. EMERGENCY DIESEL GENERATOR - EDG
43. OIL SEPARATOR
44. ADMINISTRATION BUILDING AND CENTRAL CONTROL ROOM - CCR
45. GATE HOUSE
46. WORKSHOP AND STORE
47. WATER TREATMENT PLANT BUILDING AND CONDENSATE POLISHING PLANT BUILDING
48. FIRE FIGHTING PUMP HOUSE
49. WASTE WATER TREATMENT BUILDING
50. NEUTRALIZATION PITS
51. RAW/FIRE WATER STORAGE TANK
52. DEMINERALIZED WATER STORAGE TANK
53. FIN FAN COOLERS
54. AIR COOLED CONDENSER - ACC
55. ACC ELECTRICAL AND AUXILIARY SERVICES BUILDING
56. CONDENSATE TANK
57. CONDENSATE EXTRACTION PUMPS
58. DEMI WATER DISTRIBUTION PUMPS
59. AMMONIA DOSING CONTAINER
60. H2 BOTTLE STORAGE
61. GAS RECEIVING AND METERING STATION - GRMS
62. GAS COMPRESSORS BUILDING
63. FIRE WATER RESERVE TANK
64. 500KV HV SUBSTATION - AIS - AIR INSULATED SWITCHYARD
65. HV SUBSTATION BUILDING
66. NOT USED
67. PIPERACK
68. NOT USED
69. ACCESS GATE
70. SECURITY FENCING
71. SITE ROADS
72. PARKING AREA
73. AIR COMPRESSORS
74. NOT USED
75. NOT USED
76. NOT USED
77. NOT USED
78. NOT USED
79. CONTINUOUS EMISSION MONITORING SYSTEM - CEMS
80. LUBE OIL AREA
81. STATION SERVICE TRANSFORMER
82. GAS FINAL FILTER AND PREHEATING
83. FIRE FIGHTING SYSTEM
84. AUTOMATED SAFETY SHUT OFF VALVE
85. ROTOR AIR COOLER
86. COLLECTOR
87. HOTBOX
88. HV SUBSTATION PARKING
89. EXCITATION TRANSFORMER ST

Terminal Points:
1. TP 1 NATURAL GAS
2. TP 2 SUPPLY OF RAW WATER
3. TP 3 WASTE WATER DISCHARGE
4. TP 4 ALL REMAINING WASTE WATER
5. TP 5 POWER TRANSMISSION
6. TP 6 TELECOM
7. TP 7 TELEPHONE NETWORK
8. TP 8 ACCESS CONNECTION POINT

CLIENT: SCE

CONTRACTOR DOC. NO:

ENGINEER DOC. NO:

CONTRACTOR: MITSUBISHI

	NAME	SIGNATURE	DATE	DESIGNER
PREPARED BY	EALE		December 2020	
CHECKED BY	ALIO		December 2020	
APPROVED BY	ZBAK		December 2020	
C & I				
ELECTRO				

ENGINEER

PROJECT TITLE
Dune 1700MW Combined Cycle Power Plant
Surkhandarya Uzbekistan

PROJECT No.
ARCHIVE No.
DOCUMENT TYPE
PART OF PROJECT

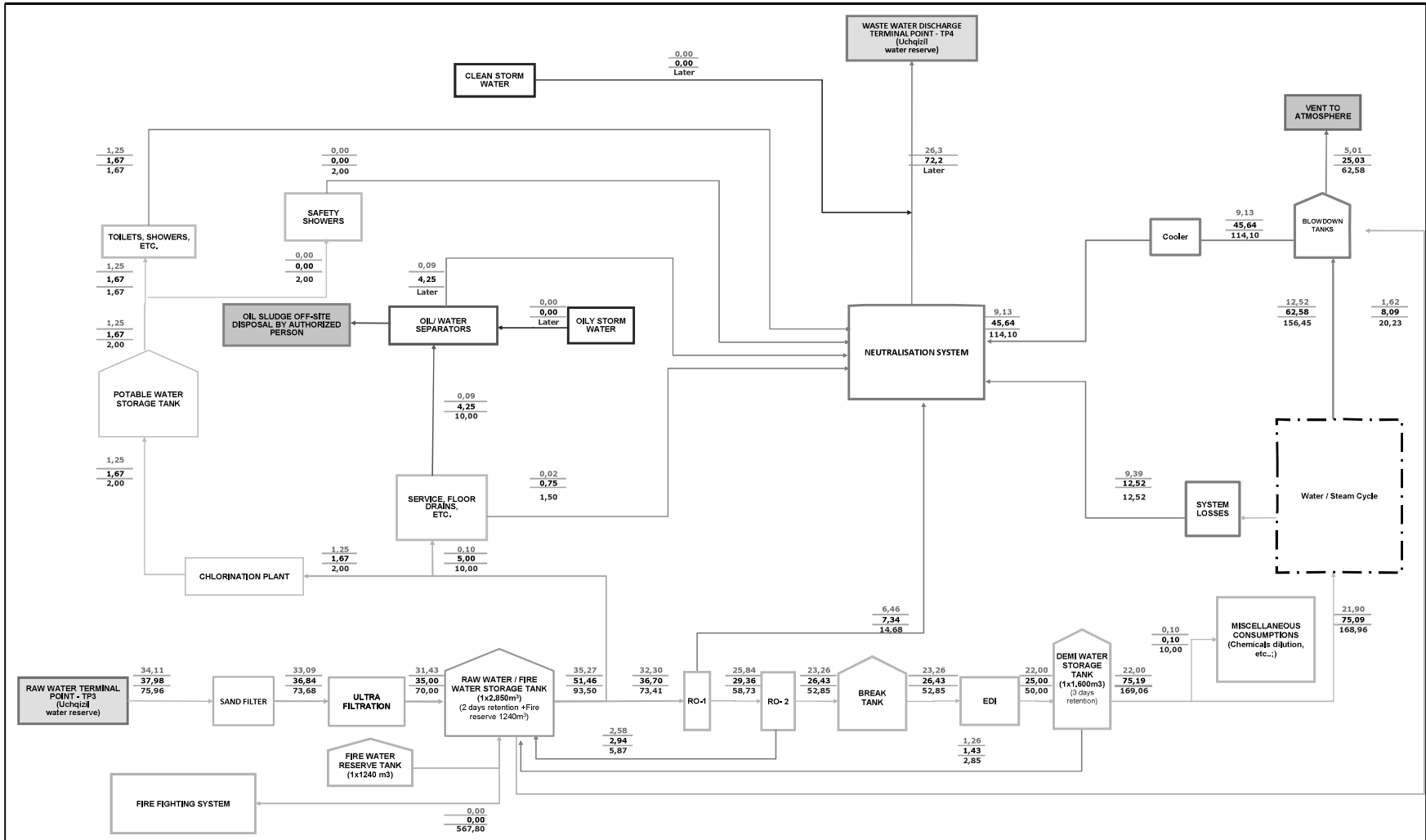
DRAWING NAME
Plot Plan

DRAWING No.: 20035/4.1
SHEET No.: 1/1

SCALE: 1:1000

SIZE: A0

ATTACHMENT C - WATER BALANCE DIAGRAM



Normal Continuos flows prorated to daily average values
Maximum Intermittent Continuos flows
Intermittent peak flows

REFERENCE DOCUMENTS

1. MYTILINEOS Proposal for project
2. Water analysis as per Inquiry documents.

NOTES

1. GENERAL
1.1 All units in t/h.
1.2 Peak flows are not coincident and they are used for the pipe size definition based on the max. flows across all operating cases.

2. CYCLE
2.1 The HRSG blowdown is cooled and rooted to neutralization system.
2.2 Boiler blowdown based on:
- 1% of steam production in normal operation.
- 5% of steam production in intermittent continuous make up
- 20% in one HRSG and 5% in the other in intermittent peak conditions (not to exceed 20 minutes).
2.3 Boiler blowdown evaporation rate assumed to be 25-40% (preliminary).

3. DEMINERALIZED WATER
3.1 Demineralized water quality according to OEM's specifications.
3.2 RO Water Treatment Plant efficiency considered ~ 80%.
3.2 Demi Water Treatment Plant efficiency and configuration shall be confirmed by supplier during detailed design
3.3 Demineralized Water is used for Steam Water Cycle Make-up.

4. POTABLE WATER
4.1 Potable water is supplied through Water Pre-Treament Plant.

5. RAW WATER
5.1 Raw water source will be from lake (Uchqizil water reserve).

6. Sanitary Waste
6.1 Estimated Peak Flow is based on 150 lit/User/day for 200 Users

7. FIRE FIGHTING WATER
7.1 Fire-fighting water value currently indicated is preliminary.

8. MISCELLANEOUS CONSUMPTIONS
8.1 Demineralised water consumption to GT washing and chemical dilution.
8.2 Allowance for system losses 0,75% of condensate flow (max continuous 1%)

9. CONDENSATE POLISHING
9.1 Condensate polishing system featured as 2x630kg/s train of cartridge filters + cation bed ion exchanger + mixed bed ion exchanger.

10. EFFLUENTS
10.1 It is assumed that 85% of service water goes to oily drain network.
10.2 Sanitary wastes will be discharged into the neutralization system.
10.3 Oily drains will be forwarding to Oil/Water Separator and then the clean drains to the non-oily collection basin.

LEGEND

- FIRE FIGHTING WATER
- PRETREATED WATER
- DEMI WATER
- HRSG BLOWDOWN
- POTABLE WATER
- INDUSTRIAL EFFLUENTS
- EFFLUENTS WITH OIL & SLUDGE
- SEWAGES
- STORM WATER

Project:	**1.700 MW Combined Cycle Power Plant Surkhandarya, Uzbekistan**
Doc. Name:	**Water Balance Diagram**

Siemens SGT5-9000HL

METKA No:	**Rev 0**
Prep.: ABALL / Rev.: ALIO / Apr.: KHOR	**Dec. 2020**
KKS No.	**Sheet**
	A3

ATTACHMENT D - LIST OF ARCHEOLOGICAL & CULTURAL SITES WITHIN THE SURKHANDARYA REGION

O'ZBEKISTON RESPUBLIKASI MADANIY AT VAZIRLIGI MADANIY MEROS DEPARTAMENTI

O' zbcki stoп. Tosl1ke11t. 100 0 27, O 'z garis l1 ko' cliasi, 1 8.
Te!.. (+998 71) 227-05-86.227- 08 -21

MINISTRY OF CULTURE OF THE REPUBLIC OF UZBEKISTAN CULTURAL HERITAGE DEPARTMENT

1 8, Uz ar,is1 str·eel, Tas11ke11t, 1 00027, Repиblic of Uzb
ekis1a11 Te ! . (+998 71)2 27-05 -86,227 -08-21

2021 y. « 13 »_07 № 01-04/1282 « » _____ 2021

Tashkent city
JV LLC "UzAssystem"

You ref. SCE-UZA-MTS-L-001
28 June 2021

According to your request regarding the planning of construction by “Stone City Energy” Dutch company of a new TPP in Angor district of Surkhandarya region, we are sending the information on existing cultural heritage sites in Angor and Termes districts

Annex: ____pages

Senior inspector-
Chief Deputy F.Davlatov

Contact: S.Azimov
Phone (71) 2 3 9 -2-1-06

SURKHANDARYA REGION

No.	Facility`s full name	Facility`s period	Facility`s location	Title to real property
Angor district				
Archaeological monuments				
1	Nogoratepa	V - VII centuries	«Tulqin» MFY	State property. Based on the right of operational management of the Department of Cultural Heritage of Surkhandarya region
2.	Bolalik tepa	V - VII centuries	“Dekhqon ittifoqi” MFY, Alisher Navoi Street	State property. Based on the right of operational management of the Department of Cultural Heritage of Surkhandarya region
3	Nomsiz tepa 1	V - VII centuries	“Yangiturmush” MFY	State property. Based on the right of operational management of the Department of Cultural Heritage of Surkhandarya region
4	Nomsiz tepa 2	X — XII centuries	«Faravon» MFY	State property. Based on of the right of operational management of the Department of Cultural Heritage of Surkhandarya region
5	Nomsiz tepa 3	V - VII centuries	«Dekhqonbirlashuv» MFY	State property. Based on the right of operational management of the Department of Cultural Heritage of Surkhandarya region
6	Umaloq tepa	V - VII centuries	“Navruz” MFY, Alisher Navoi Street	State property. Based on the right of operational management of the Department of Cultural Heritage of Surkhandarya region
7	Jovlykurgon	V - VII centuries	«Tallashqon» MFY	State property. Based on the right of operational management of the Department of Cultural Heritageof Surkhandarya region
8	Qurgontepa (Qatlamatepa (Buddhist temple)	III — VI centuries	«Талламоррон» MFY	State property. Based on the right of operational management of the Department of Cultural Heritageof Surkhandarya region
9	Qurgon	V — VIII centuries	«Faravon» MFY	State property. Based on the right of operational management of the

				Department of Cultural Heritage of Surkhandarya region
10	Qizqurgon	X — XII centuries	«Gilambob» MFY	State property. Based on the right of operational management of the Department of Cultural Heritage of Surkhandarya region
11	Shurtepa	II — IV centuries	«Qorasuv» MFY	State property. Based on the right of operational management of the Department of Cultural Heritage of Surkhandarya region
12	Urdaletepa	V — VIII centuries	«Tulqin» MFY	State property. Based on the right of operational management of the Department of Cultural Heritage of Surkhandarya region
13	Tallimaron	II — IV centuries	«Homkon» MFY	State property. Based on the right of operational management of the Department of Cultural Heritage of Surkhandarya region
14	Tallimaron 2	I — V centuries	«Homkon» MFY	State property. Based on the right of operational management of the Department of Cultural Heritage of Surkhandarya region
15	Zangtepa	I — XII centuries	«Markaz» MFY	State property. Based on the right of operational management of the Department of Cultural Heritage of Surkhandarya region
16	Zartepa	I — V centuries	«Zartepa» MFY	State property. Based on the right of operational management of the Department of Cultural Heritage of Surkhandarya region
17	Tozlartepa	V — VIII centuries	«Qorabog» MFY	State property. Based on the right of operational management of the Department of Cultural Heritage of Surkhandarya region
18	Teshik tepa	I — XIII centuries	«Qadimiy Angor» MFY	State property. Based on the right of operational management of the Department of Cultural Heritage of Surkhandarya region

19	Haypabodtepa	BC III — I centuries	“Yangiturmush” MFY	State property. Based on the right of operational management of the Department of Cultural Heritage of Surkhandarya region
20	Quyovqurgon	V century	«Zartepa» MFY	State property. Based on the right of operational management of the Department of Cultural Heritage of Surkhandarya region
Architectural monuments				
21	The mausoleum of Khoja Rushnoyi	XI century	“Qorabog” MFY, Alisher Navoi Street	State property. Based on the right of operational management of the Department of Cultural Heritage of Surkhandarya region
Termez district				
Archaeological monuments				
22	Ayritom	I — IV centuries	On the border of Uzbekistan and Afghanistan	State property. Based on the right of operational management of the Department of Cultural Heritage of Surkhandarya region
23	Nomsiztepa	I — IV centuries	«Namuna» MFY Eski Termez	State property. Based on the right of operational management of the Department of Cultural Heritage of Surkhandarya region
24	Jayronkhona	I — IV centuries	«Jayronkhona» MFY	State property. Based on the right of operational management of the Department of Cultural Heritage of Surkhandarya region
25	Mirzaqultepa	BC I AD II centuries	Termez airport area «At-Termizi» MFY	State property. Based on the right of operational management of the Department of Cultural Heritage of Surkhandarya region
26	Eski Termez	BC VI- VI — XVII centuries	Eski Termez area	State property. Surkhandarya regional department of cultural heritage based on the contract of free use of the Surkhandarya regional state museum of history and culture based on the right of operative management
27	Vayrontepa	I— IV centuries	«At-Termizi» MFY	State property. Based on the right of operational management of the Department of Cultural

				Heritage of Surkhandarya region
28	Manguzartepa	I — IV centuries	Manguzartepa MFY	State property. Based on the right of operational management of the Department of Cultural Heritage of Surkhandarya region
29	Talitogora	BC VI-V centuries BC VII century	«Guliston» MFY	State property. Based on the right of operational management of the Department of Cultural Heritage of Surkhandarya region
30	Azatepa	I — V centuries	"Yangiarik" QFY	State property. Based on the right of operational management of the Department of Cultural Heritage of Surkhandarya region
31	Khujakamol	I — IV centuries	«Guliston» MFY	State property. Based on the right of operational management of the Department of Cultural Heritage of Surkhandarya region
32	Maslakhattepa	I — VIII centuries	«Istiglol» MFY	State property. Based on the right of operational management of the Department of Cultural Heritage of Surkhandarya region
33	Momokhol tepa (Kattatepa)	I — V centuries	«Amir Temur» MFY	State property. Based on the right of operational management of the Department of Cultural Heritage of Surkhandarya region
34	Khojagulsuyar	I — IV, XVIII centuries	«Gilbakhor» MFY	State property. Based on the right of operational management of the Department of Cultural Heritage of Surkhandarya region
35	Xotinrabot (Oltinsoy- 2)	II — XVIII centuries	«Gilbakhor» MFY	State property. Based on the right of operational management of the Department of Cultural Heritage of Surkhandarya region
36	Nomsiztepa	VI — VIII centuries	«Gilbakhor» MFY	State property. Based on the right of operational management of the Department of Cultural Heritage ofSurkhandarya region
37	Oltinsoy-1	The Middle Ages	«Gilbakhor» MFY	State property. Based on the right of operational management of the

				Department of Cultural Heritage ofSurkhandarya region
38	Oqtepa-1	X — XIII centuries	«Qoraxon» MFY	State property. Based on the right of operational management of the Department of Cultural Heritage ofSurkhandarya region
39	Oqtepa-2	I — XIII centuries	«Qoraxon» MFY	State property. Based on the right of operational management of the Department of Cultural Heritage ofSurkhandarya region
40	Khujakamol	I — IV centuries	“Yangiarik” QFY	State property. Based on the right of operational management of the Department of Cultural Heritage ofSurkhandarya region
41	Shamoltegirmon (Isirtepa)	I — IV centuries	«Qoraxon» MFY	State property. Based on the right of operational management of the Department of Cultural Heritage of Surkhandarya region
42	Qoraxontepa-1	I — IV centuries	«Qoraxon» MFY	State property. Based on the right of operational management of the Department of Cultural Heritage of Surkhandarya region
43	Kalta kuchki (Kichiktepa)	I — IV centuries	«Xalqobod» MFY	State property. Based on the right of operational management of the Department of Cultural Heritage of Surkhandarya region
44	Qoratepa budda temple	I — V centuries	Eski Termez (border area)	State property. Based on the right of operational management of the Department of Cultural Heritage of Surkhandarya region
45	Uzun kuchki (Torovuztepa)	I — IX centuries	Amir Temur MFY	State property. Based on the right of operational management of the Department of Cultural Heritage of Surkhandarya region
46	Fayoz tepa budda temple	I — IV centuries	«Parandachillik» MFY	State property. Based on the right of operational management of the Department of Cultural Heritage of Surkhandarya region
47	Qoraxontepa-2	I — IV centuries	«Qoraxon» MFY	State property. Based on the right of operational

				management of the Department of Cultural Heritage of Surkhandarya region
48	Oqtepa-3	VI — VIII centuries	«Qoraxon» MFY	State property. Based on the right of operational management of the Department of Cultural Heritage of Surkhandarya region
49	Oqtepa-4	VI — VIII centuries	«Qoraxon» MFY	State property. Based on the right of operational management of the Department of Cultural Heritage of Surkhandarya region
50	Kuchultepa	V-VI — XII- XIII centuries	«Xalqobod» MFY	State property. Based on the right of operational management of the Department of Cultural Heritage of Surkhandarya region
51	Maymuntuqay	I — XIII centuries	«Xalqobod» MFY	State property. Based on the right of operational management of the Department of Cultural Heritage of Surkhandarya region
Architectural monuments				
52	Muhammad Hakim Termiziy Tomb	IX — XV centuries	«Qakhramon» MFY	State property. Surkhandarya region Department of Cultural Heritage Based on the contract of free use of the complex "Al Hakim At Termizi" on the basis of the right of operative management
53	Tomb of Zul-Kifl	XI-XII centuries	Termez district is on the border	State property. Based on the right of operational management of the Department of Cultural Heritage of Surkhandarya region
54	Kokildorota dervishes`s house	XVI centuries	«Namuna» MFY	State property. Attached to the Department of Cultural Heritage of Surkhandarya region Based on the right of operative management on the basis of a contract of free use to the public charity fund "Vaqf"
55	Qirqqiz saroy	X — XIV-XV centuries	“Alisher Navoi” MFY	State property. Attached to the Department of Cultural Heritage of Surkhandarya region Based on the right of operative management on the basis

				of a contract of free use to the public charity fund "Vaqf"
56	Sultan-Saodat mausoleum complex	X — XIV-centuries	«Namuna» MFY	State property. State property. Attached to the Department of Cultural Heritage of Surkhandarya region Based on the right of operative management on the basis of a contract of free use to the public charity fund "Vaqf"
57	Turt ogiz gumbaz mausoleum	XI-XII centuries	«Dustlik» MFY	State property. Based on the right of operational management of the Department of Cultural Heritage of Surkhandarya region
58	Yeik gumbaz mausoleum	XI-XII centuries	«Istiglol» MFY	State property. Based on the right of operational management of the Department of Cultural Heritage ofSurkhandarya region
59	Kaptarkhona Tower	XI-XII centuries	«Tallashqon» MFY	State property. Based on the right of operational management of the Department of Cultural Heritage of Surkhandarya region
60	Chorgumbaz mausoleum	XI-XII centuries	«Manguzar» MFY	State property. Based on the right of operational management of the Department of Cultural Heritage of Surkhandarya region
61	Momol mosques	XVI centuries	«Amir Temur» MFY	State property. Based on the right of operational management of the Department of Cultural Heritage of Surkhandarya region
62	Katta mosques	XVI centuries	«Qoraxon» MFY	State property. Based on the right of operational management of the Department of Cultural Heritage of Surkhandarya region
63	Zormola Tower	I-II centuries	«Qakhramon» MFY	Surkhandarya regional department of cultural heritage Based on the contract of free use of the Surkhandarya regional state museum of history and culture Based on the right of operative management
64	Sultan-Saodat-2	XVI centuries	«Namuna» MFY	State property. Based on the right of operational

				management of the Department of Cultural Heritage of Surkhandarya region
65	Shohimardonota mausoleum	V - VII centuries	«Qattabog» MFY	State property. Based on the right of operational management of the Department of Cultural Heritage of Surkhandarya region
Termez city, Architectural monuments				
66	Alexander Nevsky Christian Church	XIX century	House "a" at 13 Tokhari Street	State property. Based on the right of operational management of the Department of Cultural Heritage of Surkhandarya region
67	Murchbobo mosques	1916	«Majnuntol » MFY, Sabir Termiziy street 16 house	State property. Attached to the Department of Cultural Heritage of Surkhandarya region on the basis of the right of operative management on the basis of a contract of free useto the public charity fund "Vaqf"
68	Termez Archaeological Museum	2002	Sabir At-Termizi Street	State property. Based on the right of operational management of the Department of Cultural Heritage of Surkhandarya region
69	"Governor's House" (Regional Archive Building)	XIX century	Amir Temur street 49	State property. Archive of Surkhandarya region Based on operational management
70	Communication building	XIX century	6, Lal Yuli Street, 6	State property. Based on the right of operational management of the Department of Cultural Heritage of Surkhandarya region
71	Building of Archaeological Base	1980	«Qizil Sharq» MFY	State property. Based on the right of operational management of the Department of Cultural Heritage of Surkhandarya region
72 Monumental art monuments				
73	“Alisher Navoi” monument	1992	In the center of Termez city	State property. Based on the right of operational management of the Department of Cultural Heritage of Surkhandarya region
74	Grieving Mother statue	2016	In the center of Termez city	State property. Based on the right of operational management of the Department of Cultural Heritage of Surkhandarya

				region
75	Alpomish statue	2019	In the center of Termez city	State property. Based on the right of operational management of the Department of Cultural Heritage of Surkhandarya region

ATTACHMENT E - LABORATORY ANALYZES RESULTS

УЗБЕКСКОЕ АГЕНТСТВО СТАНДАРТИЗАЦИИ, МЕТРОЛОГИИ И СЕРТИФИКАЦИИ
(АГЕНТСТВО "УЗСТАНДАРТ")

Национальная система Аккредитации Республики Узбекистан

СВИДЕТЕЛЬСТВО ОБ АККРЕДИТАЦИИ

Зарегистрировано в государственном Реестре органов по оценке соответствия

«08» августа 2017г.

№ UZ.AMT.07.MAI.429

действительно до «08» августа 2022г.

Государственное предприятие «Узбекаккредитация» удостоверяет, что комплекс испытательных лабораторий Центра специализированного аналитического контроля в области охраны окружающей среды при Государственном комитете Республики Узбекистан по экологии и охране окружающей среды (Юридический и фактический адрес: 100100, г.Ташкент, ул. Шота Руставели, дом 13а) соответствует требованиям стандарта O'z DSt ISO/IEC 17025:2007 и аккредитована на техническую компетентность и независимость в Национальной системе аккредитации Республики Узбекистан.

Область аккредитации прилагается к настоящему свидетельству.

Уполномоченное лицо Ш.Б. Алимов

М.П.

O'ZBEKISTON STANDARTLASHTIRISH, METROLOGIYA VA SERTIFIKATLASHTIRISH AGENTLIGI ("O'ZSTANDART" AGENTLIGI)

O'zbekiston Respublikasi Milliy akkreditatsiya tizimi

AKKREDITATSIYA GUVOHNOMASI

2017 yil «08» avgustda

Muvofiqlikni baholash organlarining davlat Reestrida ro'yxatdan o'tgan

№ UZ.AMT.07.MAI.429

2022 yil «08» avgustgacha amal qiladi

«O'zbekakkreditatsiya» davlat korxonasi, O'zbekiston Respublikasi ekologiya va atrof-muhitni muhofaza qilish Davlat qo'mitasi huzuridagi atrof-muhitni muhofaza qilish sohasida ixtisoslashtirilgan analitik nazorat Markazi sinov laboratoriya majmuasi (Yuridik va joylashgan manzili: 100100, Toshkent shahri, Shota Rustaveli ko'chasi, 13a-uy) O'zbekiston Respublikasi Milliy akkreditatsiya tizimida O'z DSt ISO/IEC 17025:2007 standarti talablariga muvofiq texnik omilkorlik va mustaqillikka akkreditatsiya qilinganligini tasdiqlaydi.

Akkreditatsiya doirasi ushbu guvohnomaga ilova qilingan.

Vakolatli shaxs Sh.B. Alimov

M.O'.

«УТВЕРЖДАЮ»
Директор ЦСАК при
Госкомэкологии
_____ Файзиев Р.Х.
«07» 06 2021 г.

ПРОТОКОЛ ИЗМЕРЕНИЙ № 134
на 3-х страницах

анализ проб атмосферного воздуха с точек наблюдения участка планируемого строительства теплоэлектростанции в Сурхандарьинской области
(название проводимого измерения)

Наименование лаборатории отдел мониторинга источников выбросов в атмосферный воздух Центра специализированного аналитического контроля в области охраны окружающей среды при Госкомэкологии (ЦСАК), 100100 г.Ташкент, ул.Ш.Руставели 13[a], тел. 71-207-02-09, csak@uznature.uz. Номер аттестата аккредитации № UZ.AMT.07.MAI.429 от 08.08.2017г.
(адрес, телефон, факс, номер аттестата аккредитации)

Наименование заказчика ООО "YUKSAK MUSAFFO TABIAT", 100100, Республика Узбекистан, г. Ташкент, Юнусабадский р-н, 17-квартал, д. 12, кв. 63.
(адрес, телефон, факс)

Обозначение и данные маркировки объекта измерения пробы атмосферного воздуха на участке планируемого строительства теплоэлектростанции в Сурхандарьинской области, точка А-01. Координаты N 37°20'58.29" E 67° 11'36.42". Отбор проб произведён 10-16.07.2021 г.
(номер партии, номер образца, дата изготовления и получении, дата отбора)

Цель, задачи измерений изучение состояния воздушной среды в зоне проекта строительства теплоэлектростанции в Сырдарьинской области.

НД на методы измерений МИП 03897485.001:2019. Рабочая методика проведения испытаний с использованием автоматических газоанализаторов ЭКОЛАБ для контроля атмосферного воздуха.

НД и план на объекты измерений СанПиН №0293-11

Условия проведения измерений измерения проводились на точке наблюдения А-01, условия в которой соответствуют предъявляемым требованиям (температура окружающей среды – 27,0 - 42,0 °С; атм.давление - 723 – 728 мм.рт.ст.)
(температура, влажность, другие окружающие условия)

Измерения, проведённые субподрядчиком

Результаты проведенных исследований по определению содержания основных загрязняющих веществ в атмосферном воздухе в зоне проекта строительства теплоэлектростанции в Сурхандарьинской области, точка наблюдений А-01.

Наименование параметров	Значение параметров (требований)		Соответствие параметров (требований)
	По НД и фон	Фактически	
10.07.2021 г., утро			
CO	5,0	0,53	Соответствует
NO_2	0,085	0,00	Соответствует
SO_2	0,5	0,00	Соответствует
10.07.2021 г., день			
CO	5,0	0,00	Соответствует
NO_2	0,085	0,00	Соответствует
SO_2	0,5	0,00	Соответствует
10.07.2021 г., вечер			
CO	5,0	0,00	Соответствует
NO_2	0,085	0,00	Соответствует
SO_2	0,5	0,185	Соответствует
11.07.2021 г., утро			
CO	5,0	0,00	Соответствует
NO_2	0,085	0,00	Соответствует
SO_2	0,5	0,00	Соответствует
11.07.2021 г., день			
CO	5,0	0,00	Соответствует
NO_2	0,085	0,00	Соответствует
SO_2	0,5	0,00	Соответствует
11.07.2021 г., вечер			
CO	5,0	0,00	Соответствует
NO_2	0,085	0,00	Соответствует
SO_2	0,5	0,479	Соответствует
12.07.2021 г., утро			
CO	5,0	0,00	Соответствует
NO_2	0,085	0,00	Соответствует
SO_2	0,5	0,00	Соответствует
12.07.2021 г., день			
CO	5,0	0,00	Соответствует
NO_2	0,085	0,00	Соответствует
SO_2	0,5	0,079	Соответствует
12.07.2021 г., вечер			
CO	5,0	0,00	Соответствует
NO_2	0,085	0,00	Соответствует
SO_2	0,5	0,406	Соответствует
13.07.2021 г., утро			
CO	5,0	0,00	Соответствует
NO_2	0,085	0,00	Соответствует
SO_2	0,5	0,00	Соответствует
13.07.2021 г., день			
CO	5,0	0,00	Соответствует

"ЗАРЕГИСТРИРОВАН"
Отдел ЭСМиКИП
Ф.И.О. Насриддинова
Подпись
"04" 08 2021 г.

NO_2	0,085	0,00	Соответствует
SO_2	0,5	0,00	Соответствует
13.07.2021 г., вечер			
CO	5,0	0,00	Соответствует
NO_2	0,085	0,00	Соответствует
SO_2	0,5	0,389	Соответствует
14.07.2021 г., утро			
CO	5,0	0,00	Соответствует
NO_2	0,085	0,00	Соответствует
SO_2	0,5	0,003	Соответствует
14.07.2021 г., день			
CO	5,0	0,00	Соответствует
NO_2	0,085	0,00	Соответствует
SO_2	0,5	0,00	Соответствует
14.07.2021 г., вечер			
CO	5,0	0,00	Соответствует
NO_2	0,085	0,00	Соответствует
SO_2	0,5	0,384	Соответствует
15.07.2021 г., утро			
CO	5,0	0,00	Соответствует
NO_2	0,085	0,00	Соответствует
SO_2	0,5	0,317	Соответствует
15.07.2021 г., день			
CO	5,0	0,00	Соответствует
NO_2	0,085	0,00	Соответствует
SO_2	0,5	0,04	Соответствует
15.07.2021 г., вечер			
CO	5,0	0,00	Соответствует
NO_2	0,085	0,00	Соответствует
SO_2	0,5	0,867	Не соответствует
16.07.2021 г., утро			
CO	5,0	0,00	Соответствует
NO_2	0,085	0,00	Соответствует
SO_2	0,5	0,327	Соответствует
16.07.2021 г., день			
CO	5,0	0,00	Соответствует
NO_2	0,085	0,00	Соответствует
SO_2	0,5	0,00	Соответствует
16.07.2021 г., вечер			
CO	5,0	0,00	Соответствует
NO_2	0,085	0,00	Соответствует
SO_2	0,5	0,00	Соответствует

Дата проведения измерений 10 16. 07.2021г.

Ответственное лицо за измерения (нач.отдела) Колесникова И.В.

Измерения проводила(вед.специалист) Королёва Е.Д.

"ЗАРЕГИСТРИРОВАН"
Дата выпуска протокола 4.08.2021
Ф.И.О.
Подпись
"04" 08 2021 г.

Результаты проведенных исследований по определению запыленности в атмосферном воздухе в зоне проекта строительства теплоэлектростанции в Сурхандарьинской области, точка наблюдений А-01.

Наименование параметров	Значение параметров (требований)		Соответствие параметров (требований)
	По НД и фон	Фактически	
10.07.2021 г., утро			
пыль	0,5	0,310	Соответствует
NO	0,6	0,00	Соответствует
10.07.2021 г., день			
пыль	0,5	0,067	Соответствует
NO	0,6	0,00	Соответствует
10.07.2021 г., вечер			
пыль	0,5	0,069	Соответствует
NO	0,6	0,00	Соответствует
11.07.2021 г., утро			
пыль	0,5	0,201	Соответствует
NO	0,6	0,00	Соответствует
11.07.2021 г., день			
пыль	0,5	0,076	Соответствует
NO	0,6	0,00	Соответствует
11.07.2021 г., вечер			
пыль	0,5	0,017	Соответствует
NO	0,6	0,00	Соответствует
12.07.2021 г., утро			
пыль	0,5	0,151	Соответствует
NO	0,6	0,00	Соответствует
12.07.2021 г., день			
пыль	0,5	0,079	Соответствует
NO	0,6	0,00	Соответствует
12.07.2021 г., вечер			
пыль	0,5	0,085	Соответствует
NO	0,6	0,00	Соответствует
13.07.2021 г., утро			
пыль	0,5	0,110	Соответствует
NO	0,6	0,00	Соответствует
13.07.2021 г., день			
пыль	0,5	0,049	Соответствует
NO	0,6	0,00	Соответствует
13.07.2021 г., вечер			
пыль	0,5	0,079	Соответствует
NO	0,6	0,00	Соответствует
14.07.2021 г., утро			
пыль	0,5	0,067	Соответствует
NO	0,6	0,00	Соответствует
14.07.2021 г., день			
пыль	0,5	0,00	Соответствует
NO	0,6	0,00	Соответствует
14.07.2021 г., вечер			
пыль	0,5	0,022	Соответствует
NO	0,6	0,00	Соответствует

15.07.2021 г., утро			
пыль	0,5	0,048	Соответствует
NO	0,6	0,00	Соответствует
15.07.2021 г., день			
пыль	0,5	0,056	Соответствует
NO	0,6	0,00	Соответствует
15.07.2021 г., вечер			
пыль	0,5	0,026	Соответствует
NO	0,6	0,00	Соответствует
16.07.2021 г., утро			
пыль	0,5	0,085	Соответствует
NO	0,6	0,00	Соответствует
16.07.2021 г., день			
пыль	0,5	0,234	Соответствует
NO	0,6	0,00	Соответствует
16.07.2021 г., вечер			
пыль	0,5	0,037	Соответствует
NO	0,6	0,00	Соответствует

Дата проведения измерений 10 - 16. 07.2021г.

Ответственное лицо за измерения (вед.спец.)  Королёва Е.Д.

«УТВЕРЖДАЮ»
Директор ЦСАК при
Госкомэкологии
_____ Файзиев Р.Х.
«01» 06 2021 г.

ПРОТОКОЛ ИЗМЕРЕНИЙ № 135
на 3-х страницах

анализ проб атмосферного воздуха с точек наблюдения участка планируемого строительства теплоэлектростанции в Сурхандарьинской области
(название проводимого измерения)

Наименование лаборатории отдел мониторинга источников выбросов в атмосферный воздух Центра специализированного аналитического контроля в области охраны окружающей среды при Госкомэкологии (ЦСАК). 100100 г.Ташкент, ул.Ш.Руставели 13[a], тел. 71-207-02-09. csak@uznature.uz. Номер аттестата аккредитации № UZ.AMT.07.MA1.429 от 08.08.2017г.
(адрес, телефон, факс, номер аттестата аккредитации)

Наименование заказчика ООО "YUKSAK MUSAFFO TABIAT", 100100. Республика Узбекистан, г. Ташкент, Юнусабадский р-н, 17-квартал, д. 12, кв. 63.
(адрес, телефон, факс)

Обозначение и данные маркировки объекта измерения пробы атмосферного воздуха на участке планируемого строительства теплоэлектростанции в Сурхандарьинской области, точка А-02. Координаты N 37°22'53.43" E 67° 13'38.52". Отбор проб произведён 10-16.07.2021 г.
(номер партии, номер образца, дата изготовления и получении, дата отбора)

Цель, задачи измерений изучение состояния воздушной среды в зоне проекта строительства теплоэлектростанции в Сырдарьинской области.

НД на методы измерений МИ11 03897485.001:2019. Рабочая методика проведения испытаний с использованием автоматических газоанализаторов ЭКОЛАБ для контроля атмосферного воздуха.

НД и план на объекты измерений СанПиН №0293-11

Условия проведения измерений измерения проводились на точке наблюдения А-01, условия в которой соответствуют предъявляемым требованиям (температура окружающей среды – 29.0 - 43.0 °С; атм.давление – 722 – 728 мм.рт.ст.)
(температура, влажность, другие окружающие условия)

Измерения, проведённые субподрядчиком

Результаты проведенных исследований по определению содержания основных загрязняющих веществ в атмосферном воздухе в зоне проекта строительства теплоэлектростанции в Сурхандарьинской области, точка наблюдений А-02.

Наименование параметров	Значение параметров (требований)		Соответствие параметров (требований)
	По НД и фон	Фактически	
10.07.2021 г., утро			
CO	5,0	1,36	Соответствует
NO_2	0,085	0,00	Соответствует
SO_2	0,5	0,00	Соответствует
10.07.2021 г., день			
CO	5,0	0,00	Соответствует
NO_2	0,085	0,00	Соответствует
SO_2	0,5	0,401	Соответствует
10.07.2021 г., вечер			
CO	5,0	0,00	Соответствует
NO_2	0,085	0,00	Соответствует
SO_2	0,5	0,318	Соответствует
11.07.2021 г., утро			
CO	5,0	0,00	Соответствует
NO_2	0,085	0,00	Соответствует
SO_2	0,5	0,00	Соответствует
11.07.2021 г., день			
CO	5,0	0,00	Соответствует
NO_2	0,085	0,00	Соответствует
SO_2	0,5	0,00	Соответствует
11.07.2021 г., вечер			
CO	5,0	0,00	Соответствует
NO_2	0,085	0,00	Соответствует
SO_2	0,5	0,113	Соответствует
12.07.2021 г., утро			
CO	5,0	0,00	Соответствует
NO_2	0,085	0,00	Соответствует
SO_2	0,5	0,00	Соответствует
12.07.2021 г., день			
CO	5,0	0,00	Соответствует
NO_2	0,085	0,00	Соответствует
SO_2	0,5	0,00	Соответствует
12.07.2021 г., вечер			
CO	5,0	0,00	Соответствует
NO_2	0,085	0,00	Соответствует
SO_2	0,5	0,257	Соответствует
13.07.2021 г., утро			
CO	5,0	0,00	Соответствует
NO_2	0,085	0,388	Не соответствует
SO_2	0,5	0,00	Соответствует
13.07.2021 г., день			
CO	5,0	0,00	Соответствует

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NO_2	0,085	0,00	Соответствует
SO_2	0,5	0,180	Соответствует
13.07.2021 г., вечер			
CO	5,0	0,00	Соответствует
NO_2	0,085	0,00	Соответствует
SO_2	0,5	0,129	Соответствует
14.07.2021 г., утро			
CO	5,0	0,00	Соответствует
NO_2	0,085	0,00	Соответствует
SO_2	0,5	0,00	Соответствует
14.07.2021 г., день			
CO	5,0	0,00	Соответствует
NO_2	0,085	0,00	Соответствует
SO_2	0,5	0,00	Соответствует
14.07.2021 г., вечер			
CO	5,0	0,00	Соответствует
NO_2	0,085	0,00	Соответствует
SO_2	0,5	0,077	Соответствует
15.07.2021 г., утро			
CO	5,0	0,00	Соответствует
NO_2	0,085	0,00	Соответствует
SO_2	0,5	0,00	Соответствует
15.07.2021 г., день			
CO	5,0	0,00	Соответствует
NO_2	0,085	0,00	Соответствует
SO_2	0,5	0,207	Соответствует
15.07.2021 г., вечер			
CO	5,0	0,00	Соответствует
NO_2	0,085	0,00	Соответствует
SO_2	0,5	0,898	Не соответствует
16.07.2021 г., утро			
CO	5,0	0,00	Соответствует
NO_2	0,085	0,00	Соответствует
SO_2	0,5	0,00	Соответствует
16.07.2021 г., день			
CO	5,0	0,00	Соответствует
NO_2	0,085	0,00	Соответствует
SO_2	0,5	0,00	Соответствует
16.07.2021 г., вечер			
CO	5,0	0,00	Соответствует
NO_2	0,085	0,00	Соответствует
SO_2	0,5	0,00	Соответствует

Дата проведения измерений 10 16. 07.2021г.

Ответственное лицо за измерения (нач.отдела) Колесникова Н.В.

Измерения проводила(вед.специалист) Королёва Е.Д.

"ЗАРЕГИСТРИРОВАН"
Дата выпуска протокола 04.08.2021
Ф.И.О.
Подпись
"04" 08 2021 г.

Результаты проведенных исследований по определению запыленности в атмосферном воздухе в зоне проекта строительства теплоэлектростанции в Сурхандарьинской области, точка наблюдений А-02.

Наименование параметров	Значение параметров (требований)		Соответствие параметров (требований)
	По НД и фон	Фактически	
10.07.2021 г., утро			
пыль	0,5	0,519	Соответствует
NO	0,6	0,00	Соответствует
10.07.2021 г., день			
пыль	0,5	0,306	Соответствует
NO	0,6	0,00	Соответствует
10.07.2021 г., вечер			
пыль	0,5	0,240	Соответствует
NO	0,6	0,00	Соответствует
11.07.2021 г., утро			
пыль	0,5	0,276	Соответствует
NO	0,6	0,00	Соответствует
11.07.2021 г., день			
пыль	0,5	0,072	Соответствует
NO	0,6	0,00	Соответствует
11.07.2021 г., вечер			
пыль	0,5	0,110	Соответствует
NO	0,6	0,00	Соответствует
12.07.2021 г., утро			
пыль	0,5	0,123	Соответствует
NO	0,6	0,00	Соответствует
12.07.2021 г., день			
пыль	0,5	0,039	Соответствует
NO	0,6	0,00	Соответствует
12.07.2021 г., вечер			
пыль	0,5	0,122	Соответствует
NO	0,6	0,00	Соответствует
13.07.2021 г., утро			
пыль	0,5	0,108	Соответствует
NO	0,6	0,204	Соответствует
13.07.2021 г., день			
пыль	0,5	0,069	Соответствует
NO	0,6	0,00	Соответствует
13.07.2021 г., вечер			
пыль	0,5	0,714	Не соответствует
NO	0,6	0,00	Соответствует
14.07.2021 г., утро			
пыль	0,5	0,068	Соответствует
NO	0,6	0,00	Соответствует
14.07.2021 г., день			
пыль	0,5	0,045	Соответствует
NO	0,6	0,00	Соответствует
14.07.2021 г., вечер			
пыль	0,5	0,139	Соответствует
NO	0,6	0,00	Соответствует

15.07.2021 г., утро			
пыль	0,5	0,044	Соответствует
NO	0,6	0,00	Соответствует
15.07.2021 г., день			
пыль	0,5	0,031	Соответствует
NO	0,6	0,00	Соответствует
15.07.2021 г., вечер			
пыль	0,5	0,019	Соответствует
NO	0,6	0,00	Соответствует
16.07.2021 г., утро			
пыль	0,5	0,201	Соответствует
NO	0,6	0,00	Соответствует
16.07.2021 г., день			
пыль	0,5	0,391	Соответствует
NO	0,6	0,00	Соответствует
16.07.2021 г., вечер			
пыль	0,5	0,121	Соответствует
NO	0,6	0,00	Соответствует

Дата проведения измерений 10 – 16. 07.2021г.

Ответственное лицо за измерения (вед.спец.) _____ Королёва Е.Д.

«УТВЕРЖДАЮ»
Директор ЦСАК при
Госкомэкологии
_____ Файзиев Р.Х.
«08» 08 2021 г.

ПРОТОКОЛ ИЗМЕРЕНИЙ № 136
на 3-х страницах

анализ проб атмосферного воздуха с точек наблюдения участка планируемого строительства теплоэлектростанции в Сурхандарьинской области
(название проводимого измерения)

Наименование лаборатории отдел мониторинга источников выбросов в атмосферный воздух Центра специализированного аналитического контроля в области охраны окружающей среды при Госкомэкологии (ЦСАК), 100100 г.Ташкент, ул.Ш.Руставели 13[a], тел. 71-207-02-09, csak@uznature.uz. Номер аттестата аккредитации № UZ.AMT.07.MAI.429 от 08.08.2017г.
(адрес, телефон, факс, номер аттестата аккредитации)

Наименование заказчика ООО "YUKSAK MUSAFFO TABIAT". 100100, Республика Узбекистан, г. Ташкент, Юнусабадский р-н. 17-квартал, д. 12, кв. 63.
(адрес, телефон, факс)

Обозначение и данные маркировки объекта измерения пробы атмосферного воздуха на участке планируемого строительства теплоэлектростанции в Сурхандарьинской области, точка А-03. Координаты N 37°20'42.20" E 67° 13'22.06". Отбор проб произведён 10-16.07.2021 г.
(номер партии, номер образца, дата изготовления и получения, дата отбора)

Цель, задачи измерений изучение состояния воздушной среды в зоне проекта строительства теплоэлектростанции в Сырдарьинской области.

НД на методы измерений МИП 03897485.001:2019. Рабочая методика проведения испытаний с использованием автоматических газоанализаторов ЭКОЛАБ для контроля атмосферного воздуха.

НД и план на объекты измерений СанПиН №0293-11

Условия проведения измерений измерения проводились на точке наблюдения А-01, условия в которой соответствуют предъявляемым требованиям (температура окружающей среды – 21,4 - 41.0 °С: атм.давление - 722 - 726 мм.рт.ст.)
(температура, влажность, другие окружающие условия)

Измерения, проведённые субподрядчиком

Результаты проведенных исследований по определению содержания основных загрязняющих веществ в атмосферном воздухе в зоне проекта строительства теплоэлектростанции в Сурхандарьинской области, точка наблюдений А-03.

Наименование параметров	Значение параметров (требований)		Соответствие параметров (требований)
	По НД и фон	Фактически	
10.07.2021 г., утро			
CO	5,0	0,00	Соответствует
NO_2	0,085	0,00	Соответствует
SO_2	0,5	0,00	Соответствует
10.07.2021 г., день			
CO	5,0	0,00	Соответствует
NO_2	0,085	0,00	Соответствует
SO_2	0,5	0,00	Соответствует
10.07.2021 г., вечер			
CO	5,0	0,00	Соответствует
NO_2	0,085	0,00	Соответствует
SO_2	0,5	0,270	Соответствует
11.07.2021 г., утро			
CO	5,0	0,00	Соответствует
NO_2	0,085	0,00	Соответствует
SO_2	0,5	0,00	Соответствует
11.07.2021 г., день			
CO	5,0	0,00	Соответствует
NO_2	0,085	0,00	Соответствует
SO_2	0,5	0,00	Соответствует
11.07.2021 г., вечер			
CO	5,0	0,00	Соответствует
NO_2	0,085	0,00	Соответствует
SO_2	0,5	0,216	Соответствует
12.07.2021 г., утро			
CO	5,0	0,00	Соответствует
NO_2	0,085	0,00	Соответствует
SO_2	0,5	0,00	Соответствует
12.07.2021 г., день			
CO	5,0	0,00	Соответствует
NO_2	0,085	0,00	Соответствует
SO_2	0,5	0,00	Соответствует
12.07.2021 г., вечер			
CO	5,0	0,00	Соответствует
NO_2	0,085	0,00	Соответствует
SO_2	0,5	0,00	Соответствует
13.07.2021 г., утро			
CO	5,0	0,00	Соответствует
NO_2	0,085	0,00	Не соответствует
SO_2	0,5	0,00	Соответствует
13.07.2021 г., день			
CO	5,0	0,00	Соответствует

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NO_2	0,085	0,00	Соответствует
SO_2	0,5	0,092	Соответствует
13.07.2021 г., вечер			
CO	5,0	0,00	Соответствует
NO_2	0,085	0,00	Соответствует
SO_2	0,5	1,290	Не соответствует
14.07.2021 г., утро			
CO	5,0	0,00	Соответствует
NO_2	0,085	0,00	Соответствует
SO_2	0,5	0,512	Соответствует
14.07.2021 г., день			
CO	5,0	0,00	Соответствует
NO_2	0,085	0,00	Соответствует
SO_2	0,5	0,234	Соответствует
14.07.2021 г., вечер			
CO	5,0	0,00	Соответствует
NO_2	0,085	0,00	Соответствует
SO_2	0,5	0,710	Не соответствует
15.07.2021 г., утро			
CO	5,0	0,00	Соответствует
NO_2	0,085	0,00	Соответствует
SO_2	0,5	0,337	Соответствует
15.07.2021 г., день			
CO	5,0	0,00	Соответствует
NO_2	0,085	0,00	Соответствует
SO_2	0,5	0,308	Соответствует
15.07.2021 г., вечер			
CO	5,0	0,00	Соответствует
NO_2	0,085	0,00	Соответствует
SO_2	0,5	0,443	Не соответствует
16.07.2021 г., утро			
CO	5,0	0,00	Соответствует
NO_2	0,085	0,00	Соответствует
SO_2	0,5	0,885	Не соответствует
16.07.2021 г., день			
CO	5,0	0,00	Соответствует
NO_2	0,085	0,00	Соответствует
SO_2	0,5	0,00	Соответствует
16.07.2021 г., вечер			
CO	5,0	0,00	Соответствует
NO_2	0,085	0,00	Соответствует
SO_2	0,5	0,00	Соответствует

Дата проведения измерений 10 – 16. 07.2021г.

Ответственное лицо за измерения (нач.отдела) _____ Колесникова Н.В.

Измерения проводила(вед.специалист) _____ Королёва Е.Д.

Дата выпуска протокола 04.08.2021

"ЗАРЕГИСТРИРОВАН"
Отдел ЭСМиКИП
Ф.И.О. _____
Подпись _____
"04" 08 2021 г.

Результаты проведенных исследований по определению запыленности в атмосферном воздухе в зоне проекта строительства теплоэлектростанции в Сурхандарьинской области, точка наблюдений А-03.

Наименование параметров	Значение параметров (требований)		Соответствие параметров (требований)
	По НД и фон	Фактически	
10.07.2021 г., утро			
пыль	0,5	0,530	Соответствует
NO	0,6	0,00	Соответствует
10.07.2021 г., день			
пыль	0,5	0,610	Не соответствует
NO	0,6	0,00	Соответствует
10.07.2021 г., вечер			
пыль	0,5	0,082	Соответствует
NO	0,6	0,00	Соответствует
11.07.2021 г., утро			
пыль	0,5	0,103	Соответствует
NO	0,6	0,00	Соответствует
11.07.2021 г., день			
пыль	0,5	0,050	Соответствует
NO	0,6	0,00	Соответствует
11.07.2021 г., вечер			
пыль	0,5	0,055	Соответствует
NO	0,6	0,00	Соответствует
12.07.2021 г., утро			
пыль	0,5	0,142	Соответствует
NO	0,6	0,00	Соответствует
12.07.2021 г., день			
пыль	0,5	0,081	Соответствует
NO	0,6	0,00	Соответствует
12.07.2021 г., вечер			
пыль	0,5	0,054	Соответствует
NO	0,6	0,00	Соответствует
13.07.2021 г., утро			
пыль	0,5	0,083	Соответствует
NO	0,6	0,00	Соответствует
13.07.2021 г., день			
пыль	0,5	0,066	Соответствует
NO	0,6	0,00	Соответствует
13.07.2021 г., вечер			
пыль	0,5	0,036	Соответствует
NO	0,6	0,00	Соответствует
14.07.2021 г., утро			
пыль	0,5	0,098	Соответствует
NO	0,6	0,00	Соответствует
14.07.2021 г., день			
пыль	0,5	0,020	Соответствует
NO	0,6	0,00	Соответствует
14.07.2021 г., вечер			
пыль	0,5	0,015	Соответствует
NO	0,6	0,00	Соответствует

15.07.2021 г., утро			
пыль	0,5	0,076	Соответствует
NO	0,6	0,00	Соответствует
15.07.2021 г., день			
пыль	0,5	0,015	Соответствует
NO	0,6	0,00	Соответствует
15.07.2021 г., вечер			
пыль	0,5	0,019	Соответствует
NO	0,6	0,00	Соответствует
16.07.2021 г., утро			
пыль	0,5	0,151	Соответствует
NO	0,6	0,00	Соответствует
16.07.2021 г., день			
пыль	0,5	0,508	Соответствует
NO	0,6	0,00	Соответствует
16.07.2021 г., вечер			
пыль	0,5	0,015	Соответствует
NO	0,6	0,00	Соответствует

Дата проведения измерений 10 – 16. 07.2021г.

Ответственное лицо за измерения (вед.спец.)  Королёва Е.Д.

А К Т №
отбора проб (образцов)

от «10» июля 20 21 г.

Настоящий акт составлен о том, что при обследовании представителями ЦСАК при Госкомэкологии РУз Ахмедов И. Г гл спец отдела ЧС и РЭМ
(наименование предприятия, организации, ЭЛ)
гл спец отдела МСВ и ГБК Мамиров Д и гл спец отдела МЗП и ХИ Каюмов З
(должность, фамилия, инициалы)
и организации ООО YUKSAK MUSAFFO TABIAT
(наименование предприятия, организации)

(должность, фамилия, инициалы)
произведен отбор проб (образца) атмосферного воздуха
(наименование среды: вода, воздух, почва, донные отложения и т.д.)

для проверки на соответствие требованиям СанПиН 0293-11
(наименование НД)

условия окружающей среды t - 36-40°C Рат - 723-726 мм Hg ст.
(температура, pH-среда, влажность и т.д.)

№ п/п	Место отбора проб (образца)	Объем, количество	Ед. измерения
1.	А-01 сад рядом с поселком 300 м		
2.	от башни сотовой связи N 37°20'58.29"	3	мг/м³
3.	E = 67°11'36.42"		
4.	А-02 поселок Каптакули N 37°22'53.95"	3	мг/м³
5.	E 67°13'38.52"		
6.	А-03 бывший санатории 15-20 м от		
7.	берега водохранилища N 37°20'42.20"	3	мг/м³
8.	E 67°13'22.06		
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Представители: _____ Ахмедов И. Г.
(подпись) (Ф.И.О.)
_____ Мамиров Д
(подпись) (Ф.И.О.)
_____ Каюмов З
(подпись) (Ф.И.О.)

С актом ознакомлен:
_____ _____
(подпись) (Ф.И.О.)

АКТ №
отбора проб (образцов)

от «11» июля 2021 г.

Настоящий акт составлен о том, что при обследовании представителями ЦСАК при Госкомэкологии РУз, гл. спец. отдела ЧС и РЭМ Ахмедов И.Г.
(наименование предприятия, организации, ЭАЛ)
гл. спец. отдела МСВ и ГБК Мамиров Д. и вед. специалист отдела МЗП и ХИ Кошмов З.
(должность, фамилия, инициалы)
и организации ООО YUKSAK MUSAFFO TABIAT
(наименование предприятия, организации)

(должность, фамилия, инициалы)
произведен отбор проб (образца) атмосферного воздуха
(наименование среды: вода, воздух, почва, донные отложения и т.д.)

для проверки на соответствие требованиям СанПиН 0293-11
(наименование НД)

условия окружающей среды t 27-42°C, Ратм 727 мм H_g ст.
(температура, рН-среда, влажность и т.д.)

№ п/п	Место отбора проб (образца)	Объем, количество	Ед. измерения
1.	А-01, сад рядом с поселком 300м		
2.	от вышки сотовой связи N37°20'58.29"	3	м3/м³
3.	E 67°11'36.42"		
4.	А-02 поселок Каттакишлак N37°22'53.43"	3	м/м³
5.	E67°13'38.52"		
6.	А-03 бывший санаторий 15-20м от		
7.	берега водохранилища N37°20'42.20'	3	м/м³
8.	E67°13'22.06"		
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Представители: (подпись) Ахмедов И.Г. (Ф.И.О.)
(подпись) Мамиров Д. (Ф.И.О.)
(подпись) Кошмов З. (Ф.И.О.)

С актом ознакомлен: (подпись) (Ф.И.О.)

А К Т №
отбора проб (образцов)

от «12» июля 2021 г.

Настоящий акт составлен о том, что при обследовании представителями ЦСАК при Госкомэкологии РУз, гл. спец. отдела ЧС и РЭМ Ахмедов И.Г.
(наименование предприятия, организации, ЭАЛ)
гл спец отдела МСВ и ГБК Мамиров Д., гл спец отдела МЗП и ХИ Каюмов З
(должность, фамилия, инициалы)
и организации ООО YUKSAK MUSAFFO TABIAT
(наименование предприятия, организации)

(должность, фамилия, инициалы)
произведен отбор проб (образца) атмосферного воздуха
(наименование среды: вода, воздух, почва, донные отложения и т.д.)

для проверки на соответствие требованиям СанПиН 0293-11
(наименование НД)

условия окружающей среды t 29-40°C Ратм 723-726 мм Hg ст.
(температура, pH-среда, влажность и т.д.)

№ п/п	Место отбора проб (образца)	Объем, количество	Ед. измерения
1.	А-01, сев. граница с поселком 300 м		
2.	от башни сотовой связи N 37°20'58.29'	3	мг/м³
3.	E 67°11'34.42"		
4.	А-02 поселок Коттеджный N 37°22'53.43'	3	мг/м³
5.	E 67°13'38.52"		
6.	А-03 бывший санаторий 15-20 м от		
7.	берега водохранилища N 37°20'42.20'	3	мг/м³
8.	E 67°13'22.06"		
9.			
10.			
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16			

Представители: _____ (подпись) Ахмедов И.Г. (Ф.И.О.)

_____ (подпись) Мамиров Д (Ф.И.О.)

_____ (подпись) Каюмов З (Ф.И.О.)

С актом ознакомлен:

_____ (подпись) _____ (Ф.И.О.)

А К Т №
отбора проб (образцов)

от «13» июля 20 21 г.

Настоящий акт составлен о том, что при обследовании представителями UCAK при Госкомэкологии РУз гл спец отдела ЧС и РЭМ Ахмедов И.Г
(наименование предприятия, организации, ЭАЛ)
гл специалист отдел МСВ и СБК Мамиров Д и гл спец отдел МЗПи ХИ Комил З
(должность, фамилия, инициалы)
и организации ООО YUKSAK MUSAFFO TABIAT
(наименование предприятия, организации)
(должность, фамилия, инициалы)
произведен отбор проб (образца) атмосферного воздуха
(наименование среды: вода, воздух, почва, донные отложения и т.д.)
для проверки на соответствие требованиям СанПиН 0293-11
(наименование НД)
условия окружающей среды t 27-39°C Рамм 723-725 мм Hg ст.
(температура, pH-среда, влажность и т.д.)

№ п/п	Место отбора проб (образца)	Объем, количество	Ед. измерения
1.	А-01 сад рядом с поселком 300 м		
2.	от бывш санатой связи N 37°20'58.27"	3	мг/м³
3.	E 67°11'36.42"		
4.	А-02 поселок Каттачуп N 37°22'53.43"	3	мг/м³
5.	E 67°13'38.52"		
6.	А-03 бывший санаторий 15-20 м от		
7.	берега водохранилища N 37°20'42.20"	3	мг/м³
8.	E 67°13'22.06"		
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Представители: _____ Ахмедов И.Г.
(подпись) (Ф.И.О.)
_____ Мамиров Д
(подпись) (Ф.И.О.)
_____ Комил З
(подпись) (Ф.И.О.)

С актом ознакомлен:
_____ _____
(подпись) (Ф.И.О.)

А К Т №
отбора проб (образцов)
от «14» июля 20 21 г.

Настоящий акт составлен о том, что при обследовании представителями ЦСАК при Госкомэкологии РУз гл. спец. отдела АС и РЭМ Ахмедов И.Г
(наименование предприятия, организации, ЭАЛ)
гл. спец. отдела МСВ и ГБК Мамиров Д. и гл. спец. отдела МЗП и ХИ Каюмов З
(должность, фамилия, инициалы)
и организации ООО YUKSAK MUSAFFO TABIAT
(наименование предприятия, организации)

(должность, фамилия, инициалы)
произведен отбор проб (образца) атмосферного воздуха
(наименование среды: вода, воздух, почва, донные отложения и т.д.)

для проверки на соответствие требованиям СанПиН 0273-11
(наименование НД)

условия окружающей среды t - 26-42°C Ратм 722-724 мм Hg ст.
(температура, pH-среда, влажность и т.д.)

№ п/п	Место отбора проб (образца)	Объем, количество	Ед. измерения
1.	А-01 северная с поселком 300 м от		
2.	башни сотовой связи N 37°20'58.29"	3	мг/м³
3.	E 67°11'36.42"		
4.	А02 пос. Кантаури N 37°22'53.43"	3	мг/м³
5.	E 67°13'38.52"		
6.	А-03 бывший санаторий 0-20 м от берега	3	мг/м³
7.	водохранилища N 37°20'42.20" E 67°13'22.06"		
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Представители: _____ Ахмедов И.Г.
(подпись) (Ф.И.О.)
_____ Мамиров Д
(подпись) (Ф.И.О.)
_____ Каюмов З
(подпись) (Ф.И.О.)

С актом ознакомлен:
_____ _____
(подпись) (Ф.И.О.)

А К Т №
отбора проб (образцов)
от «15» июля 20 21 г.

Настоящий акт составлен о том, что при обследовании представителями ЦСАК при Госкомэкологии РУз гл. спец. отдела ЧС и РЭМ Ахмедов И.Г
(наименование предприятия, организации, ЭАЛ)
гл. спец. отдела МСВ и СБК Мамиров Д. и гл. спец. отдела МЗП и ХИ Комил З
(должность, фамилия, инициалы)
и организации ООО YUKSAK MUSAFFO TABIAT
(наименование предприятия, организации)
(должность, фамилия, инициалы)
произведен отбор проб (образца) атмосферного воздуха
(наименование среды: вода, воздух, почва, донные отложения и т.д.)
для проверки на соответствие требованиям СанПиН 0293-11
(наименование НД)
условия окружающей среды t 29-41°C Ратм 725 мм Hg ст.
(температура, pH-среда, влажность и т.д.)

№ п/п	Место отбора проб (образца)	Объем, количество	Ед. измерения
1.	А-01 сад перед с посадкой 300 м от воинской	3	мг/м³
2.	сотовой связи №37°20'58.27" Е67°11'36.72"		
3.	А02 пос. Катрашуи №37°22'53.43" Е67°13'38.52"	3	мг/м³
4.	А03 в зоне санаторий 15-20 м от берега		
5.	водохранилища №37°20'42.20" Е67°13'22.06"	3	мг/м³
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Представители:
(подпись) Ахмедов И.Г. (Ф.И.О.)
(подпись) Мамиров Д (Ф.И.О.)
(подпись) Комил З (Ф.И.О.)

С актом ознакомлен:
(подпись) (Ф.И.О.)

АКТ №
отбора проб (образцов)

от «16» июля 20 21 г.

Настоящий акт составлен о том, что при обследовании представителями ЦСАК при Госкомэкологии РУз гл. специалист отдела ЧС и РЭМ Ахмедов И.Г.
(наименование предприятия, организации. ЭАЛ)
гл спец отдела МСВ и ГБК Мамурил Д и гл спец отдела МЗП и ХИ Котлов З
(должность, фамилия, инициалы)
и организации ООО YUKSAK MUSAFFO TABIAT
(наименование предприятия, организации)

(должность, фамилия, инициалы)
произведен отбор проб (образца) атмосферного воздуха
(наименование среды: вода, воздух, почва, донные отложения и т.д.)

для проверки на соответствие требованиям СанПиН 0293-11
(наименование НД)

условия окружающей среды t 26-35°C Рамм 724-727 мм Hg ст.
(температура, pH-среда, влажность и т.д.)

№ п/п	Место отбора проб (образца)	Объем, количество	Ед. измерения
1.	А-01 сад рядом с поселком 300м		
2.	от бывших складов слева	3	мг/м³
3.	N 37°20'58.29" E 67°11'36.42"		
4.	А-02 поселок Кантакули	3	мг/м³
5.	N 37°22'53.43" E 67°13'38.52"		
6.	А-03 бывший санаторий		
7.	15-20 м от берега водохранилища	3	мг/м³
8.	N 37°20'42.20" E 67°13'.22.06		
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15.			
16			

Представители: _____ (подпись) Ахмедов И.Г. (Ф.И.О.)

_____ (подпись) Мамурил Д (Ф.И.О.)

_____ (подпись) Котлов З (Ф.И.О.)

С актом ознакомлен:

_____ (подпись) _____ (Ф.И.О.)

СИСТЕМА ОБЕСПЕЧЕНИЯ ЕДИНСТВА ИЗМЕРЕНИЙ
РЕСПУБЛИКИ УЗБЕКИСТАН

Узбекское агентство стандартизации, метрологии и сертификации
(агентство "Узстандарт")

ГП «Узбекский национальный институт метрологии»

СЕРТИФИКАТ ПОВЕРКИ
СРЕДСТВА ИЗМЕРЕНИЙ

№ 0904853

Действителен до «02» 06 2022 г.

Настоящий сертификат удостоверяет, что средство измерений
Атом-абсорбционный спектрометр «AA-6501 S» сер. №A3031-327
с метрологическими характеристиками Диапазон измерения
от 190 до 900 нм и с погрешностью ± 1 %
изготовленное (импортированное) «SHIMADZU»
ЯПОНИЯ
принадлежащее Dav. ekologiya qumitasi huzur. AMMQSITNM
поверенное ГП «УзНИМ»
в соответствии с QU 09-307:2016
с использованием ГСО состава ионов металлов
соответствует требованиям ТД фирмы изготовителя

и допущено к применению в сфере распространения государственного метрологического контроля и надзора.

Дата поверки «02» 06 2021 г.

Поверитель

А 0923552

СИСТЕМА ОБЕСПЕЧЕНИЯ ЕДИНСТВА ИЗМЕРЕНИЙ
РЕСПУБЛИКИ УЗБЕКИСТАН

Узбекское агентство стандартизации, метрологии и сертификации
(агентство "Узстандарт")

ГП «Узбекский национальный институт метрологии»

СЕРТИФИКАТ ПОВЕРКИ
СРЕДСТВА ИЗМЕРЕНИЙ

№ 0900897

Действителен до «09» 02 2022 г.

Настоящий сертификат удостоверяет, что средство измерений
Фотометр фотоэлектрический КФК – 3-01 № 1970344
с метрологическими характеристиками Диапазон измерения
от 5% до 100%; СКО – 0,5%
изготовленное (импортированное) ЮМТ
Россия
принадлежащее ЦСАК при Госкомэкологии РУз
поверенное ГП «УзНИМ» отдел 09
в соответствии с ГОСТ 8.298-2013
с использованием КС 100
соответствует требованиям Тех. док. фирмы-изготовителя

и допущено к применению в сфере распространения государственного метрологического контроля и надзора.

Дата поверки «09» 02 2021 г.

Поверитель Г.С.Гулимова

А 0804596

СИСТЕМА ОБЕСПЕЧЕНИЯ ЕДИНСТВА ИЗМЕРЕНИЙ
РЕСПУБЛИКИ УЗБЕКИСТАН

Узбекское агентство стандартизации, метрологии и сертификации
(агентство "Узстандарт")

ГП «Узбекский национальный институт метрологии»

СЕРТИФИКАТ ПОВЕРКИ
СРЕДСТВА ИЗМЕРЕНИЙ

№ 0900896

Действителен до «09» 02 2022 г.

Настоящий сертификат удостоверяет, что средство измерений
Газоанализатор – «Колаб» сер.№ 142
с метрологическими характеристиками Диапазон измерения
см. в паспорте
изготовленное (импортированное) ООО «Экобиохим»
Россия
принадлежащее ЦСАК при Госкомэкологии РУз
поверенное ГП «УзНИМ» отдел 09
в соответствии с ГОСТ 8.618-2013
с использованием ПГС
соответствует требованиям ГОСТ 13320-81

и допущено к применению в сфере распространения государственного метрологического контроля и надзора.

Дата поверки «09» 02 2021 г.

Поверитель Г.С.Гулимова

А 0804595

СИСТЕМА ОБЕСПЕЧЕНИЯ ЕДИНСТВА ИЗМЕРЕНИЙ РЕСПУБЛИКИ УЗБЕКИСТАН

Узбекское агентство стандартизации, метрологии и сертификации (агентство "Узстандарт")

ГП «Узбекский национальный институт метрологии»

СЕРТИФИКАТ ПОВЕРКИ
СРЕДСТВА ИЗМЕРЕНИЙ

№ 0910920

Действителен до 25 . 12 . 2021 г.

Настоящий сертификат удостоверяет, что средство измерений pH-метр модели «pH-150МИ» сер.№ 4006

с метрологическими характеристиками Диапазон изм. от минус 1 до 14,00 pH и с погрешностью ± 0,05 pH

изготовленное (импортированное) «Измерительная техника» Россия

принадлежащее ИТНМ

поверенное ГП «УзНИМ»

в соответствии с O'z DSt 8.042:2015

с использованием Стандартные буферные растворы

соответствует требованиям ГОСТ 27987-88

и допущено к применению в сфере распространения государственного метрологического контроля и надзора.

Дата поверки 25 . 12 . 20 20 г.

Поверитель

А 0767225

СИСТЕМА ОБЕСПЕЧЕНИЯ ЕДИНСТВА ИЗМЕРЕНИЙ РЕСПУБЛИКИ УЗБЕКИСТАН

Узбекское агентство стандартизации, метрологии и сертификации (агентство "Узстандарт")

ГП «Узбекский национальный институт метрологии»

СЕРТИФИКАТ ПОВЕРКИ
СРЕДСТВА ИЗМЕРЕНИЙ

№ 0904844

Действителен до « 02 » 06 20 22 г.

Настоящий сертификат удостоверяет, что средство измерений pH- метр модели «PHS-3c» сер. № 110001923139

с метрологическими характеристиками Диапазон измерения от 0,0 до 14,00 pH с погрешностью ± 0,02 pH

изготовленное (импортированное) «KELIE» Китай

принадлежащее Dav. ekologiya qumitasi xuzur. AMMQSITNM

поверенное ГП «УзНИМ»

в соответствии с O'zDSt 8.042:2015

с использованием Стандартные буферные растворы

соответствует требованиям ГОСТ 27987-88

и допущено к применению в сфере распространения государственного метрологического контроля и надзора.

Дата поверки « 02 » 06 20 21 г.

Поверитель

А 0923543

СИСТЕМА ОБЕСПЕЧЕНИЯ ЕДИНСТВА ИЗМЕРЕНИЙ РЕСПУБЛИКИ УЗБЕКИСТАН

Узбекское агентство стандартизации, метрологии и сертификации (агентство "Узстандарт")

ГП «Узбекский национальный институт метрологии»

СЕРТИФИКАТ ПОВЕРКИ
СРЕДСТВА ИЗМЕРЕНИЙ

№ 0904843

Действителен до « 02 » 06 20 22 г.

Настоящий сертификат удостоверяет, что средство измерений Анализатор жидкого кислорода «JPSJ-605» сер. № 110001923201

с метрологическими характеристиками Диапазон измерения от 0,0 до 22,00 mg/l, с погрешностью ± 1,0 %

изготовленное (импортированное) «KELIE» Китай

принадлежащее Dav. ekologiya qumitasi xuzur. AMMQSITNM

поверенное ГП «УзНИМ»

в соответствии с QU 09-321:2016

с использованием Стандартные растворы фирмы изготовителя

соответствует требованиям ГОСТ 27987-88

и допущено к применению в сфере распространения государственного метрологического контроля и надзора.

Дата поверки « 02 » 06 20 21 г.

Поверитель

А 0923542

СИСТЕМА ОБЕСПЕЧЕНИЯ ЕДИНСТВА ИЗМЕРЕНИЙ
РЕСПУБЛИКИ УЗБЕКИСТАН

Узбекское агентство стандартизации, метрологии и сертификации
(агентство "Узстандарт")

ГП «Узбекский национальный институт метрологии»

СЕРТИФИКАТ ПОВЕРКИ
СРЕДСТВА ИЗМЕРЕНИЙ

№ 0901852

Действителен до «02» 06 20 22 г.

Настоящий сертификат удостоверяет, что средство измерений
Фотоэлектроколориметр модели «КФК-3» сер. № 9007221

с метрологическими характеристиками Диапазон измерения
от 0 до 100 % с погрешностью ± 1 %

изготовленное (импортированное) «г. Загорск ОМЗ»
России

принадлежащее Dav. ekologiya qumitasi xuzur. AMMQSITNM

поверенное ГП «УзНИМ»

в соответствии с QU 11-323:2016

с использованием Светофильтров КНФ-1

соответствует требованиям ГОСТ 8.298-2013

и допущено к применению в сфере распространения государственного метрологического контроля и надзора.

Дата поверки «02» 06 20 21 г.

UZB 281 OT

Поверитель

А 0923551

СИСТЕМА ОБЕСПЕЧЕНИЯ ЕДИНСТВА ИЗМЕРЕНИЙ
РЕСПУБЛИКИ УЗБЕКИСТАН

Узбекское агентство стандартизации, метрологии и сертификации
(агентство "Узстандарт")

ГП «Узбекский национальный институт метрологии»

СЕРТИФИКАТ ПОВЕРКИ
СРЕДСТВА ИЗМЕРЕНИЙ

№ 0904851

Действителен до «02» 06 20 22 г.

Настоящий сертификат удостоверяет, что средство измерений
Фотоэлектроколориметр модели «КФК-3» сер. № 9202188

с метрологическими характеристиками Диапазон измерения
от 0 до 100 % с погрешностью ± 1 %

изготовленное (импортированное) «г. Загорск ОМЗ»
России

принадлежащее Dav. ekologiya qumitasi xuzur. AMMQSITNM

поверенное ГП «УзНИМ»

в соответствии с QU 11-323:2016

с использованием Светофильтров КНФ-1

соответствует требованиям ГОСТ 8.298-2013

и допущено к применению в сфере распространения государственного метрологического контроля и надзора.

Дата поверки «02» 06 20 21 г.

UZB 281 OT

Поверитель

А 0923550

СИСТЕМА ОБЕСПЕЧЕНИЯ ЕДИНСТВА ИЗМЕРЕНИЙ
РЕСПУБЛИКИ УЗБЕКИСТАН

Узбекское агентство стандартизации, метрологии и сертификации (агентство "Узстандарт")

ГП «УЗБЕКСКИЙ НАЦИОНАЛЬНЫЙ ИНСТИТУТ МЕТРОЛОГИИ»

наименование юридического лица, проводившего поверку

СЕРТИФИКАТ ПОВЕРКИ
СРЕДСТВА ИЗМЕРЕНИЙ

№ 1071/05

Действителен до
«30» 03 2022 г.

Настоящий сертификат удостоверяет, что средство измерений
Шумомер ШУМ-1М30 № 11171
(наименование и обозначение средства измерений, заводской номер)
с метрологическими характеристиками Частотный диапазон (31,5 Hz – 8 kHz)
(наименование параметра,
Точность 1,5 dB
пределы измерений, погрешности, класс точности средства измерений)
изготовленное (импортированное)
Россия
(юридическое лицо-изготовитель,
юридическое лицо-изготовитель, страна импортер средства измерений)
принадлежащее ЦСАК при Госкомэкологии РУз
(юридическое лицо-владелец средства измерений)
поверенное ГП «УзНИМ»
(наименование юридического лица, поверившего средство измерений)
в соответствии с ГОСТ 8.257-84
(обозначение и наименование нормативного документа по поверке)
с использованием 00090; 4231; Г3-120; В7-27; Ч3-57; С1-117
(обозначение и наименование эталонов, образцовых средств измерений, дата их поверки)
соответствует требованиям ГОСТ 17187-81
(обозначение и наименование нормативного документа,
Руководства по эксплуатации, раздел «Технические характеристики».
описания типа средств измерений, регламентирующего требования к средству измерений)
и допущено к применению в сфере распространения государственного метрологического контроля и надзора.

Дата поверки «30» 03 2021 г.

отпск поверительного клейма

Поверитель Гашева Л.Б

А 0845680

«УТВЕРЖДАЮ»
Директор
ЦСАК в области охраны
окружающей среды
при Госкомэкологии РУз
_____ Файзиев Р.Х.
«__» 08 2021 г.

ПРОТОКОЛ ИЗМЕРЕНИЙ №132

на 3-х страницах

Химический анализ поверхностных вод речки на западной части участка (SW-02), водохранилище Учкызыл (SW-01) и подземных вод поселка Каттакум, дом 24 (UW-01)

(название проводимого эксперемента)

Наименование лаборатории Центр специализированного аналитического контроля в области охраны окружающей среды (ЦСАК) при Госкомэкологии РУз 100100 г. Ташкент, ул. Ш.Руставели 13 А, тел.:2070209, e-mail: anidi@uznature.uz. UZ.AMT.07.MAI. 429 от 08.08.2017 г.

(адрес, телефон, факс, номер аттестата аккредитации)

Наименование заказчика ООО «YUKSAK MUSAFFO TABIAT», г.Ташкент. Юнусабадский район. 17-ий квартал , дом 12, кв.61

(адрес, телефон, факс)

Обозначение и данные маркировки объекта измерения поверхностные воды речки на западной части участка (SW-02), водохранилище Учкызыл (SW-01) и подземные воды поселка Каттакум, дом 24 (UW-01). Дата отбора проб от 16.07.2021 г. и доставки от 17.07.2021 г.

(номер партии, номер образца, дата изготовления и получения, дата отбора)

Цель, задачи измерений соответствие результатов требованиям ПДК

НД на объекты измерений Oz O'U 0117:1999, Oz O'U 07. 0144.01:2000, Oz O'U 07.0171:2001, Oz O'U 0482:2009, Oz O'U 07.0265:2005, Oz O'U 0413:2009, Oz O'U 0418:2009, Oz O'U 0422:2009, O'U 07.0495:2010, Oz O'U 0502:2010, Oz O'U 0503:2010, Oz O'U 0508:2010, Oz O'U 0522:2011, Oz O'U 0556:2012, Oz O'U 07.0676:2015, Oz O'U 0696:2015, Oz O'U 0705:2016, , Oz O'U 0706:2016, Oz O'U 0744:2016

НД и план на методы измерений ГОСТ 31861-2012 «Вода. Общие требования к отбору проб».

Условия проведения измерений t=21-25°С, влажность 51-59 %

(температура, влажность и другие окружающие условия)

Измерения, проведенные субподрядчиком -

Результаты проведения измерений (поверхностные воды)

Наименование параметров (требований)	Значение параметров (требований)			соответствие параметров (требований)
	По НД	Фактически		
		SW-02	SW-01	
1	2	3	4	5
pH не более	6,5-8,5	8,33	8,44	соответствует
Взвешенные вещества, мг/л не более	15	378,6	172,0	не соответствует
Азот нитритный, мг/л более	0,02	0.012	0,012	соответствует
Азот нитратный, мг/л не более	9,1	1.36	не обн.	соответствует
Хлориды, мг/л не более	300	85,96	361,0	не соответствует гр.4
Сульфаты, мг/л не более	100	133,0	290,0	не соответствует
Фосфаты, мг/л не более	0,3	не обн.	не обн.	соответствует
Минерализация, мг/л не более	1000	532,0	1160.0	не соответствует гр.4
Цианиды, мг/л не более	0,05	не обн.	не обн.	соответствует
Сероводород, мг/л не более	отс.	0,0022	0,0058	не соответствует
Алюминий, мг/л не более	0,2	не обн.	0,01	соответствует
Барий, мг/л не более	2,0	не обн.	не обн.	соответствует
Кадмий, мг/л не более	0,001	0,00275	0,00361	не соответствует
Железо, мг/л не более	0,05	0,144	0,0954	не соответствует
Марганец, мг/л не более	0,05	0,0213	0,00421	соответствует
Медь, мг/л не более	0,001	0,00296	0,00206	не соответствует
Никель, мг/л не более	0,01	0,0043	0,0076	соответствует
Ртуть, мг/л не более	0.00001	не обн.	не обн.	соответствует
Свинец, мг/л не более	0,01	0,0103	0,0109	не соответствует
Хром (3), мг/л не более	-	0,00128	0,00071	-
Хром (6), мг/л не более	0,001	0,001	не обн.	соответствует
Цинк, мг/л не более	0,01	0,0092	0,0088	соответствует

"ЗАРЕГИСТРИРОВАН"
Отдел ЭСМиКИП
Ф.И.О. Кашириновое
Подпись
"02" 08 2021 г.

Результаты проведения измерений (подземные воды)

Наименование параметров (требований)	Значение параметров (требований)		Соответствие параметров (требований)
	По НД	Фактически	
		UW-01	
1	2	3	4
pH не более	6,5-8,5	8,13	соответствует
Взвешенные вещества, мг/л не более	-	194	-
Азот нитритный, мг/л более	-	0,009	-
Азот нитратный, мг/л не более	10,1	не обн.	соответствует
Хлориды, мг/л не более	250	343,86	не соответствует
Сульфаты, мг/л не более	400	338,8	соответствует
Фосфаты, мг/л не более	3,5	0,08	соответствует
Минерализация, мг/л не более	1000	1 694	не соответствует
Цианиды, мг/л не более	0,035	не обн.	соответствует
Сероводород, мг/л не более	отс.	не обн.	соответствует
Алюминий, мг/л не более	0,20	0,011	соответствует
Барий, мг/л не более	0,10	не обн.	соответствует
Кадмий, мг/л не более	0,001	0,0058	не соответствует
Железо, мг/л не более	0,3	0,101	соответствует
Марганец, мг/л не более	0,10	0,0237	соответствует
Медь, мг/л не более	1,0	0,00535	соответствует
Никель, мг/л не более	0,1	0,0115	соответствует
Ртуть, мг/л не более	0,0005	не обн.	соответствует
Свинец, мг/л не более	0,03	0,0186	соответствует
Хром (+3), мг/л не более	-	0,000036	-
Хром (+6), мг/л не более	0,05	не обн.	соответствует
Цинк, мг/л не более	3,0	0,00998	соответствует

Дата проведения измерений 17.07-24.07.2021 г.

Ответственное лицо за измерение (нач.отдела) Мадалиева С.Х. _____
(Ф.И.О., подпись)

Измерения проводил Мамиров Д.Т. _____
(Ф.И.О., подпись)

Полякова Н.С. _____
(Ф.И.О., подпись)

Дата выпуска протокола 02.08.2021г

"ЗАРЕГИСТРИРОВАН"
Отдел ЭСМиКИП
Ф.И.О. Шарипжанова
Подпись _____
"02" 08 2021 г.

Результаты химического анализа поверхностных вод

Пробы отобраны 16.07.2021 и доставлены 17.07.2021 г.

Наименование параметров (требований)	Значение параметров (требований)			Соответствие параметров (требований)
	По НД	Фактически		
		SW-02	SW-01	
1	2	3	4	5
Азот аммоний, мг/л не более	0,39	не обн.	не обн.	соответствует
ХПК, мг0/л не более	15	24,0	160,0	не соответствует
$БПК_5$, мг0/л не более	3	2,16	14,4	не соответствует гр.4
Натрий, мг/л не более	120,0	105,550	140,85	не соответствует гр.4
Калий, мг/л не более	50	65,20	76,73	не соответствует
Ванадий, мг/л не более	0,001	не обн.	не обн.	Соответствует

Результаты химического анализа подземных вод махалля Катта-кум, дом 24

Пробы отобраны 16.07.2021 и доставлены 17.07.2021 г.

Наименование параметров (требований)	Значение параметров (требований)		Соответствие параметров (требований)
	По НД	Фактически	
		Подземные воды, махалля Катта-кум, дом 24 (UW-01)	
1	2		
Азот аммоний, мг/л не более	-	не обн.	-
ХПК, мг0/л не более	-	26,4	-
$БПК_5$, мг0/л не более	-	2,37	-
Калий, мг/л не более	-	49,71	-
Натрий, мг/л не более	-	73,90	-
Ванадий, мг/л не иболее	-	не обн.	-

Дата проведения измерений 17.07-24.07.2021 г.

Ответственное лицо за измерение (нач.отдела) Мадалиева С.Х. (Ф.И.О., подпись)

Измерения проводил

Полякова Н.С. (Ф.И.О., подпись)

Мамиров Д.Г. (Ф.И.О., подпись)

Дата выпуска 02.08.2021 г.

Приложение (вода)

Акт № 66/3
отбора проб (образцов)

от «16» 07 2021 г.

Настоящий акт составлен о том, что при обследовании представителям

ИСАК при госкомэкологии Р Уз
(наименование предприятия, организации, ЗАД)
гл. спец Маматов Д.Г.
(должность, фамилия, инициалы)

и организации Сурхандарья
(наименование предприятия, организации)

(должность, фамилия, инициалы)

произведен отбор проб (образца)
(наименование среды: вода, воздух, почва, донные отложения и т.д.)

для проверки на соответствие требованиям ГОСТ 31861-2012
(наименование НД)

условия окружающей среды
(температура, pH-среда, влажность и т.д.)

№ п/п	Место отбора проб (образца)	Объем, количество	Ед. измерения
1	Подземние вода	3	л
2	Река вход в водохранилище	3	л
3	Вода хранилище уз кизек	3	л

Представители: (подпись) Маматов Д (Ф.И.О.)

(подпись) Ахмедов М (Ф.И.О.)

(подпись) Каюмов З (Ф.И.О.)

С актом ознакомлен:

(подпись) (Ф.И.О.)

«УТВЕРЖДАЮ»
Директор ЦСАК при Госкомэкологии
_____ Файзиев Р.Х.
«27» июля 2021 г.

ПРОТОКОЛ ИЗМЕРЕНИЙ № 131

на 4-х страницах

Определение содержания pH, гумуса, нефтепродуктов, тяжелых металлов, сульфатов, нитратов, хлоридов в почве и в донных отложениях
(название проводимого эксперемента)

Наименование лаборатории: Центр специализированного аналитического контроля в области охраны окружающей среды при Госкомэкологии РУз (ЦСАК), 100100 г. Ташкент, ул. Ш. Руставели 13а, тел.: 255-08-67, факс: 255-23-89, e-mail: anidi@uznature.uz (csak@uznature.uz). № UZ.AMT.07.MAI. 429 от 08.08.2017 г.
(адрес, телефон, факс, номер аттестата аккредитации)

Наименование заказчика г. Ташкент, Юнусабадский район, 17-квартал, дом-12, кв-63.
(адрес, телефон, факс)

Обозначение и данные маркировки объекта измерения 4-пробы почвы и 2-пробы донные отложения с территории Сурхандарьинской области ООО «YUKSAK MUSAFFO TABIAT». Дата отбора проб 12-16.07.2021 г. Дата поступления проб 16.07.2021г.
(номер партии, номер образца, дата изготовления и получения, дата отбора)

Цель, задачи измерений соответствие СанПиН РУз № 0191-05 или фоновым значениям

НД и план на объекты измерений ГОСТ 28168-89 «Почвы. Отбор проб», СанПиН РУз № 0191-05 «Предельно допустимые концентрации (ПДК) и ориентировочно допустимые концентрации (ОДК) экзогенных вредных веществ в почве». ГОСТ 17.1.5.01-80 «Охрана природы. Гидросфера. Общие требования к отбору проб донных отложений на загрязненность водных объектов для анализа».

НД на методы измерений O'z O'U 0750:2017 (Нп); O'z O'U 0482:2009 (свинец); O'z O'U 0502:2010 (кадмий); O'z O'U 0475:2009 (железо); O'z O'U 0510:2010 (хром); O'z O'U 0422:2009 (ртуть); O'z O'U 290:2006 (цинк, медь, никель и марганец); O'z O'U 0521:2011 (мышьяк); O'z O'U 0485:2010 (селен); O'z O'U 07.0142:2000 (хром); O'z O'U 0595:2013 (нитраты); ГОСТ 26423-85 (pH); ГОСТ 26428-85 (кальций, магний); ГОСТ 26213-91 (гумус); ГОСТ 26426-85 (сульфаты); ГОСТ 26425-85 (хлориды); ГОСТ26485-85 (алюминий).

Условия проведения измерений Температура t 25^{0}C, влажность 58 %
(температура, влажность, другие окружающие условия)

Измерения, проведенные субподрядчиком –

Результаты проведения измерений pH, гумуса, нефтепродуктов, тяжелых металлов, сульфатов, нитратов, хлоридов в почве и в донных отложениях

№	Наименование параметров (требований)		Значение параметров (требований)		Соответствие параметров (требований)
			по СанПиН РУз № 0191-05 или фоновым значениям (mg/kg)	фактически (mg/kg)	
1	**Проба № S-1** **№ $37^{0}22'39,3''$, Е $67^{0}15'02,4$**	НП	0,082	0,090	Соответствует
		Pb	32,0	41,724	Не соответствует
		As	2,0	н/о	Соответствует
		Se	0,129	0,155	Не соответствует
		Cd	2,028	1,172	Соответствует
		Zn	52,720	37,100	Соответствует
		Cu	10,074	11,056	Не соответствует
		Ni	19,028	16,572	Соответствует
		Hg	2,1	0,00137	Соответствует
		Cr(3)	6,644	9,532	Не соответствует
		Cr(6)	0,98	1,35	Не соответствует
		Fe	10332,00	11811,00	Не соответствует
		Al	3,37	3,21	Соответствует
		NO_3	130,0	15,2	Соответствует
		SO_4 %	0,016	0,024	Не соответствует
		Cl %	0,0028	0,0042	Не соответствует
		pH	7,80	7,45	Соответствует
		Гумус %	0,72	0,57	Соответствует
		Ca %	0,010	0,018	Не соответствует
		Mg %	0,008	0,015	Не соответствует
2	**Проба № S-2** **№ $37^{0}23'20.6''$, Е $67^{0}14'21.8$**	НП	0,082	0,060	Соответствует
		Pb	32,0	5,640	Соответствует
		As	2,0	0,515	Соответствует
		Se	0,129	0,271	Не соответствует
		Cd	2,028	1,076	Соответствует
		Zn	52,720	36,600	Соответствует
		Cu	10,074	7,938	Соответствует
		Ni	19,028	13,454	Соответствует
		Hg	2,1	н/о	Соответствует
		Cr(3)	6,644	6,640	Соответствует
		Cr(6)	0,98	1,04	Не соответствует
		Fe	10332,00	10185,00	Соответствует
		Al	3,37	2,94	Соответствует
		NO_3	130,0	14,0	Соответствует
		SO_4	0,016	0,021	Не соответствует
		Cl	0,0028	0,0060	Не соответствует
		pH	7,80	7,52	Соответствует
		Гумус %	0,72	0,62	Соответствует
		Ca %	0,010	0,026	Не соответствует
		Mg %	0,008	0,017	Не соответствует
3	**Проба № S-3** **№ $37^{0}21'05.3''$, Е $67^{0}14'59.7$**	НП	0,082	0,138	Не соответствует
		Pb	32,0	6,050	Соответствует
		As	2,0	0,981	Соответствует
		Se	0,129	0,179	Не соответствует

"ЗАРЕГИСТРИРОВАН"
Отдел ЭСМиКИП
Ф.И.О.
Подпись
" " 20 г.

№	Наименование параметров (требований)		Значение параметров (требований)		Соответствие параметров (требований)
			по СанПиН РУз № 0191-05 или фоновым значениям (mg/kg)	фактически (mg/kg)	
		Cd	2,028	1,260	Соответствует
		Zn	52,720	35,000	Соответствует
		Cu	10,074	8,942	Соответствует
		Ni	19,028	13,460	Соответствует
		Hg	2,1	н/о	Соответствует
		Cr(3)	6,644	6,990	Не соответствует
		Cr(6)	0,98	1,25	Не соответствует
		Fe	10332,00	12092,00	Не соответствует
		Al	3,37	2,56	Соответствует
		NO_3	130,0	22,5	Соответствует
		SO_4	0,016	0,020	Не соответствует
		Cl	0,0028	0,0060	Не соответствует
		pH	7,80	7,45	Соответствует
		Гумус %	0,72	0,68	Соответствует
		Ca %	0,0100	0,014	Не соответствует
		Mg %	0,0080	0,012	Не соответствует
4	**Проба № S-4 (Фон) № 37021/13.2//, E 67012/40.2**	НП	-	0,082	-
		Pb	32,0	9,748	Соответствует
		As	2,0	0,107	Соответствует
		Se	-	0,129	-
		Cd	-	2,028	-
		Zn	-	52,720	-
		Cu	-	10,074	-
		Ni	-	19,028	-
		Hg	2,1	н/о	Соответствует
		Cr(3)	-	6,644	-
		Cr(6)	-	0,98	-
		Fe	-	10332,00	
		Al	-	3,37	
		NO_3	130,0	12,0	Соответствует
		SO_4 %	0,016	0,068	Не соответствует
		Cl %	-	0,0028	-
		pH	-	7,80	-
		Гумус %	-	0,72	-
		Ca %	-	0,0100	-
		Mg %	-	0,0080	-

Результаты проведения измерений pH, гумуса, нефтепродуктов, тяжелых металлов, сульфатов, нитратов, хлоридов в почве и в донных отложениях

	Наименование параметров (требований)	Значение параметров (требований)		Соответствие параметров (требований)
		по СанПиН РУз № 0191-05 или фоновыз начениям (mg/kg)	фактически mg/kg	
5	**Проба № BS-1 донные отложения № 37022/26.7", 67014/48.2 (водохранилище «Уч кизил»)**			
	pH	-	7,95	-
	Гумус %	-	0,53	-
	Ca %	-	0,010	-
	Mn	1500,0	538,040	Соответствует
	Mg %	-	0,0072	-
	Ni	-	23,004	-
	Zn	-	60,120	-
	Cu	-	16,390	-
	Cr(3)	-	7,568	-
	Cd	-	1,786	-
	Hg	2,1	0,0193	Соответствует
	Pb	32,0	17,708	Соответствует
	Fe	-	14674,000	-
	As	2,0	1,282	Соответствует
	SO_4 %	0,016	0,019	Не соответствует
	Cl %	-	0,0042	-
	NO_3	130,0	7,5	Соответствует
6	**Проба № BS-2 донные отложения № 37°22'40.2", 67°14'32.7 (канал)**			
	pH	-	8,58	-
	Гумус %	-	0,74	-
	Ca %	-	0,011	-
	Mn	1500,0	433,400	Соответствует
	Mg %	-	0,0084	-
	Ni	-	25,252	-
	Zn	-	47,840	-
	Cu	-	16,870	-
	Cr(3)	-	14,221	-
	Cd	-	1,810	-
	Hg	2,1	0,00337	Соответствует
	Pb	32,0	7,278	Соответствует
	Fe	-	14315,000	-
	As	2,0	1,003	Соответствует
	SO_4%	0,016	0,021	Не соответствует
	Cl %	-	0,0049	-
	NO_3	130,0	10,8	Соответствует

Дата проведения измерений 19.23-24.26.07. 2021 г.

Ответственное лицо за измерение (нач. отдела) Полякова Н.С. [подпись]
Ф.И.О. (подпись)

Измерения проводил Полякова Н.С. [подпись] Ролянова Л.В. [подпись]
Ф.И.О. (подпись)

Дата выпуска протокола 27.07.2021 г.

ЗАРЕГИСТРИРОВАН
Отдел ЭСМиКИП
Ф.И.О. Хайриддинова
Подпись [подпись]
"27" 07 2021 г.

Результаты проведения измерений
проб почв и донных отложений с территории мониторинга
ООО «YUKSAK MUSAFFO TABIAT» Сурхандарьинской области РУз

Дата отбора – 12-16.07.2021 г. Дата поступления – 16.07.2021 г.

№	Наименование параметров (требований)		Значение параметров (требований)		Соответствие параметров (требований)
			По фону mg/kg	Фактически mg/kg	
1	Проба № S-4 (Фон) № 37°21'13.2", E 67°12'40.2				
		Co	ПДК отсутствует	6,040	-
		Na	ПДК отсутствует	46,5	-
2	Проба № S-1 № 37°22'39,3", E 67°15'02,4				
		Co	6,040	4,644	Соответствует
		Na	46,5	53,1	Не соответствует
3	Проба № S-2 № 37°23'20.6", E 67°14'21,8				
		Co	6,040	3,804	Соответствует
		Na	46,5	69,0	Не соответствует
4	Проба № S-3 № 37°21'05.3", E 67°14'59,7				
		Co	6,040	4,204	Соответствует
		Na	46,5	55,0	Не соответствует
5	Проба № BS-1 донные отложения № 37°22'26.7", 67°14'48,2 (водохранилище «Уч кизил»)				
		Na	ПДК отсутствует	244,625	-
		K	ПДК отсутствует	55,250	-
6	Проба № BS-2 донные отложения № 37°22'40.2", 67°14'32.7 (канал)				
		Na	ПДК отсутствует	79,375	-
		K	ПДК отсутствует	26,615	-

Дата проведения измерений 19.23-24.26.07. 2021 г.

Ответственное лицо за измерение (нач. отдела) Полякова Н.С.
Ф.И.О. (подпись)

Измерения проводил Полякова Н.С. Рольянова Л.В.
Ф.И.О. (подпись)

АКТ № 66/1
отбора проб (образцов)
от «12» июля 2021 г.

Настоящий акт составлен о том, что при обследовании представителями ИГАИС, гл спец ОИЗП и КИ Каюмов З.Г. и гл спец ИСВ и ГБК Маширов Д.Г.
(наименование предприятия, организации, ЭАЛ)
(должность, фамилия, инициалы)

и организации С актом ознакомлен представитель
(наименование предприятия, организации)
ООО "Yuksak Musaffo tabiat"
(должность, фамилия, инициалы)

произведен отбор проб (образца) почва ГОСТ 28168-89
(наименование среды: вода, воздух, почва, донные отложения и т.д.)

для проверки на соответствие требованиям СанПиН РУз № 0191-05
(наименование НД)

условия окружающей среды
(температура, атмосферное давление и т.д.)

№ п/п	Место отбора проб (образца)	Объем, количество	Ед. измерени.
1	Проба № S-1 N37°22'39.3" E67°15'02.4"	0,5	кг
2	Проба № S-2 N37°23'29.6" E67°14'21.8"	0,5	кг
3	Проба № S-3 N37°21'05.3" E67°14'59.7"	0,5	кг
4	Проба № S-4 (Фон) N37°21'13.2" E67°12'40.2"	0,5	кг

Представители: (подпись) Каюмов З.Г. (Ф.И.О)

(подпись) Маширов Д.Г. (Ф.И.О)

(подпись) (Ф.И.О)

С актом ознакомлен: (подпись) (Ф.И.О)

АКТ № 66/2
отбора проб (образцов)
от «16» июля 2021 г.

Настоящий акт составлен о том, что при обследовании представителям ЦСАНС, гл. спец. ОИЗП и М Каюмов З.Г
(наименование предприятия, организации, ЭАЛ)
и гл. спец. ИСВ и ГБК Маширов Д.Г
(должность, фамилия, инициалы)
и организации Г. ...
(наименование предприятия, организации)
ООО "Yuksak Musaffo tabiat"
(должность, фамилия, инициалы)

произведен отбор проб (образца) донные отложения
/ ГОСТ 17.1.5.01-80 /
(наименование среды: вода, воздух, почва, донные отложения и т.д.)

для проверки на соответствие требованиям СанПиН РУз № 0191-05
(наименование НД) Гост 017.1.5.01-80

условия окружающей среды
(температура, атмосферное давление и т.д.)

№ п/п	Место отбора проб (образца)	Объем, количество	Ед. измерения
1	Проба № BS-1	0,5	кг
	Водохранилище "Уз..."		
	N 37°22'26.7" E 67°14'48.2"		
2.	Проба № BS-2	0,5	кг
	канал		
	N 37°22'40.2" E 67°14'32.7"		

Представители: _[подпись]_ (подпись) Каюмов З.Г (Ф.И.О)

[подпись] (подпись) Маширов Д.Г (Ф.И.О)

(подпись) (Ф.И.О)

С актом ознакомлен: (подпись) (Ф.И.О)

СИСТЕМА ОБЕСПЕЧЕНИЯ ЕДИНСТВА ИЗМЕРЕНИЙ
РЕСПУБЛИКИ УЗБЕКИСТАН

Узбекское агентство стандартизации, метрологии и сертификации
(агентство "Узстандарт")

ГП «Узбекский национальный институт метрологии»

СЕРТИФИКАТ ПОВЕРКИ
СРЕДСТВА ИЗМЕРЕНИЙ

№ 0904853

Действителен до «02» 06 2022 г.

Настоящий сертификат удостоверяет, что средство измерений
Атом-абсорбционный спектрометр «AA-6501 S» сер. №A3031-327
с метрологическими характеристиками Диапазон измерения
от 190 до 900 нм и с погрешностью ± 1 %
изготовленное (импортированное) «SHIMADZU»
ЯПОНИЯ
принадлежащее Dav. ekologiya qumitasi huzur. AMMQSITNM
поверенное ГП «УзНИМ»
в соответствии с QU 09-307:2016
с использованием ГСО состава ионов металлов
соответствует требованиям ТД фирмы изготовителя

и допущено к применению в сфере распространения государственного метрологического контроля и надзора.

Дата поверки «02» 06 2021 г.

Поверитель

А 0923552

СИСТЕМА ОБЕСПЕЧЕНИЯ ЕДИНСТВА ИЗМЕРЕНИЙ
РЕСПУБЛИКИ УЗБЕКИСТАН

Узбекское агентство стандартизации, метрологии и сертификации
(агентство "Узстандарт")

ГП «Узбекский национальный институт метрологии»

СЕРТИФИКАТ ПОВЕРКИ
СРЕДСТВА ИЗМЕРЕНИЙ

№ 0900897

Действителен до «09» 02 2022 г.

Настоящий сертификат удостоверяет, что средство измерений
Фотометр фотоэлектрический КФК – 3-01 № 1970344
с метрологическими характеристиками Диапазон измерения
от 5% до 100%; СКО – 0,5%
изготовленное (импортированное) ЮМТ
Россия
принадлежащее ЦСАК при Госкомэкологии РУз
поверенное ГП «УзНИМ» отдел 09
в соответствии с ГОСТ 8.298-2013
с использованием КС 100
соответствует требованиям Тех. док. фирмы-изготовителя

и допущено к применению в сфере распространения государственного метрологического контроля и надзора.

Дата поверки «09» 02 2021 г.

Поверитель Г.С.Гулимова

А 0804596

СИСТЕМА ОБЕСПЕЧЕНИЯ ЕДИНСТВА ИЗМЕРЕНИЙ
РЕСПУБЛИКИ УЗБЕКИСТАН

Узбекское агентство стандартизации, метрологии и сертификации
(агентство "Узстандарт")

ГП «Узбекский национальный институт метрологии»

СЕРТИФИКАТ ПОВЕРКИ
СРЕДСТВА ИЗМЕРЕНИЙ

№ 0900896

Действителен до «09» 02 2022 г.

Настоящий сертификат удостоверяет, что средство измерений
Газоанализатор – «Колаб» сер.№ 142
с метрологическими характеристиками Диапазон измерения
см. в паспорте
изготовленное (импортированное) ООО «Экобиохим»
Россия
принадлежащее ЦСАК при Госкомэкологии РУз
поверенное ГП «УзНИМ» отдел 09
в соответствии с ГОСТ 8.618-2013
с использованием ПГС
соответствует требованиям ГОСТ 13320-81

и допущено к применению в сфере распространения государственного метрологического контроля и надзора.

Дата поверки «09» 02 2021 г.

Поверитель Г.С.Гулимова

А 0804595

СИСТЕМА ОБЕСПЕЧЕНИЯ ЕДИНСТВА ИЗМЕРЕНИЙ
РЕСПУБЛИКИ УЗБЕКИСТАН
Узбекское агентство стандартизации, метрологии и сертификации (агентство "Узстандарт")

ГП «Узбекский национальный институт метрологии»

СЕРТИФИКАТ ПОВЕРКИ
СРЕДСТВА ИЗМЕРЕНИЙ

№ 0910920

Действителен до 25 . 12 2021 г.

Настоящий сертификат удостоверяет, что средство измерений
pH-метр модели «pH-150МИ» сер.№ 4006
с метрологическими характеристиками Диапазон изм.
от минус 1 до 14,00 pH и с погрешностью ± 0,05 pH
изготовленное (импортированное) «Измерительная техника»
Россия
принадлежащее [illegible] ИТНМ
поверенное ГП «УзНИИМ»
в соответствии с O'z DSt 8.042:2015
с использованием Стандартные буферные растворы
соответствует требованиям ГОСТ 27987-88

и допущено к применению в сфере распространения государственного метрологического контроля и надзора.

Дата поверки 25 . 12 20 20 г.

оттиск поверительного клейма — UZB 270 O'T — Поверитель

А 0767225

СИСТЕМА ОБЕСПЕЧЕНИЯ ЕДИНСТВА ИЗМЕРЕНИЙ
РЕСПУБЛИКИ УЗБЕКИСТАН
Узбекское агентство стандартизации, метрологии и сертификации (агентство "Узстандарт")

ГП «Узбекский национальный институт метрологии»

СЕРТИФИКАТ ПОВЕРКИ
СРЕДСТВА ИЗМЕРЕНИЙ

№ 0904844

Действителен до «02» 06 20 22 г.

Настоящий сертификат удостоверяет, что средство измерений
pH- метр модели «PHS-3c» сер. № 110001923139
с метрологическими характеристиками Диапазон измерения
от 0,0 до 14,00 pH с погрешностью ± 0,02 pH
изготовленное (импортированное) «KEILIE»
Китай
принадлежащее Dav. ekologiya qumitasi xuzur. AMMQSITNM
поверенное ГП «УзНИИМ»
в соответствии с O'zDSt 8.042:2015
с использованием Стандартные буферные растворы
соответствует требованиям ГОСТ 27987-88

и допущено к применению в сфере распространения государственного метрологического контроля и надзора.

Дата поверки «02» 06 20 21 г.

оттиск поверительного клейма — UZB 281 O'T — Поверитель

А 0923543

СИСТЕМА ОБЕСПЕЧЕНИЯ ЕДИНСТВА ИЗМЕРЕНИЙ
РЕСПУБЛИКИ УЗБЕКИСТАН
Узбекское агентство стандартизации, метрологии и сертификации (агентство "Узстандарт")

ГП «Узбекский национальный институт метрологии»

СЕРТИФИКАТ ПОВЕРКИ
СРЕДСТВА ИЗМЕРЕНИЙ

№ 0904843

Действителен до «02» 06 20 22 г.

Настоящий сертификат удостоверяет, что средство измерений
Анализатор жидкого кислорода «JPSJ-605» сер. № 110001923201
с метрологическими характеристиками Диапазон измерения
от 0,0 до 22,00 mg/l, с погрешностью ± 1,0 %
изготовленное (импортированное) «KEILIE»
Китай
принадлежащее Dav. ekologiya qumitasi xuzur. AMMQSITNM
поверенное ГП «УзНИИМ»
в соответствии с QU 09-321:2016
с использованием Стандартные растворы фирмы изготовителя
соответствует требованиям ГОСТ 27987-88

и допущено к применению в сфере распространения государственного метрологического контроля и надзора.

Дата поверки «02» 06 20 21 г.

оттиск поверительного клейма — UZB 281 O'T — Поверитель

А 0923542

СИСТЕМА ОБЕСПЕЧЕНИЯ ЕДИНСТВА ИЗМЕРЕНИЙ
РЕСПУБЛИКИ УЗБЕКИСТАН

Узбекское агентство стандартизации, метрологии и сертификации
(агентство "Узстандарт")

ГП «Узбекский национальный институт метрологии»

СЕРТИФИКАТ ПОВЕРКИ
СРЕДСТВА ИЗМЕРЕНИЙ

№ 0901852

Действителен до «02» 06 20 22 г.

Настоящий сертификат удостоверяет, что средство измерений
Фотоэлектроколориметр модели «КФК-3» сер. № 9007221

с метрологическими характеристиками Диапазон измерения
от 0 до 100 % с погрешностью ± 1 %

изготовленное (импортированное) «г. Загорск ОМЗ»
России

принадлежащее Dav. ekologiya qumitasi xuzur. AMMQSITNM

поверенное ГП «УзНИМ»

в соответствии с QU 11-323:2016

с использованием Светофильтров КНФ-1

соответствует требованиям ГОСТ 8.298-2013

и допущено к применению в сфере распространения государственного метрологического контроля и надзора.

Дата поверки «02» 06 20 21 г.

UZB 281 OT

Поверитель

А 0923551

СИСТЕМА ОБЕСПЕЧЕНИЯ ЕДИНСТВА ИЗМЕРЕНИЙ
РЕСПУБЛИКИ УЗБЕКИСТАН

Узбекское агентство стандартизации, метрологии и сертификации
(агентство "Узстандарт")

ГП «Узбекский национальный институт метрологии»

СЕРТИФИКАТ ПОВЕРКИ
СРЕДСТВА ИЗМЕРЕНИЙ

№ 0904851

Действителен до «02» 06 20 22 г.

Настоящий сертификат удостоверяет, что средство измерений
Фотоэлектроколориметр модели «КФК-3» сер. № 9202188

с метрологическими характеристиками Диапазон измерения
от 0 до 100 % с погрешностью ± 1 %

изготовленное (импортированное) «г. Загорск ОМЗ»
России

принадлежащее Dav. ekologiya qumitasi xuzur. AMMQSITNM

поверенное ГП «УзНИМ»

в соответствии с QU 11-323:2016

с использованием Светофильтров КНФ-1

соответствует требованиям ГОСТ 8.298-2013

и допущено к применению в сфере распространения государственного метрологического контроля и надзора.

Дата поверки «02» 06 20 21 г.

UZB 281 OT

Поверитель

А 0923550

UzAssystem

STONE CITY ENERGY (1600 MW) CCPP PROJECT

ATTACHMENT F

STAKEHOLDER ENGAGEMENT PLAN

ASE-UZA-571-REP-ESA-0001-02

Rev	Date	Purpose of issue	Issuer	Checker	Approver
02	16/12/2021	Initial	U. GÜNGÖR	M. ACIRLI	F. SATTAROV

UzAssystem

STONE CITY ENERGY (1600 MW) CCPP PROJECT

ATTACHMENT F

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1. Abbreviations & Definitions

EHS	Environmental Health And Safety
E&S	Environmental And Social
EBRD	European Bank for Reconstruction and Development
EIA	Environmental Impact Assessment
EP	Environmental Policy
EPFI	Equator Principles Financial Institution
ESIA	Environmental And Social Impact Assessment
ESMS	Environmental And Social Management System
FC "SCE-QUVVAT" LLC CCPP	Stone City Energy- Quvvat-Combined Cycle Power Plant Joint
FGD	Focus Group Discussion
GDP	Gross Domestic Product
GIP	Good International Practice
GRC	Grievance Redress Committees
GRM	Grievance Redress Mechanism
ha	Hectare (1 Ha = 10,000 M2)
IFC	International Finance Corporation

IFC-PS's	International Finance Corporation Project Standards
IFI	International Financial Institutions
km	Kilometer
MW	Megawatt Watt Is A Unit Of Power In The International System Of Units (1 MW = 106 Watt)

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2. Stakeholder Engagement Plan

2.1 INTRODUCTION

The Project has certain obligations to ensure relevant processes are in place for stakeholder engagement on an on-going basis in accordance with EBRD requirements and that of the EP's, IFC Performance Standards and World Bank Group EHS Guidelines. As the SEP will remain relevant throughout the lifetime of the Project as a 'live document', it will act as a plan within the Project's construction, commissioning and operational phase ESMS that will require updating as Project circumstances or stakeholder dynamics evolve; and to ensure continual improvement of the Environmental and Social Management System (ESMS).

2.2 SCOPE OF THE SEP

The government of the Republic of Uzbekistan aims modernize and increase the electricity production in the country in order to foster economic growth.

This report is prepared in the pursuance of the agreement mutually signed between FC "SCE-QUVVAT" LLC and JV "UzAssystem "LLC. UzAssystem is appointed to undertake an Environmental and Social Impact Assessment Report (ESIA) in compliance with IFC Standards for the project of the Combined Cycle Power Plant (CCPP).

This SEP has been prepared to align with applicable requirements of the EBRD Performance Requirements, as well as the applicable elements of the IFC Performance Standards for Stakeholders Engagement and Grievance Mechanism, via Equator Principle IV, specifically EP5 and EP6.

2.3 OBJECTIVES OF THE SEP

The objectives of the SEP include:

- To identify the key stakeholders that may be affected by the Project;
- To define processes to inform the identified stakeholders about the Project and to manage stakeholder expectations;
- To understand current and potential emerging issues and to capture views and concerns of the relevant stakeholders with regard to the Project;
- To provide a basis for stakeholder participation in social impact identification, prevention and mitigation including impacts and risks relating to gender
- To establish a grievance mechanism that will be implemented for the Project.

2.4 PROJECT LOCATION AND DESCRIPTION

The Project site is located in the Angor district of the Surkhandarya Region of the Republic of Uzbekistan, on the north-eastern coast of the Uchkizil irrigation reservoir. According to the project area sent by the Client, SCE (1600MW) CCPP Project Area boundary is approximately 75ha.

2.5 LOCAL CONTEXT AND SENSITIVES

The nearest town is Uchkizil with the population of 3,500, which is located 2 km in the south of the area. The potential sensitive receptor is the community is identified as Kaftarkhana, which is located 1 km in the west of the site. There exist a channel, which discharges to the Uchkizil reservoir, is located between the Project area and Kaftarkhana.

The potential social impact area in terms of social aspects is identified based on the international standards within the environmental and social context. During the social assessment, the radius of 5 and 10 km will be considered. There is no large community and settlement within a radius of 5 km from the Project Area.

2.6 LAND USE

The territory of the area from the north, east and west is surrounded by uncultivated land in agriculture. From the west, at a distance of 800 m, there is the channel discharging to Uchkizil reservoir. The Project area is accessible with the main road M-39 at a distance of 500 m and to the main railway line Kagan-Termez-Dushanbe from the south at a distance of 7 km.

2.7 REGULATIONS AND REQUIREMENTS

2.7.1 National Requirements

Article 29 of the Law on Environmental Protection states ensuring stakeholder participation is crucial for improving the efficiency of environmental monitoring in the implementation of state and other environmental programs. Uzbekistan, public hearings as part of the EIA is regulated by Appendix 3 of Decree of the Cabinet of Ministers No 541 dated September 07, 2020. According to the Decree all objects divided in four categories and public hearings are mandatory for categories I and II (almost similar to World Bank A and B categories). There are no requirements for public hearing or EIA disclosure for Category III and IV projects

There are two non-mandatory mechanisms for public participation in the EIA assessment procedure which include the public hearings. The law allows for independent expert groups to organise public environmental review (PER) but the findings are non-mandatory. However, there are no provisions for public hearings.

The EIA assessment procedure Manual provides some procedural guidance by recommending organisation of public hearings in the course of the draft EIA preparation. In addition, the law does not require public disclosure of the ESIA apart from the requirement to publish a summary of the conclusions received from the State Committee on Ecology and Environmental Protection.

2.7.2 International Requirements

2.7.2.1 EBRD Requirements

All projects financed by EBRD shall be structured to meet the requirements of the EBRD Environmental and Social Policy which includes ten Performance Requirements (PRs) for key areas of environmental and social sustainability that projects are required to meet, including PR10 Information Disclosure and Stakeholder Engagement.

EBRD PR10 "recognises the importance of an open and transparent engagement between the client, its workers, local communities directly affected by the project and where appropriate, other stakeholders as an essential element of Good International Practice (GIP) and corporate citizenship. Such engagement will involve the following key elements:

- Stakeholder Identification and analysis;
- Stakeholder engagement planning;
- Disclosure of information;
- Consultation and Participation and
- Grievance Mechanism.

2.7.2.2 Equator Principles

The Equator Principles establish key requirements for stakeholder engagement through the following principles:

- Principle 5

Stakeholder Engagement: For all Category A and Category B Projects the EPFI will require the client to demonstrate effective Stakeholder Engagement, as an ongoing process in a structured and culturally appropriate manner, with Affected Communities, Workers and, where relevant, Other Stakeholders.

For Projects with potentially significant adverse impacts on Affected Communities, the client will conduct an Informed Consultation and Participation process. The client will tailor its consultation process to: the risks and impacts of the Project; the Project's phase of development; the language preferences of the Affected Communities; their decision-making processes; and the needs of disadvantaged and vulnerable groups.

- Principle 6: Grievance Mechanism

For all Category A and, as appropriate, Category B Projects, the EPFI will require the client, as part of the ESMS, to establish effective grievance mechanisms which are designed for use by Affected Communities and Workers, as appropriate, to receive and facilitate resolution of concerns and grievances about the Project's environmental and social performance.

Grievance mechanisms are required to be scaled to the risks and impacts of the Project, and will seek to resolve concerns promptly, using an understandable and transparent consultative process that is culturally appropriate, readily accessible, at no cost, and without retribution to the party that originated the issue or concern. Grievance mechanisms should not impede access to judicial or administrative remedies. The client will inform Affected Communities and Workers about the grievance mechanisms in the course of the Stakeholder Engagement process.

2.7.2.3 IFC Performance Standards

All of the IFC Performance Standards include requirements for an amount of stakeholder consultation/engagement (either in the ESIA, or as part of the future ESMS) and therefore the Project will require a level of engagement. In particular, IFC Performance Standard 1 on "Social and Environmental Assessment and Management Systems" describes the stakeholder engagement requirements in more depth. Stakeholder engagement is an on-going process that may involve, in varying degrees, the following elements:

- Stakeholder analysis and planning;
- Disclosure and dissemination of information;
- Consultation and participation;
- Grievance mechanism; and
- On-going reporting to Affected Communities.

The IFC Performance Standards indicate that when Affected Communities are subject to identified risks and adverse impacts from a project, the developer/client will undertake a process of consultation in a manner that provides the Affected Communities with opportunities to express their views on project risks, impacts and mitigation measures, and allows the client to consider and respond to them.

As Policy on Environmental and Social Sustainability and Access to Information Policy are directed towards Corporation itself, Performance Standards are directed towards clients, providing direction on risks and impacts identification. The standards are designed to assist in avoidance, mitigation, and management of risks and impacts of the project financed.

Moreover, it includes stakeholder engagement and disclosure obligations of the client in relation to project-level activities. Therefore, development of Performance Standards developed by client is considered as the mandatory document for IFC financing. As IFC is the sister organization of World Bank, its Performance standards is very similar to the Environmental and Social Standards of World Bank, which has been presented earlier. The standards on Performance standards were described based on the report IFC Performance Standards on Environmental and Social Sustainability.

2.8 PREVIOUS STAKEHOLDER ENGAGEMENT

Stakeholder identification and consultations for the Project were conducted within the context of the scoping and ESIA stage. Indirect impacts are induced by, or 'by-products' of, the Project activities. Predicting indirect impacts is more complex as they derive from interactions of multiple factors and stakeholders with the Project. Therefore, main objective of the mentioned stages as informing all relevant stakeholders and associated planned works, indicating what might be affected from the proposed project and initiating an interactive process between the developer and the competent authority, and with other interested parties as well as public.

In line with National Requirements, considering that the planned combined cycle power plant with a design capacity of 1,600 MW belongs to facilities of the I category of environmental impact, the management of the combined cycle power plant under construction together with representatives of the Angora District Khokimiyat, the Ecology and Environmental Protection Inspectorate, the Kattakum Village Community Assembly in the prescribed manner, were organized and carried out public hearings.

During the public hearings with the participation of the population, issues of the implementation of the planned project were discussed and relevant presentations were presented on the technological process and the impact of the power plant on the environment, as well as social and economic benefits for residents of the area where the facility is located.

2.8.1 Identification of Stakeholders

A systematic approach to identify affected stakeholders has been used. This approach not only consider the projects but also put into consideration associated facilities, transport routes and areas potentially affected by cumulative impacts. The stakeholders identified have been classified as into two categories as "Directly Impacted Stakeholders" and "Indirectly or Interest Based Stakeholders"

The Impacted stakeholders are individuals or group of people that can be potentially affected by the Projects' environmental and social impacts either directly.

Identified stakeholders that can potentially be directly impacted by the Project or its environmental

Table 1: Identification of Stakeholders

Directly Impacted Stakeholders		**Indirectly (Interest Based) Impacted**
Population within Project Impact Area	Local Authorities of Mahallas	Represantative of Institution
0-10 km radius area	**Bahor** **Dehqonbirlashuv** **Ilgor** **Karvon** **Kattaqum** **Kayran** **Madaniyat** **Markaz** **Qoshtegirmon** **Tallashqon** **Zang Gilambop** **Zartepa** **Namuna** **Orol** **Uchkyzyl** **Khalqobod**	**Khokiyat** **District Statistic Department** **District Health Department** **Labor and Social Protection** **Finance and Investment Department**
Local Level		**Local Level and Regional Level**
Who can be potentially affected by one or more of the potential impacts of the project		**Stakeholders concerned with any of the procedures set by the Project, the Project's beneficiaries, national organizations.**
Local Authority Survey was conducted as a consultation method		**Focus Group Discussions was conducted as a consultation method**

2.9 STAKEHOLDER CONSULTATIONS

Data acquisition is one of the main steps of the identification of community's thoughts and attitudes about the project and assess the stakeholder engagement and information disclosure of the stakeholders about the project organization in the area. The other one of these is analysis of the socio-economic factors to develop grievance redress mechanism to provide stakeholders with a framework for settlement of grievances. Accordingly, one of the main data sources of the report will be based on the field surveys such as Local Administrative Survey and Stakeholder Survey.

Local authority questionnaire inquires mostly quantitative information about demography, economic conditions, educational levels, health, agriculture and stockbreeding, transportation, infrastructure and communication at the regional (districts) and local level (impact area: 0 – 10 km).

Focus group meeting questionnaire inquire the answers to the questions about:

- Stakeholder engagement in the project;
- Disclosure of information;
- Revealing the positive/negative impacts of the project;
- Stakeholders' grievances related to the project;
- Benefits and problems of the area and the project;
- Expectations of the stakeholders from the project and their suggestions.

During the qualitative phase, 2 Focus Group Discussions (FGD) were also conducted with stakeholders, one in Termez district and one in Angor district. Stakeholders are persons or groups who:

- Are directly or indirectly affected by a project;
- Have interests in a project;
- Have ability to influence its outcome, either positively or negatively.

Stakeholders include:

- Locally affected communities or individuals and their formal and informal representatives;
- National or local government authorities;
- Politicians;
- Religious leaders;
- Civil society organizations;
- Groups with special interests;
- The academic community;
- Other businesses.

Potential stakeholders are:

- Project affected communities/settlements;
- Vulnerable groups (female, low-income, disabled and elderly people) in the Project affected settlements;
- Local authorities;
- Municipalities.

15-20 stakeholders participated in each FGDs. Each group included representatives of different stakeholder groups. By conduction the FGDs, the social impacts of the project to be constructed have been identified through discussions.

Social impact of the project can be defined as the impact of an activity on a community and the well-being of individuals and households. As the purpose of the impact assessment is to identify and assess the potential social impacts associated with a project, impacts could be positive and negative.

Here the social impacts have been identified, and list of questions were asked in order to clarify the stakeholders' expectations on the project. Questions asked included following points:

- Defining the impacts of the project, clarifying if they are positive and/or negative
- Awareness about the project
- Main issues in the area, their prioritization
- Expectations from the project

2.9.1 Local Authority Survey

The following section describes the findings of the socio-economic survey according to the local authority questionnaire. As per field observation, the total number of mahallas within 10 km is 16, having 59,875 people (see Table 2). However, socio-economic survey was conducted among 8 local authority representatives in Angor and Termez districts from 22 to 29 July, 2021. The survey analyzed the socio-demographic characteristics of mahallas and affected settlements, that will experience a positive or negative impact from the construction of TPP. The data analyzed in this chapter were gathered from field survey and in-depth interviews with mahallas and khokimiyat representatives (see Annex 1.2. Questionnaire for Local Authority of Socio Economic-Research)

Table 2: List of settlements located within 10 km of the Project impact area (Source: Local Authority Survey, July, 2021)

#	Settlements (Mahalla)	Population	Household
1	**Bahor**	**4,12**	**680**
2	**Dehqonbirlashuv**	**2,59**	**478**
3	**Ilgor**	**3,10**	**645**
4	**Karvon**	**3,70**	**623**
5	**Kattaqum**	**5,33**	**1,00**
6	**Kayran**	**4,71**	**792**

#	Settlements (Mahalla)	Population	Household
7	Madaniyat	2,65	510
8	Markaz	3,10	485
9	Qoshtegirmon	3,63	631
10	Tallashqon	3,57	538
11	Zang Gilambop	2,17	342
12	Zartepa	4,46	770
13	Namuna	3,41	556
14	Orol	4,17	725
15	Uchkyzyl	4,58	894
16	Khalqobod	4,54	804
	TOTAL	59,8	10,4

According to the results of the survey, none of the respondents is aware of the project, except for the district and regional khokimiyats. Local authorities would like to know about the negative impact of the project on the life of the population, flora and fauna. Due to the high level of unemployment, the respondents were very interested to get information about the required specialist and the number of employees (see Table 3).

Table 3: Opinions of Local Authorities on project

Questions	Answers of the respondents
Do you have any information about the Project?	**None of the respondents know about the project**
What do you want to know about the Project?	**Negative impacts of the project** **What specialists will be hired** **TPP operation year** **Job creation opportunities**
Who should give the information which do you want to know?	**Stone City, UzAssystem or Khokimiyat**
How should give the information which do you want to know?	**Via Telegram network**

2.9.2 Focus Group Discussions (FGDs)

The focus group discussions were conducted as part of the socio-economic assessment of the project impact area in Angor and Termez districts in Surkhandarya province.

During the qualitative phase of the study, the detailed qualitative information was expected to be obtained from representatives of the target groups on the most important issues, such as awareness of the local agencies and population about the project, positive and negative consequences of the project to the region, existing challenges and suggestions – recommendations etc.

The information gathered in these focus groups is to be used to establish basic indicators "before" the implementation of the Project. Also, the survey materials will serve as the basis for the development of socio-economic and gender design elements of the Project Feasibility Study being developed within the framework of the construction of the TPP in Surkhandarya province. The survey will contribute to the development of a monitoring and evaluation strategy, as well as a framework for the project impact assessment.

Therefore, qualitative phase included two FGDs which were conducted with representatives from the local authorities, local self-regulatory organizations (Mahallas), utility agencies and representatives of the population in the project impact area.

The residents / population differentiated according to geographical location of the settlements for the study were involved in the FGD, as follows:

- 1) settlements and population within 5 km from proposed construction area,
- 2) settlements and population within 10 km from proposed construction area
- 3) settlements and population more than 10 km from proposed construction area.

In order to organize FGDs with representatives of the aforementioned organizations, a team of experts contacted the local khakomiyat to obtain permission and technical assistance. In both cases, local hokimiyats in Angor and Termez districts have provided room for the event with all necessary facilities. On top of that local government, authorities helped the expert team to invite and collect required participants for FGD on time.

Although experience working with rural women indicates that they are less reticent to share their opinions and experiences when men are excluded, the groups were deliberately arranged to be gender-specific.

With the exception of the pilot group, the groups were deliberately arranged to be gender-specific. Experience working with immigrant Hispanic women indicates that they are less reticent to share their opinions and experiences when men are excluded. They also are more likely to share information about women-specific issues or family problems that cause socio-economic problems on the ground.

All focus groups were conducted in Uzbek and lasted approximately 2 and half hours. Each focus group discussion was tape-recorded and later transcribed. Two focus group discussions were conducted at the two sides (Angor and Termez) on 28 of July, 2021. The number of participants and place of the event are given in the following Table 4 and Table 5 (see Annex 1.3. Focus Group Meeting Questionnaire)

Table 4: Focus group discussion details

Date	Location	Representatives from	Number
28.07.2021 (Morning)	**Small Hall of Termez hokimiyat, Uchqizil city.**	**Khokiyat, district statistic department, district health department, labor and social protection, mahalla etc.**	**24**
28.07.2021 (Afternoon)	**Conference Hall at Angor hokimiyat, Angor city.**	**Khokiyat, district statistic department, district health department, finance and investment department, labor and social protection, mahalla etc.**	**37**

Table 5: Participant's age

Age range	Percentage
22 – 29 years	**7**
30 – 39 years	**25**
40 – 49 years	**39**
50 – 59 years	**23**
60 – 69 years	**6**

The participants in Termez and Angor districts were generally quite responsive when answering "what do you know about the planned project?" Very few people hesitated or chose not to answer. Several of the men, however, began their response by saying, "we never heard about this project before experts visit" and then gave some core information on it.

In both cases, the participants became proactively discuss question about "how will the planned project affect the region? Positive effects, because". So, the majority of the participants stressed out that the positive sides of the project are much more than the negative consequences of the project. Following improvements were highlighted by participants as project positive effect: no more power cut in the settlements, unemployment decrease, district GDP will increase, possibility of the development innovative business models such as greenhouse development close to the power plant etc. However, there were several negative points against to power plant construction and further operation in the district. The negative sides that participants spoke up about are negative environmental consequences (micro-climate change, biodiversity change, noise from the TPP.

To the question "have you had any problems with the project to date? What was the problem you had?" all participants replied no. All participants indicated that no work has been done so far and it is so hard to say about problems. However, in the coming future they might have problems therefore "any negative effect from the project should be avoided" – said one of the participants.

When participants were asked about "what are the most important issues in your area" many respondents in both districts emphasized that the drinking water and natural gas supply are the most important issues that the local population ask pay attention to. For example, the most common disease among Angor's local population is a kidney-related disease which as local population reported due to no centralized drinking water supply. The low electricity supply, unemployment, road infrastructure and absence of sports centers were mentioned as a second priority issue.

According to most heads of Mahallas participating in FGD in Angor, people who make this project could help with drinking water supply in settlements and hire as many as possible local labor for the construction and operation period. The same reaction was received from Termez FGD. According to response of FGD held in Termez, "there were some measures last years from local government addressed to drinking water supply problem in the settlement but unfortunately unsuccessful" – said, participant.

The focus groups that were conducted presented an opportunity to comprehend opinion of local hokimiyats and local communities on planned TPP construction in Surkhandarya region.

Although these groups were not representative of all mahallas in Angor and Termez districts, the opinions obtained provide a foundation for the development of a plan that successfully meets the needs of this population.

The information obtained in the focus groups is critical to understand existing issues on the ground because it considers socio-economic factors and provides insight into those concepts that are not well understood. More importantly, it gives an awareness of the issues most relevant to the project impact area population.

Generally, these focus groups were well received by the participants. Many participants expressed their appreciation of having the opportunity to "learn" about the project. They also were glad to be able to vocalize their opinion on this subject. Because of this enthusiasm, the participants were asked to write their name and occupation if they were interested in becoming involved in a future project activity (e.g., receiving information, participating in discussion groups). Every person who participated in the focus groups willingly provided this information. A few people said that they would like to help out in any aspect of the project if they were paid.

Overall, the picture that FGD moderators had from each session were almost the same. To the questions regarding the most important issues drinking water problem was leading in both cases. However, in mahallas as Kattaqum (Angor district) this problem has become relatively serious and local people are suffering from kidney-related illnesses. Despite listed by participants negative effects of the project, all participants supported the idea to have industry plant in the allocated place. The population of both districts believes that planned TPP would play a significant role in the development of the place they live in and to the reduction of the unemployment rate in the settlements. They hope that investors and government officials will involve local labor for the project construction and operation so that even unskilled people could get foundation training courses.

2.10 GRIEVANCE MECHANISM

From the national legislation prospective there is a centralized complaints mechanism (online portal) for all public utility providers that was opened in 2017 by Presidential Decree No. 728 of 15/09/2017. As this online portal is intended for wide range of issues brought to government attention, it was considered more appropriate to develop a single system/approach for receiving feedback and complains from stakeholders. The following approach was used in the establishment of the Project specific grievance mechanism.

This part of the report describes grievance redress mechanism which is going to be implemented for the project for internal (construction and commissioning personnel, workers, project staff,) and external parties (project-affected people of communities).

A Grievance Redress Mechanism (GRM) is a set of measures that enable stakeholders to raise grievances to the project and seek redress when stakeholders perceive an adverse impact arising from the project activities. The mechanism sets out clear systematic steps for affected individuals and communities to submit complaints and feedback and simultaneously for the Project in responding to queries, feedbacks and complaints received. The mechanism will be applied to guarantee the project is responsive to any concerns and grievances particularly from affected stakeholders and communities.

GRM will be available to people living or working in the areas impacted by the project activities. Any impacted or concerned person or group of people about the project activities have the right to participate in the GRM and be encouraged to use it. Moreover, the developed GRM does not replace the public mechanisms for filing complaints and resolving conflicts in the legal system of Uzbekistan, but, on the contrary, seeks to minimize its use as much as possible.

Overall responsibility for timely implementation of GRM lies with "Stone City" LLC through its Project Management Unit supported by the Engineer involved in managing and supervising the Project, while the Engineering, Procurement and Construction Contractor undertakes the actual construction works. Relevant Hokimiyats (Angor and Termez), who are mandated by law to perform grievance redress related tasks, and mediators who are involved in facilitating amicable resolution of grievances are also included in GRM.

This GRM envisages two levels of grievance resolution for projects implemented: Grievance Redress Committees (GRC) at the local level and central (Tashkent) level. Local GRCs are usually composed of members nominated from the Project Management Unit, Hokimiyats, Engineer & Contractor on Engineering, Procurement and Construction. GRCs at the central levels are chaired by the Heads responsible for the overall operation of GRM and its efficient and timely implementation, while the coordinators are responsible for involving the relevant parties and coordinating the works of GRCs at regional/central levels (see Annex 4 Grievance Redress Mechanism Forms)

2.10.1 Grievance redress mechanism: Local Level

Firstly, resolution of grievance will be attempted through GRC at local level through the following steps.

A. Registration

Complainants or interested parties visit, call or send a letter, email or fax to the Khokimiyat, Design, Procurement and Construction Contractor, Engineer or PMU "Stone City". Complaints submitted in person, by phone, letter, email or fax will be registered in a standard format.

B. Grievance processing

Grievances that are explained and resolved at the point of entry are closed immediately. Cases needing further investigation and action are reviewed by the GRC at the local level. The GRC at the local level organizes meetings once in a month, however special impromptu meetings can be settled if needed. The main obligation of GRC is review of the grievance cases within ten working days and recommend its settlement to parties. The GRC Coordinator at the local level distributes information among the members of GRC and be responsible for proper documentation (preparing minutes of GRC meeting and progress reports) of the GRC actions for resolving the grievances.

C. Feedback on the grievance

Receipt of grievances lodged in person or via phone will be acknowledged immediately. Receipt of grievances received through a letter or e-mail or will be acknowledged through a letter / e-mail / fax within 3 working days upon receipt by GRC coordinator at regional level.

If the grievance was resolved at the local level, the complaining party will be informed of the outcome. If grievance was not resolved at the local level and was passed to the GRC at the central level for consideration and resolution, appropriate information will be provided to the complaining party, including the date when the case was passed to GRC at the central level and the date by which the outcome at the central level is expected. In case of anonymous complaints, the printed response will be posted at the information board of the relevant Hokimiyat, so as the complaining party can approach and review the feedback.

2.10.2 Grievance redress mechanism: Central Level

Following unsuccessful consideration of grievance by the GRC at the local level, complaint resolutions will be attempted at a central level through following steps.

Grievance processing: If grievance cannot be resolved by the GRC at the local level, it will be forwarded for consideration by the GRC at the central level, including all relevant documents. The GRC at central level:

(i) holds meetings on monthly basis, however special ad hoc meetings can be arranged, as needed; and

(ii) discusses the grievance case within twenty working days and recommend its settlement to parties

GRC Coordinator at central level circulates relevant information among the members of GRC, prepares Minutes of GRC meeting and progress reports, and ensures that actions and decisions are properly documented.

Feedback provision: If the grievance was resolved, the complaining party will be informed on the outcome of grievance resolution. If grievance was not resolved by the GRC at central level, appropriate information will be provided to the complaining party, including details why the case was not resolved, as well as recommendation to seek for resolution through the Government of Uzbekistan legal system.

2.10.3 Grievance redress mechanism: Legal System

If after the intervention and assistance from the GRCs at both local and central levels, no solution has been reached, and if the grievance redress system fails to satisfy the complaining parties, the case will be referred to the court for resolution in accordance with the legislation of Government of Uzbekistan.

In the meantime, it should also be emphasized that the GRM Guideline does not limit the right of the complaining party to submit the case to the court of law in the first stage of grievance process.

Moreover, in the Government of Uzbekistan Complaint Handling System functions. This is another option of filing a complaint. The Law of the Republic of Uzbekistan on the Appeals of Individuals and Legal Entities was introduced on 29 October 2014 and this law replaced the earlier law on Appeal of Citizens that was introduced on 13 December 2012. This law guarantees the right to appeal and prescribes the requirements of an appeal, its form and structure. Further, the timeline for addressing the appeal, the procedure for personal hearing, need for maintaining record of appeals and procedure for second appeal are prescribed.

According to the law, affected persons can submit their grievances through the Virtual reception of the President of the Republic of Uzbekistan, which is an online portal. From February 2018, the online version is updated and presented on this online portal. All citizens of the country can use different options for their appeals.

- By calling the phone number 0-800-210-00-00 or the short number 10-00;
- By using the online portal and filling out a special request form on the website pm.gov.uz;
- By visiting the People's Reception Office. The address of the 14 People's Reception offices in each district of the Bukhara region are provided on its site.

This mechanism assures the constitutional rights of citizens to appeal to the President of the Republic of Uzbekistan. Through this system, any persons in Angor and Termez districts can send their applications, suggestions and complaints to the portal of the President of the Republic of Uzbekistan. After receiving the complaint from a district, the responsible person from online portal will provide complainant with contact details of the responsible person from related Hokimiyat. The Hokimiyat will directly request the PMU of "Stone City" LLC to resolve the grievance, with an option of sending the grievance through an email. In the new version of the Virtual Reception, the complainant can indicate the mahalla in which they live when submitting the appeal. This will speed up the solution of the problem, help determine which sector is responsible for the problem resolving.

The online portal has provisions for checking the status of the grievance and further appeal if the appellant has been harassed for raising the grievance. If someone who sends a complaint is persecuted, she/he can quickly report it by pressing a special "button" on the same site. Such messages will be considered promptly and with high priority of involving law enforcement agencies.

2.10.4 World Bank Accountability Mechanism Policy, 2020

In addition to the GRM, the World Bank has also its Accountability Mechanism Policy. It is an independent complaints mechanism where people and communities who believe that they have been or may be harmed by a World Bank-funded project can address. The Accountability Mechanism is consisted of the Inspection Panel for compliance reviews, and the Dispute Resolution Service, to

provide communities and the borrower with another way to address their disagreements. Complaints are filed to the Inspection Panel and requests should be sent to ipanel@worldbank.org.

2.10.5 Disclosure of the Grievance Process

Information about the grievance handling process will be disseminated through booklets and posted to the Khokimiyat. During informal meetings on the project site during the construction phase of the Project, grievance mechanism will also be presented. Information on the resolution of grievances will be summarized in the Project Management Unit's progress reports, which will be submitted to the World Bank (see Figure 1)

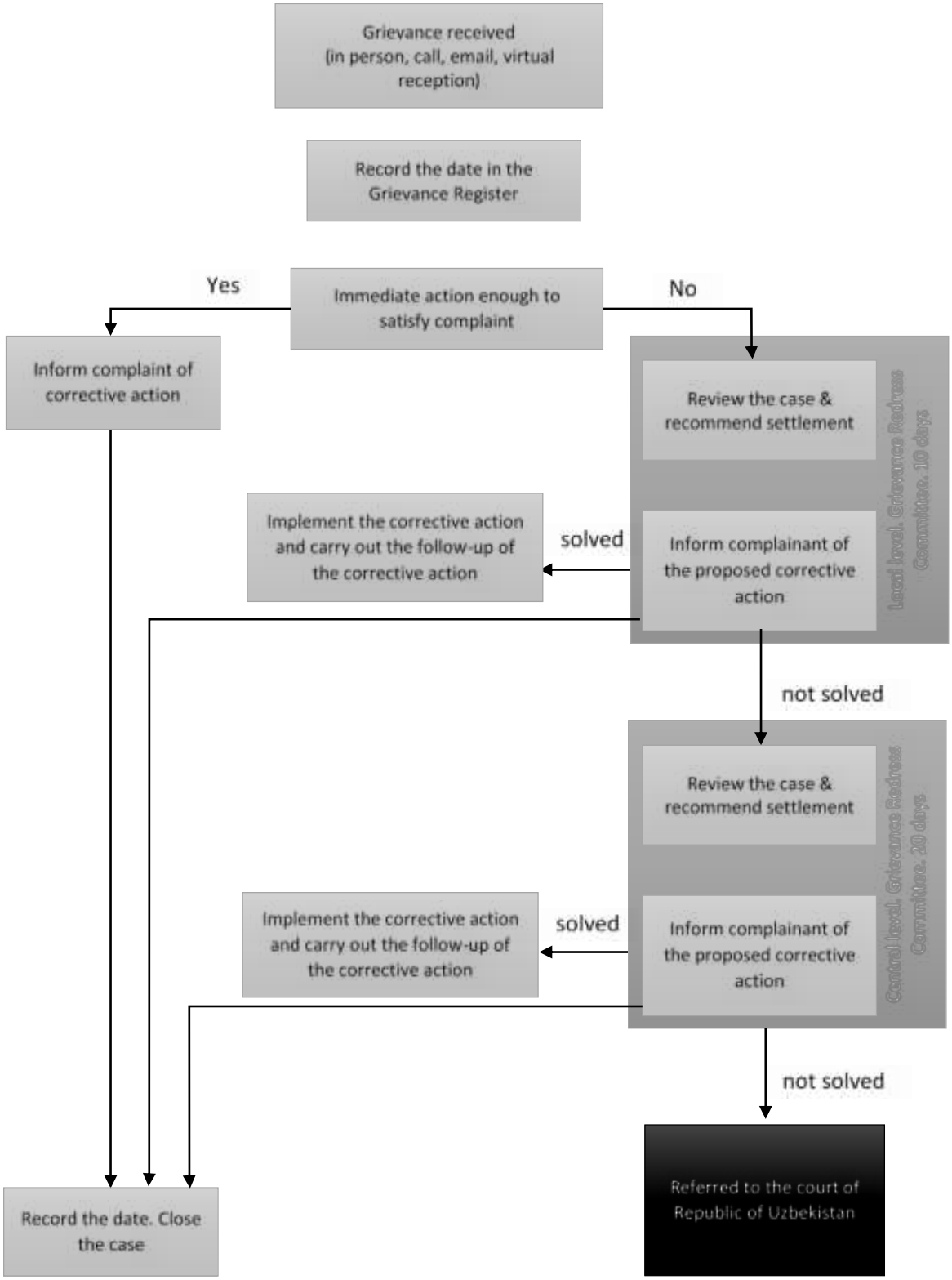


Figure 1: Grievance Redress Mechanism of the project (excluding court referring)

2.10.6 Engagement Methods

The following methods will be used to inform stakeholders about the on-going stakeholder engagement process during construction and operations of the Project:

Letters, Phone calls and email - Suitable to engage interest-based stakeholders and to notify them of the engagement and disclosure mechanisms.

Posters or Notices - Signboards and Illustrative posters (info graphics) will be placed at the Project entrance gate, including direct access to the grievance mechanism.

Social Media – This may include use of messaging platforms such as WhatsApp, Telegram, Zoom etc to communicate general information about the Project.

Data privacy must be ensured and protected if a stakeholder database is established.

Meetings with community leaders- These can be informal meetings held with community leaders so as to maintain good relations with the community and address any concerns the community might have.

Bilateral meetings - Suitable to engage impacted and interest-based stakeholders as identified, to allow these stakeholders provide their views and opinions and to notify them of the engagement and disclosure mechanisms.

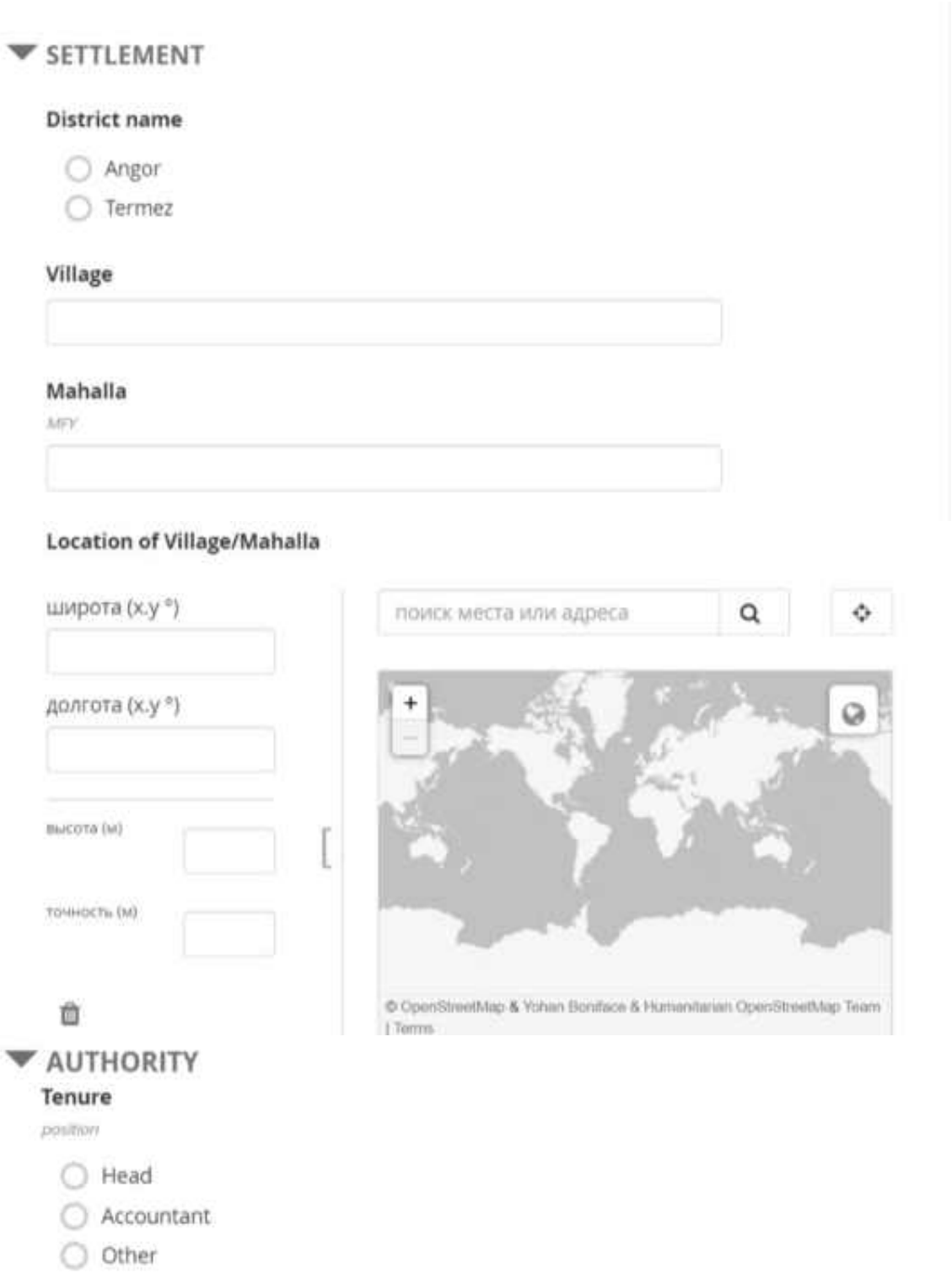
Online – Useful for Interest-based Stakeholders. The engagement and disclosure mechanisms for the ESIA package during the construction and operational phases of the project will be advertised on website with a contact point provided for comment. The same will be available on the lending institution respective websites.

2.11 ANNEXES

2.11.1 Annex 1.2. Questionnaire for Local Authority of Socio Economic-Research

KoBo Toolbox

Local authority questionnaire


SETTLEMENT
District name
Angor
Termez
Village
Mahalla
MFY
Location of Village/Mahalla
широта (x.y °)
долгота (x.y °)
высота (м)
точность (м)
поиск места или адреса
© OpenStreetMap & Yohan Boniface & Humanitarian OpenStreetMap Team | Terms
AUTHORITY
Tenure
position
Head
Accountant
Other

DEMOGRAPHY

What is the total population in the settlement?

number of population

What is the total household in the settlement?

in numbers

How many women do live in the settlement?

number of female

How many men do live in the settlement?

number of men

How many infant person are in the settlement (in 0-6 age range)?

Please clarify the range if different

How many children are in the settlement (in 7-16 age range; school)?

Please clarify the range if different

How many young people are in the settlement (in 17-35 age range)?

Please clarify the range if different

How many middle-age people are in the settlement (in 36-60 age range; retirement)?

Please clarify the range if different

How many elderly people are in the settlement (in 60 and over age range)?

Please clarify the range if different

How has the settlement's population changed in last 5 years?

- ○ Decrease
- ○ Increase
- ○ No change

» Population change

What is the reason of the change?

- ☐ Emigration
- ☐ Immigration
- ☐ Birth number
- ☐ Death number
- ☐ Emigration and immigration are equal
- ☐ Birth number and death number are equal

Economy

Number of the household who has Low income?

Number of the household who has Middle income?

Number of the household who has High income?

» Employment

» » Employment condition

Number of employed people

Number of Unemployed people

Number of students

Number of Pensioners

Number of disabled people

» » Income source

Primary income source of regular income owners

- ○ Agriculture
- ○ Stockbreeding
- ○ Worker (state)
- ○ Worker (private)
- ○ Pensioner
- ○ Tradesman
- ○ Production based trade
- ○ Driver, operator
- ○ Craftsmanship (electrical, watery, construction)
- ○ Unskilled worker as seasonal labour
- ○ Fishery
- ○ Other (specify)

Secondary income source of regular income owners

- ○ Agriculture
- ○ Stockbreeding
- ○ Worker (state)
- ○ Worker (private)
- ○ Pensioner
- ○ Tradesman
- ○ Production based trade
- ○ Driver, operator
- ○ Craftsmanship (electrical, watery, construction)
- ○ Unskilled worker as seasonal labour
- ○ Fishery
- ○ Other (specify)

What is the general educational attainment of the settlement?

1

Number of person

Specify education

- ○ No education
- ○ School
- ○ Vocational college
- ○ Lyceum
- ○ University, bachelor
- ○ Master
- ○ Doctorate or higher

−

+

HEALTH

Where do people go to the general health problems?

- ○ Qishloq vrachlik punkti
- ○ State hospital
- ○ Private hospital
- ○ Other (specify)

Distance of the health institution with the settlement

Most common primary disease in the settlement ?

- ○ Hearth diseases

- ○ Lung diseases
- ○ Stomach diseases
- ○ Intestinal diseases
- ○ Kidney diseases
- ○ Dermatological diseases
- ○ Bone diseases
- ○ Neurological diseases
- ○ Allergic diseases
- ○ Hormonal diseases
- ○ Gynaecological diseases
- ○ Over-aged related diseases
- ○ Tension
- ○ Diabetes
- ○ Gall bladders diseases
- ○ Any type of cancer

According to you, what is the reason of being common of the disease?

Most common secondary disease in the settlement ?

- ○ Hearth diseases
- ○ Lung diseases
- ○ Stomach diseases
- ○ Intestinal diseases
- ○ Kidney diseases
- ○ Dermatological diseases
- ○ Bone diseases
- ○ Neurological diseases
- ○ Allergic diseases
- ○ Hormonal diseases
- ○ Gynaecological diseases
- ○ Over-aged related diseases

- ○ Tension
- ○ Diabetes
- ○ Gall bladders diseases
- ○ Any type of cancer

According to you, what is the reason of being common of the disease?

Is there any cancer which is commonly seen in the settlement?

- ◉ Yes
- ○ No

Most common primary cancer in the settlement

- ○ Lung cancer
- ○ Intestinal cancer
- ○ Brain neoplasm
- ○ Skin cancer
- ○ Breast cancer
- ○ Bladder cancer
- ○ Gastric cancer
- ○ Ovarian cancer
- ○ Throat cancer
- ○ Pancreatic cancer
- ○ Prostate cancer
- ○ Uterine cancer
- ○ Other

According to you, what is the reason of being common of the cancer?

TRANSPORTATİON – INFRASTRUCTURE - COMMUNİCATİON

*Is there an electric network where you live?

- Yes
- No

*Is there an water supply network where you live?

- Yes
- No

*Is there an sewarage system where you live?

- Yes
- No

*Is there a telephone line where you live?

- Yes
- No

*Is there an internet line where you live?

- Yes
- No

***Is the settlement within the a coverage area?**

- ○ Yes
- ○ No

***Is there any school building where you live?**

- ○ Yes
- ○ No

***Is there any health service building where you live?**

- ○ Yes
- ○ No

▼ Quality of the infrastructure

According to you; is sufficient your...? 1.no mentioned service - 2.Insufficient - 3.Neither sufficient nor insufficient - 4.Sufficient

shopping service

no mentioned service	Insufficient	Neither sufficient nor insufficient	Sufficient

health service

no mentioned service	Insufficient	Neither sufficient nor insufficient	Sufficient

education service

transportation system

access roads

roads within the settlement

waste disposal system

sewage water system

irrigation water system:

no mentioned service	Insufficient	Neither sufficient nor insufficient	Sufficient

water supply system

no mentioned service	Insufficient	Neither sufficient nor insufficient	Sufficient

drinking water supply system

no mentioned service	Insufficient	Neither sufficient nor insufficient	Sufficient

What is the most important problem in the settlement where do you live?

General questions

What are the most spoken languages in the settlement?

- [ ] Uzbek
- [ ] Tajik
- [ ] Russian
- [ ] Kazakh

What ethnic / religious group does the majority live in?

- [ ] Islam
- [ ] Christianity
- [ ] Judaism
- [ ] No religion

Is there any holly place?

- (•) Yes
- ( ) No

Name of any blessed structure, wish tree, tomb, mausoleum, entombed saint etc.?

Project information

Do you have any information about the Project?

Where did you obtain this information?

What do you want to know about the Project?

Who should give the information which do you want to know?

How should given the information which do you want to know?

Did you have any grievance by now? What was your grievance? Did you report your grievance any where? Where did you report your grievance?

What kind of benefits it may have?

What kind of problems may be seen?

What should be the best social project/ investment / support area for your region?

Enter a date and time

yyyy-mm-dd hh:mm

2.11.2 Annex 1.3. Focus Group Meeting Questionnaire

FOCUS GROUP MEETING PARTICIPATION FORM				
	Age	**Occupation**	**Gender**	**Date**
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				

OPINION ABOUT THE PROJECT			
How will the planned project affect the region?	**Positive**	**Negative**	**Both positive and negative**
If it's positive, why?	**Reason 1**	**Reason 2**	**Reason 3**

OPINION ABOUT THE PROJECT			
If it's negative, why?	**Reason 1**	**Reason 2**	**Reason 3**
Information about the Project	**Information 1**	**Information 2**	**Information 3**
What do you wonder about the project?	**Question 1**	**Question 2**	**Question 3**
By whom and how should information be made?	**Informative1**	**Informative 2**	**Informative 3**
What are the main problems in your area that need to be solved first?	**Problem 1**	**Problem 2**	**Problem 3**
How can the people who make the project contribute to your settlement?	**Support area opinion 1**	**Support area opinion 2**	**Support area opinion 3**
What problems can the project people come up with?	**Critical issue 1**	**Critical issue 2**	**Critical issue 3**

2.11.3 Annex 4 Grievance Redress Mechanism Forms

2.11.3.1 Annex 4.1 Public Grievance Form

Reference No:		
Full Name Note: *you can remain anonymous if you prefer or request not to disclose your identity to the third parties without your consent*	**My first name** _____ **My last name** _____ ☐ **I wish to raise my grievance anonymously I request not to disclose my identity** ☐ **without my consent**	
Contact Information Please mark how you wish to be contacted (mail, telephone, e-mail).	☐ **By Post: Please provide mailing address:** _____ ☐ **By Telephone:** _____ ☐ **By E-mail:** _____	
Preferred Language for communication	1. **Russian** 2. **Uzbek**	3. **English** 4. **Other (specify)**
Description of Incident or Grievance:	What happened? Where did it happen?	Who did it happen to? What is the result of the problem?
Date of Incident/Grievance		
	1. **One-time incident/grievance (date_____)** 2. **Happened more than once (how many times? _____)** 3. **On-going (currently experiencing problem)**	
What would you like to see happen to resolve the problem?		

2.11.3.2 Annex 4.2 Grievance Log Form

Name/Contact Details	Date Received	Details of Compliant/Comment	Responsibility	Actions Taken	Date Resolved

UzAssystem

STONE CITY ENERGY (1600 MW) CCPP PROJECT

ATTACHMENTS OF THE SOCIO-ECONOMIC REPORT

ASE-UZA-571-REP-ESA-0001-02

Rev	Date	Purpose of issue	Issuer	Checker	Approver
02	16/12/2021	Initial	U. GÜNGÖR	M. ACIRLI	F. SATTAROV

UzAssystem

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Contents

1. Annexes

1.1 ANNEX 1. QUESTIONNAIRE FORMS

1.1.1 Annex 1.1. Household Questionnaire of Socio- Economic Research


KoBoToolbox

Socio-economic baseline_hhld

DISTRICT:

Termiz Angor

SETTLEMENT

Makhalla Fuqarolar Yigini

VILLAGE (Qishloq)

Location of the household

Age (or birthdate):

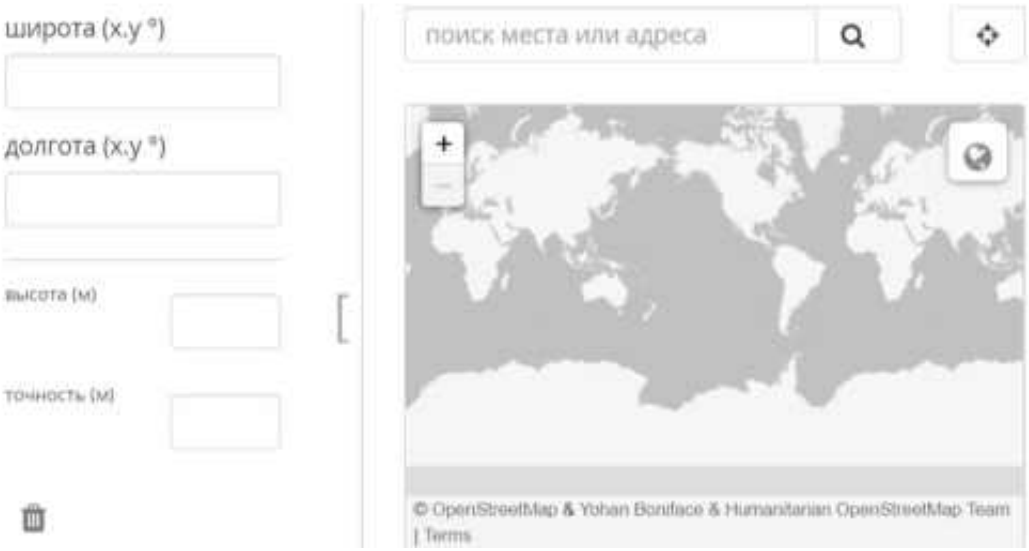
Household

Number of member in the household permanently (Including the household head):

Number of member in the household temporarily

Number of member with regular income

Location of the household



Number of member with disability

Information about Household Member(s)

1

» List of Household Member(s)

Name of the member

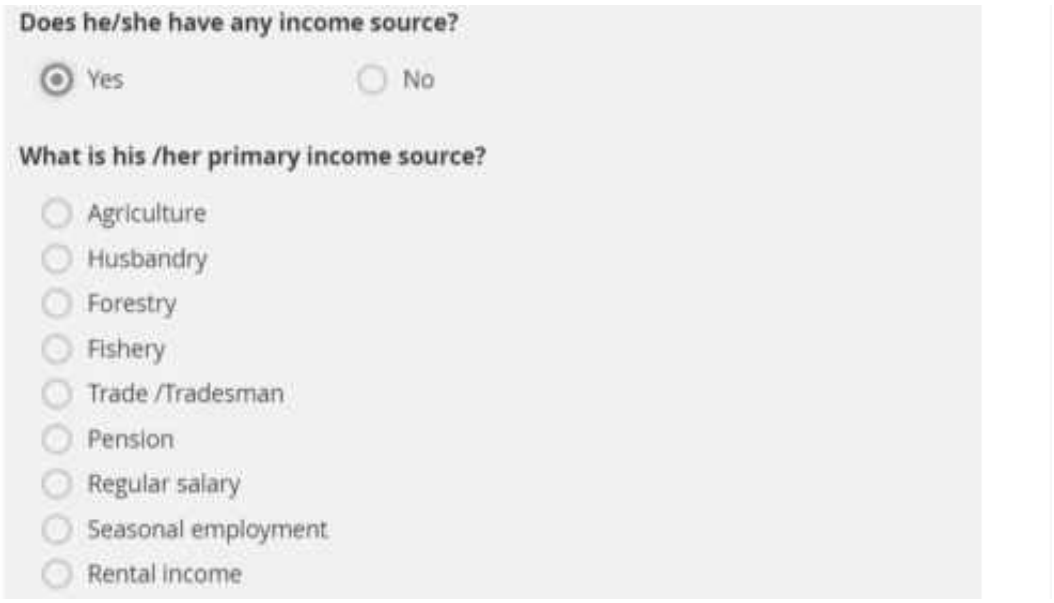
(If it is not possible to obtain the name information, please note as Person 1)

Degree of affinity with household head

- ○ Household head
- ○ Partner
- ○ Son / Daughter
- ○ Bride / Groom
- ○ Grandchild
- ○ Mother / Father
- ○ Father in law / Mother in law
- ○ Sibling
- ○ Wife / husband of sibling
- ○ Son /daughter of sibling
- ○ Other

Gender

- ○ Male
- ○ Female



- Other

If he/she does have secondary income source, what is this?

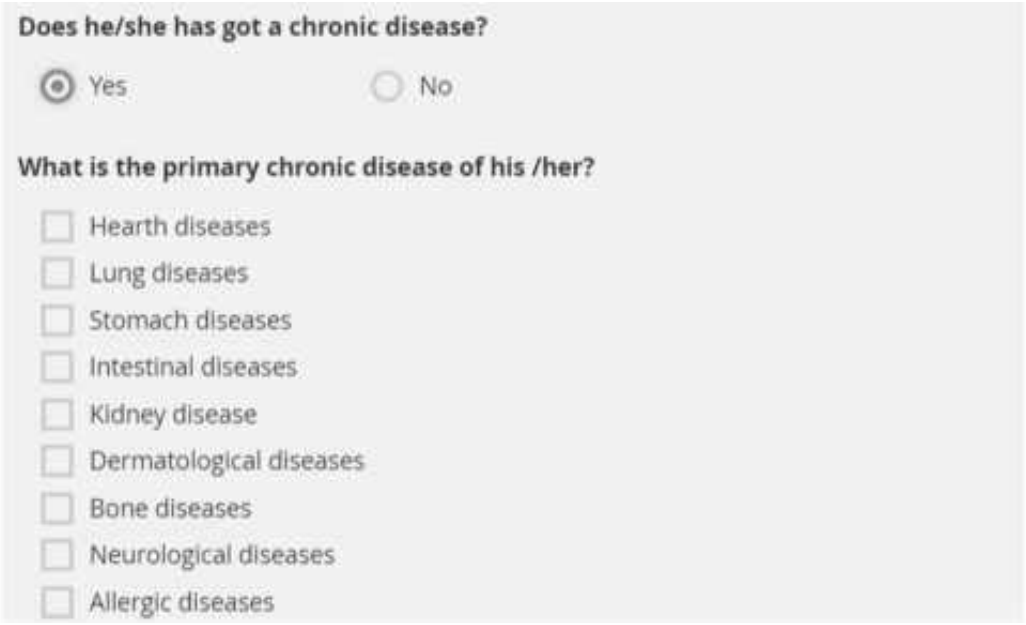
- no secondary income source
- Agriculture
- Husbandry
- Forestry
- Fishery
- Trade /Tradesman
- Pension
- Regular salary
- Seasonal employment
- Rental income
- Other

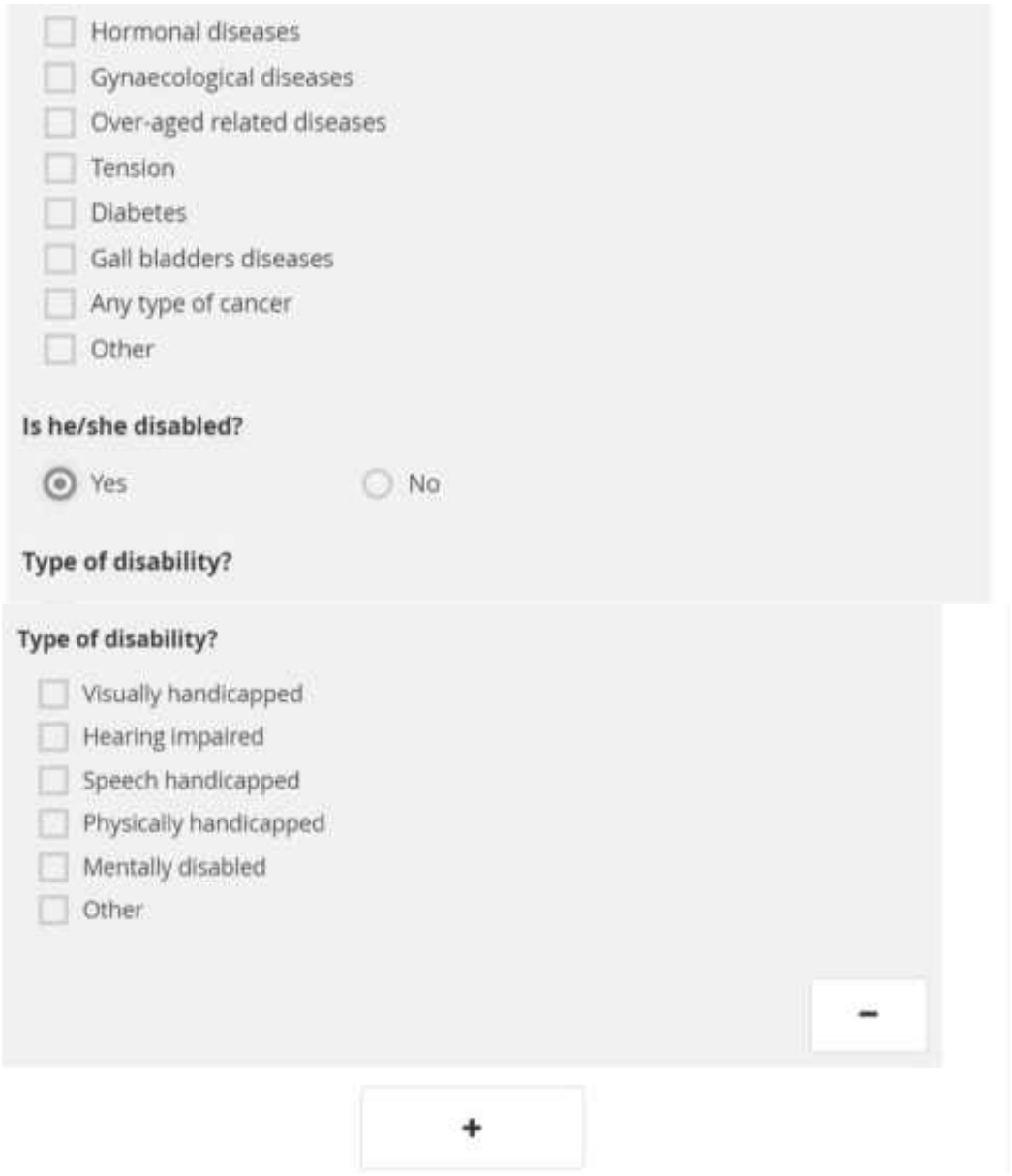
» SECTION 1-3: LITERACY, EDUCATIONAL STATUS and BEING STUDENT

Which school did he/she attend at last?

- Pre-school
- High school
- Vocational college
- Lyceum
- University, bachelor
- Master
- Doctorate and higher
- Other

» SECTION 1-4: HEALTH




Hormonal diseases
Gynaecological diseases
Over-aged related diseases
Tension
Diabetes
Gall bladders diseases
Any type of cancer
Other
Is he/she disabled?
Yes
No
Type of disability?
Type of disability?
Visually handicapped
Hearing impaired
Speech handicapped
Physically handicapped
Mentally disabled
Other
-
+
SECTION 1-5: MIGRATION and other MOVEMENTS
Did you live in another place as whole members of this household?
(A) Specify

(●) Yes ( ) No

» Migration related questions

Where did you live before your current location?

Name of the location

How long have you lived in A settlement?

What was the reason of your migration from A settlement?

- [ ] Employment
- [ ] Job change
- [ ] Retirement
- [ ] Returning to the hometown
- [ ] Sanitary reasons
- [ ] Educational reasons
- [ ] Safety related reasons
- [ ] Other

Did you live elsewhere before A settlement?

( ) Yes ( ) No

Do you have agricultural activity?

(●) Yes ( ) No

SECTION 2-1 AGRICULTURAL AREAS and PRODUCTS

Who owns the land?

- ( ) My own land (50-year-rent)
- ( ) I'm cultivating the land owned by the someone else and I pay a rent.
- ( ) I do not own the land, I'm seasonal worker
- ( ) Other

What is the size of the land?

indicate in ha

How do you derive income from the land?

- ○ I am the one personally benefitting from the income
- ○ I'm cultivating the land of my family and sharing the income
- ○ I'm cultivating the land, but I am paying rent to someone else.
- ○ I am leasing out my land to someone else and derive rent income.
- ○ I give it to the share farmer.
- ○ Other

Which products are mostly produced in the land?

Do you sell this product?

- ○ Yes
- ○ No

SECTION 2-2 HUSBANDRY

Do you have any stockbreeding activity?

- ◉ Yes
- ○ No

» Stockbreeding details

Stockbreeding

- [ ] Cattle breeding
- [ ] Small cattle breeding
- [ ] Poultry
- [ ] Beekeeping
- [ ] Fishery

Do you derive income from stockbreeding?

- ( ) Yes
- ( ) No

Section 3 GENERAL FEATURES of THE HOUSING

Is there an electric network?

( ) Yes ( ) No

Is there a sewerage system?

( ) Yes ( ) No

Is there a water supply network?

( ) Yes ( ) No

Is there a solar power?

( ) Yes ( ) No

Is there a telephone line?

○ Yes ○ No

Is there an internet line?

○ Yes ○ No

» SERVICES

According to you; is sufficient your...? 1.no mentioned service - 2.Insufficient - 3.Neither sufficient nor insufficient - 4.Sufficient

drinking water supply system

no mentioned service	Insufficient	Neither sufficient nor	Sufficient

water supply system

no mentioned service	Insufficient	Neither sufficient nor insufficient	Sufficient

irrigation water system:

no mentioned service	Insufficient	Neither sufficient nor insufficient	Sufficient

sewage water system

no mentioned service	Insufficient	Neither sufficient nor insufficient	Sufficient

waste disposal system

roads within the settlement

access roads

transportation system

health service

education service

shopping service

no mentioned service	Insufficient	Neither sufficient nor insufficient	Sufficient

» 40 MOST IMPORTANT PROBLEM – TRANSPORTATION - COMMUNİCATION-CIVIL SOCIETY

What is the most important problem according to your settlement where you live?

Where do you go to for weekly shopping? In which day?

Where do you go to for other works?

Where do you go to for your general health problems? Please specify the name and location of the health institution.

Enter a date and time

yyyy-mm-dd hh:mm

1.1.2 Annex 1.2. Questionnaire for Local Authority of Socio Economic-Research

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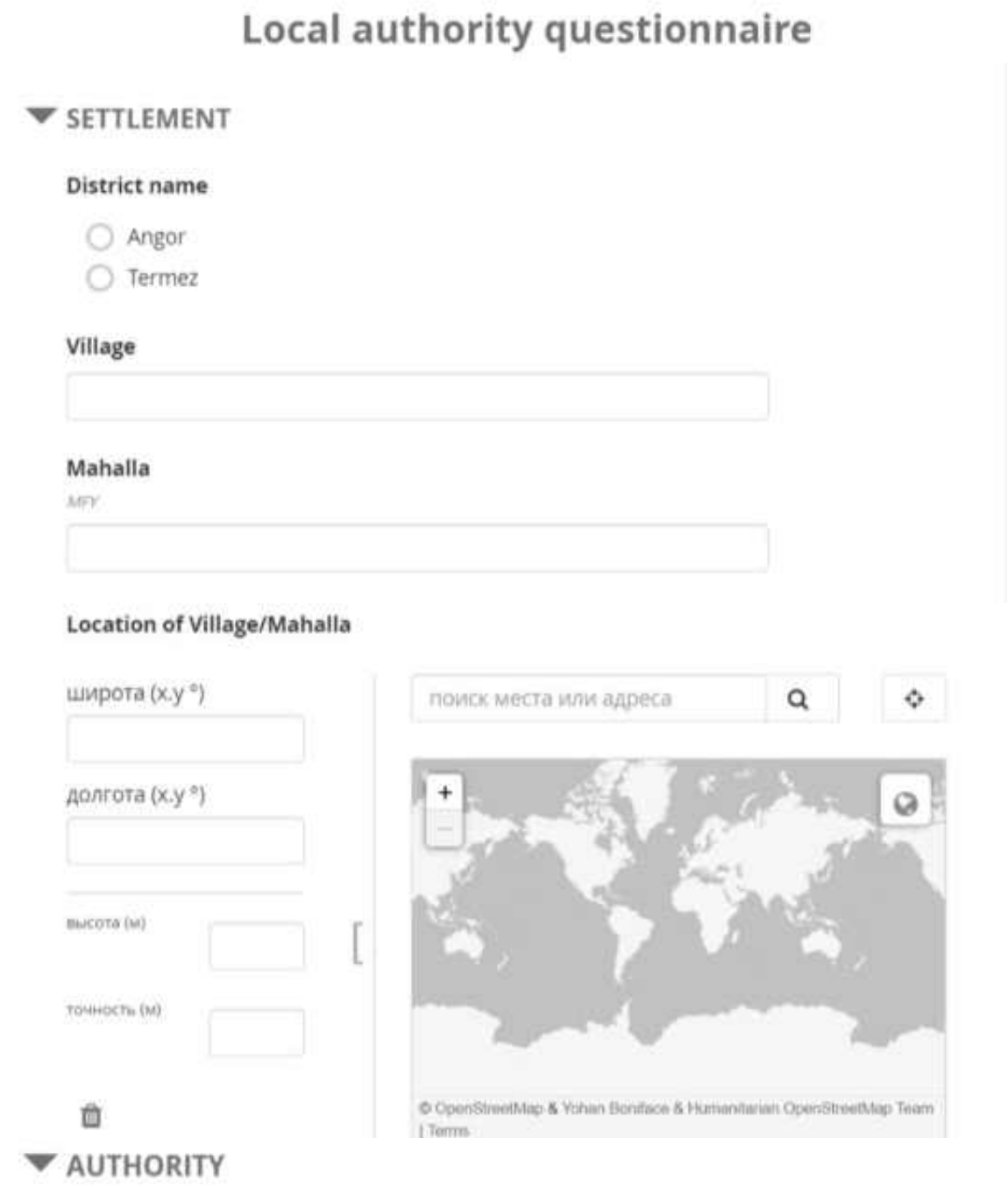


Tenure

position

- ○ Head
- ○ Accountant
- ○ Other

DEMOGRAPHY

What is the total population in the settlement?

number of population

What is the total household in the settlement?

in numbers

How many women do live in the settlement?

number of female

How many men do live in the settlement?

number of men

How many infant person are in the settlement (in 0-6 age range)?

Please clarify the range if different

How many children are in the settlement (in 7-16 age range; school)?

Please clarify the range if different

How many young people are in the settlement (in 17-35 age range)?

Please clarify the range if different

How many middle-age people are in the settlement (in 36-60 age range; retirement)?

Please clarify the range if different

How many elderly people are in the settlement (in 60 and over age range)?

Please clarify the range if different

How has the settlement's population changed in last 5 years?

- ○ Decrease
- ○ Increase
- ○ No change

» Population change

What is the reason of the change?

- ☐ Emigration
- ☐ Immigration
- ☐ Birth number
- ☐ Death number
- ☐ Emigration and immigration are equal
- ☐ Birth number and death number are equal

Economy

Number of the household who has Low income?

Number of the household who has Middle income?

Number of the household who has High income?

» Employment

» » Employment condition

Number of employed people

Number of Unemployed people

Number of students

Number of Pensioners

Number of disabled people

» » Income source

Primary income source of regular income owners

- ○ Agriculture
- ○ Stockbreeding
- ○ Worker (state)
- ○ Worker (private)
- ○ Pensioner
- ○ Tradesman
- ○ Production based trade
- ○ Driver, operator
- ○ Craftsmanship (electrical, watery, construction)
- ○ Unskilled worker as seasonal labour
- ○ Fishery
- ○ Other (specify)

Secondary income source of regular income owners

- ○ Agriculture
- ○ Stockbreeding
- ○ Worker (state)
- ○ Worker (private)
- ○ Pensioner
- ○ Tradesman
- ○ Production based trade
- ○ Driver, operator
- ○ Craftsmanship (electrical, watery, construction)
- ○ Unskilled worker as seasonal labour
- ○ Fishery
- ○ Other (specify)

What is the general educational attainment of the settlement?

1

Number of person

Specify education

- ○ No education
- ○ School
- ○ Vocational college
- ○ Lyceum
- ○ University, bachelor
- ○ Master
- ○ Doctorate or higher

−

+

HEALTH

Where do people go to the general health problems?

- ○ Qishloq vrachlik punkti
- ○ State hospital
- ○ Private hospital
- ○ Other (specify)

Distance of the health institution with the settlement

Most common primary disease in the settlement ?

- ○ Hearth diseases

- ○ Lung diseases
- ○ Stomach diseases
- ○ Intestinal diseases
- ○ Kidney diseases
- ○ Dermatological diseases
- ○ Bone diseases
- ○ Neurological diseases
- ○ Allergic diseases
- ○ Hormonal diseases
- ○ Gynaecological diseases
- ○ Over-aged related diseases
- ○ Tension
- ○ Diabetes
- ○ Gall bladders diseases
- ○ Any type of cancer

According to you, what is the reason of being common of the disease?

Most common secondary disease in the settlement ?

- ○ Hearth diseases
- ○ Lung diseases
- ○ Stomach diseases
- ○ Intestinal diseases
- ○ Kidney diseases
- ○ Dermatological diseases
- ○ Bone diseases
- ○ Neurological diseases
- ○ Allergic diseases
- ○ Hormonal diseases
- ○ Gynaecological diseases
- ○ Over-aged related diseases

- ○ Tension
- ○ Diabetes
- ○ Gall bladders diseases
- ○ Any type of cancer

According to you, what is the reason of being common of the disease?

Is there any cancer which is commonly seen in the settlement?

- ◉ Yes
- ○ No

Most common primary cancer in the settlement

- ○ Lung cancer
- ○ Intestinal cancer
- ○ Brain neoplasm
- ○ Skin cancer
- ○ Breast cancer
- ○ Bladder cancer
- ○ Gastric cancer
- ○ Ovarian cancer
- ○ Throat cancer
- ○ Pancreatic cancer
- ○ Prostate cancer
- ○ Uterine cancer
- ○ Other

According to you, what is the reason of being common of the cancer?

TRANSPORTATİON – INFRASTRUCTURE - COMMUNİCATİON

*Is there an electric network where you live?

- Yes
- No

*Is there an water supply network where you live?

- Yes
- No

*Is there an sewarage system where you live?

- Yes
- No

*Is there a telephone line where you live?

- Yes
- No

*Is there an internet line where you live?

- Yes
- No

***Is the settlement within the a coverage area?**

- ○ Yes
- ○ No

***Is there any school building where you live?**

- ○ Yes
- ○ No

***Is there any health service building where you live?**

- ○ Yes
- ○ No

▼ Quality of the infrastructure

According to you; is sufficient your...? 1.no mentioned service - 2.Insufficient - 3.Neither sufficient nor insufficient - 4.Sufficient

shopping service

health service

education service

transportation system

access roads

roads within the settlement

waste disposal system

sewage water system

irrigation water system:

water supply system

drinking water supply system

What is the most important problem in the settlement where do you live?

General questions

What are the most spoken languages in the settlement?

- [ ] Uzbek
- [ ] Tajik
- [ ] Russian
- [ ] Kazakh

What ethnic / religious group does the majority live in?

- [ ] Islam
- [ ] Christianity
- [ ] Judaism
- [ ] No religion

Is there any holly place?

- (•) Yes
- ( ) No

Name of any blessed structure, wish tree, tomb, mausoleum, entombed saint etc.?

Project information

Do you have any information about the Project?

Where did you obtain this information?

What do you want to know about the Project?

Who should give the information which do you want to know?

How should given the information which do you want to know?

Did you have any grievance by now? What was your grievance? Did you report your grievance any where? Where did you report your grievance?

What kind of benefits it may have?

What kind of problems may be seen?

What should be the best social project/ investment / support area for your region?

Enter a date and time

yyyy-mm-dd hh:mm

1.1.3 Annex 1.3. Focus Group Meeting Questionnaire

FOCUS GROUP MEETING PARTICIPATION FORM				
	Age	**Occupation**	**Gender**	**Date**
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				

OPINION ABOUT THE PROJECT			
How will the planned project affect the region?	**Positive**	**Negative**	**Both positive and negative**
If it's positive, why?	**Reason 1**	**Reason 2**	**Reason 3**
If it's negative, why?	**Reason 1**	**Reason 2**	**Reason 3**
Information about the Project	**Information 1**	**Information 2**	**Information 3**
What do you wonder about the project?	**Question 1**	**Question 2**	**Question 3**
By whom and how should information be made?	**Informative1**	**Informative 2**	**Informative 3**
What are the main problems in your area that need to be solved first?	**Problem 1**	**Problem 2**	**Problem 3**
How can the people who make the project contribute to your settlement?	**Support area opinion 1**	**Support area opinion 2**	**Support area opinion 3**
What problems can the project people come up with?	**Critical issue 1**	**Critical issue 2**	**Critical issue 3**

1.2 ANNEX 2. PHOTOGRAPHS TAKEN DURING THE STUDY

1.2.1 Annex 2.1 Photos of the survey

Ground truthing the coordinates of the project location was done in the bench of Uchkyzyl Reservoir. By defining the accurate location of the project, 10 km distance was clarified. Consequently, project impact area and relevant settlements (makhallas) were defined with the help of hokimiyat representatives.

Survey conduction process from local authorities

1.2.2 Annex 2.2. Focus Group Discussion Photos

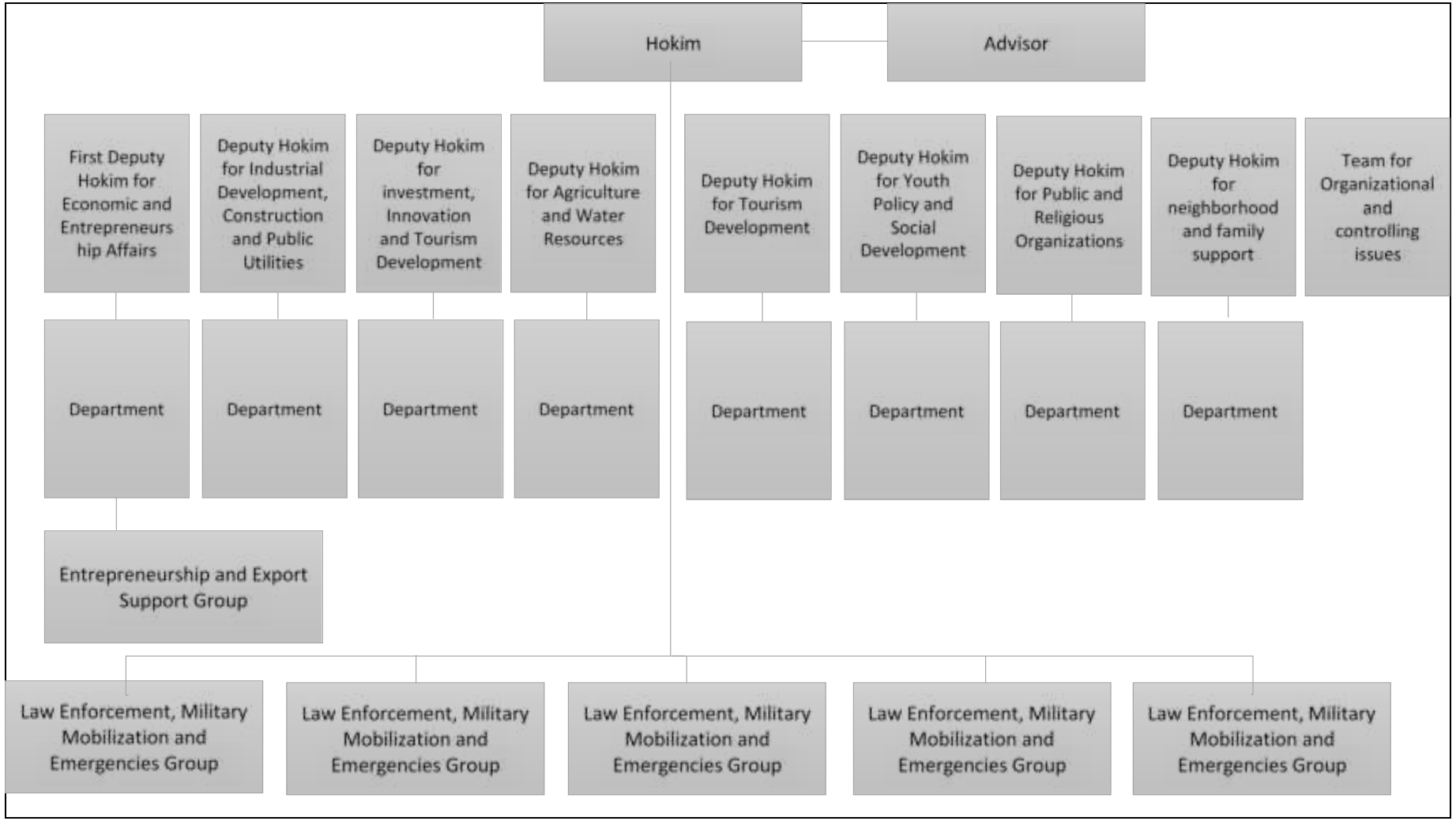



- Focus Group Discussion in Angor




- Focus Group Discussion in Termiz

1.3 ANNEX 3 ORGANIGRAM OF SURKHANDARYA PROVINCE HOKIMIYAT



1.4 ANNEX 4 GRIEVANCE REDRESS MECHANISM FORMS

1.4.1 Annex 4.1 Public Grievance Form

Reference No:		
Full Name Note: *you can remain anonymous if you prefer or request not to disclose your identity to the third parties without your consent*	**My first name** _____ **My last name** _____ ☐ **I wish to raise my grievance anonymously I request not to disclose my identity** ☐ **without my consent**	
Contact Information Please mark how you wish to be contacted (mail, telephone, e-mail).	☐ **By Post: Please provide mailing address:** _____ ☐ **By Telephone:** _____ ☐ **By E-mail:** _____	
Preferred Language for communication	1. **Russian** 2. **Uzbek**	3. **English** 4. **Other (specify)**
Description of Incident or Grievance:	What happened? Where did it happen? When did it happen?	Who did it happen to? What is the result of the problem?
Date of Incident/Grievance		
	1. **One-time incident/grievance (date_____)** 2. **Happened more than once (how many times? _____)** 3. **On-going (currently experiencing problem)**	
What would you like to see happen to resolve the problem?		

1.4.2 Annex 4.2 Grievance Log Form

Name/Contact Details	Date Received	Details of Compliant/Comment	Responsibility	Actions Taken	Date Resolved

UzAssystem

STONE CITY ENERGY (1600 MW) CCPP PROJECT

ATTACHMENT H

ENVIRONMENTAL&SOCIAL ACTION PLAN

ASE-UZA-571-REP-ESA-0001-02

Rev	Date	Purpose of issue	Issuer	Checker	Approver
02	16/12/2021	Initial	U. GÜNGÖR	M. ACIRLI	F. SATTAROV

UzAssystem

STONE CITY ENERGY (1600 MW) CCPP PROJECT

ATTACHMENT H

ENVIRONMENTAL&SOCIAL ACTION PLAN

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Rev	Date	Purpose of issue	Issuer	Checker	Approver
02	16/12/2021	Initial	U. GÜNGÖR	M. ACIRLI	F. SATTAROV

No	Action	Environmental Risks, Liability/ Benefits	Legislative Requirement / Lender Requirements / Good practice	Investment Needs / Resources Costs	Timetable Action Due Date	Target and Evaluation Criteria for Successful Implementation
PS1	**Assessment and Management of Environmental and Social Risks and Impacts**					
1.1	**Health, Safety, Security and Environment (HSSE)Policy** **The Project shall produce an HSSE Policy, based on Project's existing HSSE Policy; and fully aligned with the Lender Requirements; IFC Performance Standards.** **The Policy shall be signed by the Project Executive Managing Officer / CEO; displayed on-site at all times; and appended to the Project's supporting Environmental & Social Management Plans.**	**Management of HSSE risks in accordance with Lender Requirements.**	**Good Practice** **IFC PS1**	**Internal Costs.**	**Prior to Financial Close.**	**HSSE Policy submitted to Lenders.**
1.2	**Environmental, Health & Safety and Social (EHSS) Contractor Requirements Incorporate the requirements for EHSS management (environmental, health and safety and social, including HR and GBVH policies), as well as ESIA recommendations generally, as part of contract documents.** **Conduct periodic inspection of contractors' EHSS performance.**	**Ensure that all aspects of the company operation, including those delivered by sub-contractors are in compliance with the Lender Requirements to avoid causing social disruption, environmental damage or harm to employees and the public.**	**Good Practice** **IFC PS1 / PS2**	**Internal costs and resources.** **Liaison with contractors.**	**On-going and upon appointment of contractors**	**Sub-contractor clauses setting out requirements for performance with respect to environmental, H&S, labor and HR policies of the Company are developed and included in the tender documentation.** **Results of Risk Assessment for Contractors and sub-contractors.**

No	Action	Environmental Risks, Liability/ Benefits	Legislative Requirement / Lender Requirements / Good practice	Investment Needs / Resources Costs	Timetable Action Due Date	Target and Evaluation Criteria for Successful Implementation
1.3	**National Permits, Licenses, Consents & Authorizations Obtain the necessary outstanding permits prior to commencements of activities for which the permits are required. These shall be inclusive of, but not limited to:** • **Construction Permit(s) (following camps plan submission);** • **Permit(s) for stationary air pollution sources;** • **Permit(s) for water use;** • **Permit(s) of temporary and permanent land use; and** • **Permit(s) for use of foreign workers.** **If there are any design changes, obtain the necessary permits again prior to commencements of activities for which the permits are required.**	**Compliance with the Republic of Uzbekistan regulatory requirements.**	**Legislative Requirements IFC PS1**	**Internal costs, part of project delivery.**	**Prior to 1st Disbursement**	**Obtain National EIA Authorization (OVOS).**
					Prior to activities for which authorizations are required; particularly commencement of construction activities.	**Checklist of all required permits required for the Project, construction- and operational-phases, included within the Project's Management System (see ESAP Item 1.7.**
1.4	**Environmental, Health & Safety, and Social (EHSS) Incident Reporting Procedure** **Establish an EHSS)Incident Reporting Procedure (or equivalent) to maintain records of monitoring, accidents and incidents (including near-misses). Procedure must include and auditable investigation procedure, including Corrective Action Reporting (CAR) system.** **The procedure must be overarching, unique and fully integrated into the Project and for contractors located on site.**	**Reporting of EHSS incidents, to inform ongoing improvement.**	**Good Practice** **IFC PS1**	**Internal costs.**	**Prior to commencement of construction.**	**Format for EHSS Reports, including reporting of incidents and near-misses, to be submitted to the Lenders for agreement.**
					Monthly	**EHSS Reports submitted to Lenders**

No	Action	Environmental Risks, Liability/ Benefits	Legislative Requirement / Lender Requirements / Good practice	Investment Needs / Resources Costs	Timetable Action Due Date	Target and Evaluation Criteria for Successful Implementation
1.5	**Influx Management Plan** **Given the estimated peak workforce (>2,000 workers); and probability of significant influx into the local communities; the Project shall prepare an *Influx Management Plan*, in accordance with IFC Publication, *Projects and People: A Handbook for Addressing Project-induced In-migration*.**	**Manage the potential impacts arising through worker influx**	**Good Practice** **IFC PS1/PS2/PS4**	**Management time and internal cost.** **External consultants if required.** **Coordination with EPC Contractor.** **Liaison with external stakeholders as required.**	**Prior to commencement of construction.**	**Submission of Influx Management Plan to Lenders; including summary of how the identified mitigation / interventions have been integrated throughout the Project.**
1.6	**Workers Accommodation: Design and Gap Analysis** **Workers accommodation facilities should be designed to meet regulations; and,** ***Workers' Accommodation: Processes and Standards; A guidance note by IFC and the EBRD*, September 2009.The plan should also detail prioritization of workers for housing on the worker accommodation site.**	**Ensure safety and wellbeing of workers.** **Minimize risk of incidents, and accidents.** **Minimize risk of social conflicts.**	**Good Practice** **IFC/ PS1/ PS2**	**Part of project implementation – Contractor's own resources.** **Project Company supervision and ultimate accountability for compliance.** **External consultant support if required.**	**Prior to commencement of construction works.**	**Submission of Workers Accommodation Plan, which shall demonstrate compliance of the design and provision of facilities to be aligned with the Lenders Requirements.** **Record of internal and external (by the Engineer and Supervising Consultant) inspections.** **Record of grievances. Feedback from workers.**
1.7	**Environment, Health & Safety Management System** **Establish and Implement Environmental, Health & Safety (EHS) management system on ISO 14001 and ISO 45001.** **The EHS Management System shall be prepared to cover the construction-, commissioning- and operational-phase of the Project.**	**The procedures for critical environmental, occupational and social issues are implemented to improve the management and performance; whilst reduce residual risks.**	**Good Practice** **IFC PS1/PS2**	**Prepared by Project Company (internal cost); with optional external consultant support.**	**Prior to commencement of Construction**	**Project-level EHS Management System, submitted to Lenders.**

No	Action	Environmental Risks, Liability/ Benefits	Legislative Requirement / Lender Requirements / Good practice	Investment Needs / Resources Costs	Timetable Action Due Date	Target and Evaluation Criteria for Successful Implementation
	The CESMP, CoESMP and OESMP will include plans, procedures, checklists, etc. as required to ensure adequate implementation of the ESMS. The anticipated suite of Management Plans are provided under the ESIA Volume 3, and include: (i) waste management plan; (ii) occupational health and safety plan; (iii) emergency preparedness and response; (iv) hazardous materials handling and storage; (v) environmental monitoring plan; (vi) traffic management plan; (vii) security management plan; and (viii) chance find procedure.			**Prepared by EPC Contractor, with review and approval by Project Company.**	**Prior to commencement of Construction.**	**Construction-phase Environmental & Social Management Plan (CESMP) submitted to Lenders, reviewed and approved.**
				Prepared by EPC Contractor, with review and approval by Project Company.	**Prior to commencement of Commissioning**	**Commissioning-phase Environmental & Social Management Plan (CoESMP) submitted to Lenders, reviewed and approved.**
				Prepared by O&M Contractor, with review and approval by the Project Company.	**By Early Power Period Commissioning**	**Operational-phase Environmental & Social Management Plan(OESMP) submitted to Lenders, reviewed and approved**
				Managed by Project Company, in coordination with O&M Contractor.	**Within 2 years of Complete Project Commissioning**	**Certification of EHS Management System to ISO45001 and ISO14001.**
1.8	**Quarterly Construction Monitoring** **The Project shall be subject to independent audits of construction activities by Environmental, Health and Safety, Social, and Labor (EHSS) specialists.**	**Prevention of damage to environment, accidents prevention,** **ensuring adequate labor working conditions, cooperation with administration.** **Supervision of implementation of environmental consent decisions for construction works.**	**Good Practice** **IFC PSs** **Labor Regulations Environmental Regulations Environmental Consent**	**Cost of Independent Environmental & Social Consultant,**	**During Construction**	**Audit reports to be provided to Lenders.** **(In addition to regular monthly monitoring reports).**

No	Action	Environmental Risks, Liability/ Benefits	Legislative Requirement / Lender Requirements / Good practice	Investment Needs / Resources Costs	Timetable Action Due Date	Target and Evaluation Criteria for Successful Implementation
1.9	**6 Monthly Operational Monitoring for 1st Year** **The Project shall be subject to independent audits of operation activities by Environmental, Health and Safety, Social, and Labor (EHSS) specialists.**	**Confirm how the plants operational impacts and risks are being managed,**	**Good Practice** **IFC PSs** **Labor Regulations Environmental Regulations Environmental Consent**	**Cost of Independent Environmental & Social Consultant,**	**During Operation, every 6 months for the first year and annually thereafter.**	**Audit reports to be provided to Lenders.** **(In addition to regular annual reporting)**
1.10	**Health & Safety and Environmental (HSE) Management and Supervision Staffing Plan** **Project Company and EPC Contractor to appoint suitably qualified HSE Managers to be based on site during the construction phase.** **As a minimum, this should be in line with the EPC Contract.**	**Ensure that suitably qualified resources are available to manage HSE risks throughout construction.**	**Good Practice** **IFC PS1/PS2**	**Internal Cost (part of Project implementation).**	**Prior to commencement of construction**	**Proposed management staff CVs to be provided to Lenders, including confirmation of number of HSE dedicated roles.** **Details of HSE supervisors, as a ratio to the construction workforce, also to be aligned with industry best practice and submitted to Lenders for approval.**
1.11	**Stakeholder Engagement Plan (SEP)** **Implement the SEP and Grievance Mechanism.** **Nominate a person in the Project Company responsible for SEP implementation and for responses to**	**Need for good stakeholder engagement and public information.** **The Company needs a plan for communication with third parties as well as workers**	**Good Practice** **IFC PS1**	**Management time, or external experts fee**	**As soon as possible, and at the latest, prior to commencement of construction.** **Continuous implementation.**	**SEP published on website and disclosed to affected stakeholders.** **Documentation of stakeholder engagement activities is readily available for the Bank's**

No	Action	Environmental Risks, Liability/ Benefits	Legislative Requirement / Lender Requirements / Good practice	Investment Needs / Resources Costs	Timetable Action Due Date	Target and Evaluation Criteria for Successful Implementation
	grievances raised by stakeholders. Details of the nominated person, including experience and qualifications relevant to the task, are to be provided to Lenders. Typically, individuals would be sourced from the local community and would work closely with the Community Liaison Officer (CLO) (see ESAP Item 10.2). **Ensure that SEP and Non- Technical Summary (NTS) and appropriate environmental documentation is disclosed on the company website – in English, Uzbek and Russian - throughout the project life, and updated as necessary.**	**and subcontractors, and create mechanisms for feedback on concerns/issues raised by stakeholders.** **Tasks and responsibilities are clearly identified.** **Reducing the risk of conflicts and ensuring good public relations**				**review.** **Grievance and suggestions log and resolution records are readily available for the Bank's review.** **SEP implementation results will be part of annual reporting to the Bank.**
1.12	**Community Liaison Officer Appoint a site-based Community Liaison Officer (CLO) with appropriate skills and experience to effectively manage the implementation of the SEP.**	**Liaison with local communities and authorities on a regular basis, analyze interaction and provide updates and practical recommendations.**	**IFC PS1**	**Internal costs.**	**Prior to commencement of construction.**	**Submission to Lenders of proposed CLO CV and experience, including time allocation in fulfilling the CLO role ; in advance of appointment.** **Appointment of CLO.**

No	Action	Environmental Risks, Liability/ Benefits	Legislative Requirement / Lender Requirements / Good practice	Investment Needs / Resources Costs	Timetable Action Due Date	Target and Evaluation Criteria for Successful Implementation
10.3	**Community Development Plan** **Undertake consultation with the local community and agree a documented *Community Development Plan*.**	**Enhancement of local facilities and resources as a result of the Project.** **Distribution of benefits among the local communities.**	**IFC PS1** **IFC, Strategic Community Investment: A Good Practice Handbook for Companies doing Business in Emerging Markets, June 2010**	**Internal \ Project Costs.**	**Prior to Early Power Commissioning**	**Community Development Plan agreed with local community.** **Documented development goals, timeline and funding. Audit \ closure report upon completion.**
10.4	**Corporate ESG Reporting & Disclosure** **As part of corporate ESG reporting and disclosure provide information on the Project in annual corporate reports.** **This will include providing information in line with EU Guidelines on reporting climate related information from July 2019 – and/or best practice as appropriate.** **The report will include information on Water use/impacts as well as GHG emissions.**	**Implementation of best practice in terms of Non-Financial Disclosure and ESG.**	**Good Practice** **IFC PS1**	**Internal costs.**	**Prior to commissioning**	**Copy of corporate ESG/Non-Financial Report submitted to Lenders.**
10.5	**Annual Reporting** **Prepare annual reports for the benefit of the Lenders, throughout the operation of the Project.** **These reports should cover the full breadth of Lender Requirements; including a summary of ESAP compliance.**	**Ensure that Lenders are informed of the Project performance,**	**IFC PS1**	**Internal costs.**	**Prior to Early Power Commercial Operations Date.**	**Submission of reporting template to Lenders for agreement.**
					From Project Commercial Operation Date **Reports submitted annually, on 31 January, covering the** **previous year of operation.**	**Submission of Annual Reporting to Lenders.**
PS2	**Labor and Working Conditions**					
2.1	**Human Resource Policy Project to develop Human Resources (HR) policies and procedures to ensure that rights of employees are protected in accordance with the Uzbekistan Labor Code and Lender Requirements.**	**Employee awareness about their rights.**	**Uzbekistan Labor Code** **IFC PS2**	**Internal Costs.**	**Prior to Financial Close.**	**HR Policy Statement which all employees have access to.**

No	Action	Environmental Risks, Liability/ Benefits	Legislative Requirement / Lender Requirements / Good practice	Investment Needs / Resources Costs	Timetable Action Due Date	Target and Evaluation Criteria for Successful Implementation
2.2	**EPC Constructor Staff Human Resource (HR) Management** **The EPC Contractor shall appoint a HR Manager to coordinate with the Project Company and ensure that all aspects of EPC (and Supply Chain) HR Management are aligned with the Lenders' Requirements.**	**Ensure that HR Management remains aligned with the Project Company, and Lenders, Human Resource policy and management requirements.**	**IFC PS2**	**Internal Costs.**	**Prior to commencement of construction.**	**EPC HR Manager CV provided to Project Company for approval and notification to the Lenders.**
2.3	**Gender-based Violence & Harassment (GBVH) Policy Develop and implement a sexual harassment policy to prevent and address any form of violence or harassment, including any form of gender based violence or harassment (GBVH).** **Training on this policy will be provided to all employees and contractors. Human resources personnel will also be trained on how to respond to incidents of GBVH.**	**Protection of workers and project stakeholders from GBVH risks; and clearly aligning the project's GBVH policy.**	**Good Practice** **IFC PS 1 / 2 / 4**	**Internal Costs.**	**Prior to Financial Close.**	**GBVH Policy which all employees have access to.**
2.4	**Employee Code of Conduct Develop an employee Code of Conduct, and include within induction training for all project staff. The Code of Conduct should inform workers of local rules, etiquette and cultural sensitivities; and set out expectations relating to potential anti-social behavior (alcoholism) and the Project's GBHV Policy (ESAP Item 2.2)**	**Reduced incidents between workers and the local communities; including risk of GBVH incidents.**	**IFC PS2**	**Internal Costs.** **Coordination with EPC and O&M Contractors.**	**Include within Staff Induction, which shall be implemented on an ongoing basis throughout the Project.**	**Records of induction materials; and register of induction completion by Project staff, including sub-contractor staff.**

No	Action	Environmental Risks, Liability/ Benefits	Legislative Requirement / Lender Requirements / Good practice	Investment Needs / Resources Costs	Timetable Action Due Date	Target and Evaluation Criteria for Successful Implementation
2.5	**Worker Grievance Mechanism** **Ensure that the Project Company Grievance Mechanism is extended / cascaded across all workers involved in the Project, including the EPC Contractor and their Sub-contractor staff.**	**Provide a channel for raising workers' concerns and a transparent, consistent mechanism for resolution.**	**IFC PS2**	**Internal costs and resources.**	**Prior to Commencement of Construction.**	**Adoption of Grievance Mechanism allowing anonymous complaints and suggestions.** **Register of grievances and suggestions, and their resolution.** **Grievance and suggestion boxes available across the sites.**
2.6	**Labor Risks in Supply Chain** **During the procurement process, put in place a mechanism for checking the presence/absence of child labor, forced labor and high risks of significant safety issues, in the production of core materials and equipment.**	**Minimize risk of child labor and forced labor being used in a core supply chain.**	**IFC PS2**	**Internal costs and resources.**	**Prior to EPC Contract finalization.**	**Specific tender clauses on the exclusion, and definition, of 'forced' and 'child' labor; together with requirements to undertake Supply Chain Risk Assessment; monitoring; and verification.**
2.7	**Employment Policy Document (EPD)** **Develop an *Employment Policy Document* (EPD) for construction phase** **The EPD document should build upon the *Human Resource Policy* (ESAP Item 2.1) and *GBVH Policy* (ESAP Item 2.2), and will address:** **• Working conditions** **• Terms of employment** **• Informing workers about their rights** **• Child Labor** **• Forced labor** **• Equal Opportunities/non-**	**Ensure cascading of core PR2 / PS2 requirements through the contracting chain, and to ensure ongoing monitoring of - and reporting on performance of the EPC Contractor, and all sub- contractors.**	**National Legislation Good Practice** **IFC PS2**	**EPD development - Management time of Project Company, or 'external experts' fee.**	**Prior to commencement of the construction activities.** **To be submitted together with the Construction Environmental & Social Management Plan (CESMP)** **(See ESAP Item 1.6).**	**EPD is developed, and approved by Lenders before the start of construction works.** **Implementation of EPD to be subject to periodic review and monitoring by Supervising Consultant.**

No	Action	Environmental Risks, Liability/ Benefits	Legislative Requirement / Lender Requirements / Good practice	Investment Needs / Resources Costs	Timetable Action Due Date	Target and Evaluation Criteria for Successful Implementation
	discrimination **• Workers organizations** **• Workers accommodation Regulations and Workers' accommodation: processes and standards; (A guidance note by IFC and the EBRD, September 2009)** **• Occupational Health and Safety** **• Grievance mechanism for all workers on the project site.** **The EPD should include targets and procedures for recruitment of local workers where possible.** **In addition to the above, the EPD will summarize the estimated no. of workers working under National Minimum Wage; and whether the Project has voluntarily adopted a '*Living Wage*' for workers.**			**Internal Costs of the Project Company, to audit the EPC Contractor's compliance with the EPD.**	**Within 3 months of commencement of construction.**	**First EPD implementation report – including an audit finding - to be submitted to Lenders.**
2.8	**EPC Contractor Staffing Plan** **The EPC Contractor shall develop a staffing plan, detailing the projected workforce throughout construction, including the number of staffs at various skills levels.** **The Staffing Plan should fully apply the principles set out under the EPD.**	**Management potential adverse risks; as well as opportunities for local employment and training; resulting from the construction phase workforce requirement.**	**IFC PS2**	**Internal Costs of the Project Company, in ensuring that this is completed by the EPC Contractor.**	**Prior to commencement of construction.**	**Staffing Plan – reviewed and approved by the Project Company – to be submitted to the Lenders for review.**
PR3	**Resource Efficiency and Pollution Prevention**					
3.1	**Continuous Ambient Air Quality Monitoring & Meteorological Station** **Locations should be selected to be representative of potential exposure to emissions.**	**Management and verification of potential air quality risks, in order to demonstrate that impacts are in line with ESIA projections and within acceptable thresholds (National Thresholds and Lender Requirements).**	**IFC PS3**	**Internal costs of the Project Company; together with external consultant support.**	**Prior to commencement of construction.**	**Develop an Air Quality Monitoring Plan which sets out locations and methodology. Submit plan to Lenders for review.**
					1 year prior to Early Power Commercial Operation Date.	**Commence Ambient Air Quality Monitoring in line with plan.** **Include findings within Lender reporting.**

No	Action	Environmental Risks, Liability/ Benefits	Legislative Requirement / Lender Requirements / Good practice	Investment Needs / Resources Costs	Timetable Action Due Date	Target and Evaluation Criteria for Successful Implementation
					Project Commercial Operation Date.	**Upon Project COD, continue monitoring for a period of 2 years.** **Include findings within Lender reporting.**
3.2	**Ongoing Noise Monitoring & Compliance Reporting** **Weekly (construction phase) and monthly (operational phase) sound level monitoring to be undertaken during working hours (construction phase) or day and night-time periods (operational phase).** **Sound level measurement equipment to conform with IEC 61672-1:2013 class 1 or class 2 specifications.** **Plans defining the measurement locations, strategy, surveying and reporting templates, and the further actions to be taken in the event of identified exceedances of relevant thresholds to be prepared for each phase.**	**Management and verification of potential adverse effects of noise, in order to demonstrate that impacts are in line with ESIA projections and within acceptable thresholds (national thresholds and Lender requirements).**	**IFC PS3** **IFC EHS Guidelines**	**Measurement equipment and suitable training, or costs of external consultant support.**	**Prior to commencement of construction.**	**Develop a Construction Noise Monitoring Plan and submit to Lenders for review.**
						Commence construction noise monitoring in line with plan.
					Prior to Early Power Commercial Operation Date.	**Develop an Operational Noise Monitoring Plan and submit to Lenders for review.**

No	Action	Environmental Risks, Liability/ Benefits	Legislative Requirement / Lender Requirements / Good practice	Investment Needs / Resources Costs	Timetable Action Due Date	Target and Evaluation Criteria for Successful Implementation
						Commence operational noise monitoring in line with plan.
3.3	**Best Available Techniques (BAT): Associated Emission Limits (AEL), NOx and CO** **The project must comply with the AELs for NOx and CO, as set out under the *Best Available Techniques (BAT) Reference Document for Large Combustion Plants* (BREF).**	**Control of air emissions and associated impacts arising from the Project.**	**Best Available Techniques** **IFC PS3**	**Part of project implementation,**	**Pre-Financial Close**	**Written statement provided to Lenders to demonstrate BAT AEL compliance has been integrated within the Project and fully considered and costed throughout the project's operation by the Client.**

	AEL (mg/Nm^3)	
	Yearly	**Daily**
Early Power Commercial Operation Date (Open-Cycle Operation)		
NOx	**35***	**50***
CO	**<40***	**-**
Project Commercial Operation Date (Combined-Cycle Operation)		

No	Action	Environmental Risks, Liability/ Benefits	Legislative Requirement / Lender Requirements / Good practice	Investment Needs / Resources Costs	Timetable Action Due Date	Target and Evaluation Criteria for Successful Implementation
	NOx **30*** **40*** *** AEL subject to correction factor, taking into account Net Electrical Efficiency. See BREF for guidance.**					
3.4	**Best Available Techniques (BAT): Net Electrical Efficiency** **The project must comply with BAT Net Electrical Efficiency, as follows:** • **Project Commercial Operation Date (Combined-cycle Operation): >57%**	**Ensure efficient resource consumption and power generation.**	**Best Available Techniques** **IFC PS3**	**Part of project implementation,**	**Pre-Financial Close**	**Written statement provided to Lenders to demonstrate BAT Net Electrical Efficiency compliance has been integrated within the Project and fully considered and costed throughout the project's operation by the Client.**
3.5	**Continuous Emissions Monitoring System** **Install continuous emissions monitoring systems (CEMS) on all emission stacks – main- and bypass-stacks.** **Ensure that the position of installed monitoring portals (sampling locations) for both CEMS and extractive testing, comply with international standards for this sampling (EN15259), in particular in order to ensure homogenous flow and avoidance of turbulent zone sampling. A homogenous flow specialist assessment should be undertaken prior to installation of the CEMS in order to confirm that the installation portals are in the correct position.**	**Minimization of pollution.**	**Good Practice** **EU Best Available Techniques** **IFC PS3**	**Internal Resource**	**CEMS on all locations with correct portals prior to plant commissioning. Survey of monitoring portals against the EN 15259 standard prior to any detailed design finalization and prior to release of tender package for installation (to ensure valid sampling and monitoring results).**	**Monitoring reports.** **Monitoring portals to be installed in line with EN 15259 (2007 or latest version).**
3.6	**Annual GHG Emissions Reporting; and Carbon Capture Storage (CCS) Readiness.** **Undertake annual GHG Emissions reporting for the Project.** **The reporting should be included within the Project's general corporate reporting package, and demonstrate alignment of the actual carbon intensities with those disclosed under the Project's ESIA; in summary:**	**The estimated annual GHG emissions exceed the Lender thresholds requiring annual reporting.** **Reporting Critical for ensuring that the Project's GHG impacts are understood, and minimized as and when new technology becomes viable.**	**Good Practice** **IFC PS1**	**Management time, internal costs.** **External consultants if required.**	**GHG Emissions Reporting commencing on 31 January following Early COD 1.** **Reporting shall cover the preceding year; and be undertaken on an** **annual basis.** **CCS Feasibility to be completed 5 years from commissioning, and every 5 years thereafter.**	**GHG Reports to be provided to the Lenders annually.** **Provide a report to the Lenders: *The assessment report covering the availability of suitable storage sites and the technical and economic feasibility of transport facilities and retrofit for CO_2 capture*** **The report should follow EU**

No	Action	Environmental Risks, Liability/ Benefits	Legislative Requirement / Lender Requirements / Good practice	Investment Needs / Resources Costs	Timetable Action Due Date	Target and Evaluation Criteria for Successful Implementation
	Undertake a CCS Readiness / Feasibility Assessment of the Project every 5 years throughout operations.					**guidance**
3.7	**1st Hot Gas Path Inspections: Emissions Compliance Report** **Following the 1st Hot Gas Inspection, and the associated plant upgrades to align emissions with BAT-AELs without the use of secondary abatement / SCR; an *Emissions Compliance Report* shall be submitted to outline the proposed strategy to ensure ongoing BAT-compliance.** **For the avoidance of doubt, please see ESAP Item 3.4 for** **BAT-AELs.**	**To ensure continued BAT-compliance of air emissions, particularly NOx.**	**Best Available Techniques** **IFC PS3**	**Project Company time in preparing report.** **Potential support from external consultants.**	**Within 3 weeks from completion of Hot Gas Inspections and associated works.**	**Submission of Emissions Compliance Report, to demonstrate efficacy of plant upgrades; strategy for continued BAT compliance; and contractual protections / recourse in the event of non-compliance.**
					Prior to modification of SCR operation; including reduced capacity or removal.	**Approval by Lenders.**
3.8	**Audit within 1 year of Operation inclusive of:** • **NOx emissions;** • **noise;** • **water use, impacts and strategy for reduction (including cooling technology optimization, and reviewed risk analysis based on updated climate change projections);** • **labor issues;** • **Greenhouse Gas (GHG) emissions; and** • **Carbon-Capture-Storage (CCS) Readiness.** **The audit shall include verification that the plant operation is aligned with Best Available Techniques (BAT).** **Repeat the audit every 5 years and**	**Need to verify operations.** **BAT compliance, particularly NOx performance and management of potential risks associated with SCR operation.** **Water use to verify projected abstraction requirements, loss, and absence of conflict issues with adjacent irrigation**	**Good Practice** **IFC PS1 / PS2 / PS3 /PS4**	**Independent consultant, with a demonstrable track-record in auditing CCPP projects against International Lender Requirements.**	**Within 1 year of Project (CCPP) Commissioning.** **Repeat audits every 5 years thereafter.**	**Compliance Report and Improvement Plan.** **The Terms of Reference for the Audit, and selection of Consultant shall be approved by the Lenders prior to instruction.**

No	Action	Environmental Risks, Liability/ Benefits	Legislative Requirement / Lender Requirements / Good practice	Investment Needs / Resources Costs	Timetable Action Due Date	Target and Evaluation Criteria for Successful Implementation
	develop an action plan based upon the audit findings. This shall include an options appraisal **for continued improvement, including for water use reduction.**	**demands.**				
PS4	**Community Health, Safety, and Security**					
4.1	**Traffic Management Plan Agree transportation routes and acceptable traffic patterns to minimize traffic nuisance during construction phase of the Project.**	**Avoid or minimize risks and nuisance to local community**	**IFC PS4**	**Part of project implementation.**	**Prior to commencement of construction works.**	**The plan is in place, consulted with local authorities and approved by the Engineer and the Project Company.** **The Plan shall form part of the CESMP (ESAP Item 1.7)**

No	Action	Environmental Risks, Liability/ Benefits	Legislative Requirement / Lender Requirements / Good practice	Investment Needs / Resources Costs	Timetable Action Due Date	Target and Evaluation Criteria for Successful Implementation
4.2	**Occupational Health and Safety Management System including a detailed Occupational Health and Safety Management Plan to be developed for the Project.**	**Minimization of accidents and incidents and ensure a safe working environment and promote the health of workers and safe use of equipment.** **Improved and continual improvement of health and safety performance.** **.**	**IFC PS2 / PS4**	**Part of project implementation**	**Prior to commencement of construction works.**	**OHS Plan is in place and approved by the Project Company.** **Records of OHS training.** **Record of Safety Meetings.** **Accidents and near- misses record.** **Record of safety inspections to be included in semi-annual environmental monitoring reports.**
4.3	**Emergency Preparedness and Response Plan** **A comprehensive Emergency Response Plan to be developed for the Project clearly setting roles and responsibilities.** **There should be sections developed to cover situations relating to:** • **Containment of hazardous materials;** • **Oil and fuel spills;** • **Fire, gas leaks and explosions;** • **Work-site accidents; and Earthquake and other natural hazards.**	**Maximize effectiveness of response to emergencies Minimization of risks to workers and community health and safety**	**IFC PS1 / PS4**	**Part of project implementation**	**Prior to commencement of construction works.**	**The plan is in place, consulted with and, as appropriate, approved by local Emergency Services and/or appropriate Competent Authorities.** **Record of consultation.** **Schedule and record of drills.**

No	Action	Environmental Risks, Liability/ Benefits	Legislative Requirement / Lender Requirements / Good practice	Investment Needs / Resources Costs	Timetable Action Due Date	Target and Evaluation Criteria for Successful Implementation
	• **Extreme weather conditions** **COVID-19 outbreaks.**					
4.4	**Community Health & Safety Management Plan** **A comprehensive Community Health and Safety Management Plan shall be developed for the Project.** **This should include aspects of the *Traffic Management Plan*; *Influx Management Plan*; *GBVH Policy*; water quality management; and *Emergency Preparedness and Response Plan* - all considered in the context of their impacts on the community and measures to prevent those impacts.**	**Integrated management of potential risks affecting Community Health & Safety; and integrating the specific considerations derived from specific hazard management plans.**	**Good Practice** **IFC PS1 / PS4**	**Internal Costs of the Project Company.**	**Prior to commencement of construction.**	**Submission of Project Company's *Community Health & Safety Management Plan*, to the Lenders for review and approval.**

No	Action	Environmental Risks, Liability/ Benefits	Legislative Requirement / Lender Requirements / Good practice	Investment Needs / Resources Costs	Timetable Action Due Date	Target and Evaluation Criteria for Successful Implementation
4.5	**Security Risk Assessment and Security Management Plan** **The plan will be aligned to the UN Code of Conducts for law enforcement officials, the IFC's *Good Practice Handbook on the Use of Security Forces: Assessing and Managing Risks and Impacts*; and the UN Basic Principles on the use of Force and Firearms by law enforcement officials (where firearms are in use).**	**Ensure that the security established at site is proportionate to the potential security risks; and that security is implemented in line with the Lenders' Requirements and International Best Practice.**	**Good Practice** **IFC PS4**	**Internal Costs of the Project Company.**	**Prior to commencement of construction.**	**Submission of *Security Risk Assessment* and *Security Management Plan* to Lenders for review and approval.**

No	Action	Environmental Risks, Liability/ Benefits	Legislative Requirement / Lender Requirements / Good practice	Investment Needs / Resources Costs	Timetable Action Due Date	Target and Evaluation Criteria for Successful Implementation
PR5	**Land Acquisition and Involuntary Resettlement**					
5.1	**Overhead Transmission Line (OHTL) Finalization** **At present, the OHTL routing is not yet finalized by JSC National Electric Networks of Uzbekistan.** **The OHTL – and the associated construction corridor - will result in livelihood impacts; which will need to be managed in line with the Lender Requirements, and Livelihood Restoration Framework.**	**Management of Associated Facilities impacts, in line with Lender Requirement.**	**IFC PS1 / PS5**	**Independent E&S Consultant.** **Internal time.** **Coordination with JSC National Electric Networks of Uzbekistan**	**Prior to finalization of Livelihood Restoration Plan (see ESAP Item 5.4).**	**Supplementary studies, including consultation and inventories, to determine the extent of impacts.** **Findings to be incorporated within the Project's Livelihood Restoration Plan.**
5.2	**Gas Connection Line Finalization** **At present, the gas connection routing is not yet finalized by Uztransgaz.** **The gas pipeline – and the associated construction corridor - will result in livelihood impacts; which will need to be managed in line with the Lender Requirements, and Livelihood Restoration Framework.**	**Management of Associated Facilities impacts, in line with Lender Requirement.**	**IFC PS1 / PS5**	**Independent E&S Consultant.** **Internal time.** **Coordination with Uztransgaz.**	**Prior to finalization of Livelihood Restoration Plan (see ESAP Item 5.4).**	**Supplementary studies, including consultation and inventories, to determine the extent of impacts.** **Findings to be incorporated within the Project's Livelihood Restoration Plan.**

No	Action	Environmental Risks, Liability/ Benefits	Legislative Requirement / Lender Requirements / Good practice	Investment Needs / Resources Costs	Timetable Action Due Date	Target and Evaluation Criteria for Successful Implementation
5.3	**Sanitary Protection Zone (SPZ) Finalization** **At present, the Ministry of Health of Uzbekistan are reviewing the requirement for an SPZ – 500m radius – for the Project. In the event that this is required, additional livelihood impacts will occur. Whilst these have been tentatively assessed under the Project's ESIA, further consultation and surveys will be required to verify the impacts, and inform the finalization of the Project's Livelihood Restoration Plan.**	**Management of Associated Facilities impacts, in line with Lender Requirement.**	**Legislative Requirements** **IFC PS1 / PS5**	**Coordination with Ministry of Health of Uzbekistan**	**Prior to Early Power Commercial Operation Date**	**Written confirmation from the relevant authorities that an SPZ is not required;** **OR** **Supplementary studies, including consultation and inventories, to determine the extent of impacts**
					Prior to Project Commercial Operation Date	**Findings to be incorporated within an updated Project Livelihood Restoration Plan; which shall be submitted to Lenders for review.**
5.4	**Livelihood Restoration Plan Develop, implement and regularly update the Livelihood Restoration Plan (LRP); based upon the *Livelihood Restoration Plan Framework* which was prepared as part of the Project's disclosure.** **The LRP will establish the entitlements of affected persons and communities and will ensure that these are provided in a transparent, consistent and equitable manner. The process should include the following:** • **Determination of cut-off date;** • **Identification of all formal and informal land users at time of the cut-off date as well as their income sources and provide adequate details (e.g. size of used land, size of land affected by the projected, size of land remaining post project**	**Minimization of impacts of land acquisition and mitigation for the risks of permanent and temporary land acquisition and compensating for lost income and land.**	**Good Practice** **IFC PS5**	**Third party consultant/ Project Company**	**As soon as possible, and at the latest, prior to commencement of construction.**	**Extent of economic displacement and compensatory measures required for the displacement determined.** **Evidence of LRP implementation and compensation in line with the LRP provided prior to construction, and reported to Lenders'.** **The client will summarize the information** **contained in the LRP for public disclosure to ensure that affected people understand the compensation procedures and**

No	Action	Environmental Risks, Liability/ Benefits	Legislative Requirement / Lender Requirements / Good practice	Investment Needs / Resources Costs	Timetable Action Due Date	Target and Evaluation Criteria for Successful Implementation
	implementation); • **Determination of land pieces;** • **Compensation in line with lender and national requirements (details to be provided);** • **Livelihood Restoration Programs; and,** • **Consideration of, and measures to address, differential impacts on Vulnerable People.**					**know what to expect at the various stages of the project.**
					Prior to Project Commercial Operation Date	**Complete any updates to the LRP in relation to the SPZ (see ESAP Item 5.3), and an updated LRP provided to the Lenders for review.**
PR6	**Biodiversity Conservation and Suitable Management of Living Natural Resources**					

No	Action	Environmental Risks, Liability/ Benefits	Legislative Requirement / Lender Requirements / Good practice	Investment Needs / Resources Costs	Timetable Action Due Date	Target and Evaluation Criteria for Successful Implementation
6.1	**Overhead Transmission Line (OHTL)** **Work with JSC National Electric Networks of Uzbekistan to ensure that bird protection measures are included in the final design and implementation of the OHTL.**	**Protection of biodiversity from Project Associated Facilities.**	**IFC PS6**	**Internal costs.** **Optional support from external consultants.** **Coordination with JSC National Electric Networks of Uzbekistan**	**Prior to construction of Overhead Transmission Line.**	**Written statement to Lenders confirming the mitigation incorporated, including risk assessment to demonstrate that the residual impacts will not result in significant harm to biodiversity.**

No	Action	Environmental Risks, Liability/ Benefits	Legislative Requirement / Lender Requirements / Good practice	Investment Needs / Resources Costs	Timetable Action Due Date	Target and Evaluation Criteria for Successful Implementation
PR8	**Cultural Heritage**					
8.1	**Chance Find Procedure Ensure Contractors/Sub- contractors adopt a chance finds procedures and report 'chance finds' to the authorities and other relevant institutions to undertake excavation and full archaeological assessment of the finds.** **All workers of Contractors/Sub-contractors to receive induction training on the use of chance finds procedures.**	**To preserve cultural heritage.**	**Legislative Requirement** **IFC/ PS8**	**Internal Costs.** **Client to review, approve and audit implementation of Chance Find Procedures prepared by EPC and O&M Contractors.**	**Prior to commencement of construction.**	**Chance finds procedure adopted by Contractors/Sub-contractors.** **Report to the required authorities on any archaeological findings and excavation, and notify the Lenders.**

UzAssystem

STONE CITY ENERGY (1600 MW) CCPP PROJECT

ATTACHMENT I

ENVIRONMENTAL&SOCIAL MANAGEMENT PLAN

ASE-UZA-571-REP-ESA-0001-02

Rev	Date	Purpose of issue	Issuer	Checker	Approver
02	16/12/2021	Initial	U. GÜNGÖR	M. ACIRLI	F. SATTAROV

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1. Abbreviations & Definitions

ASY	Assystem Company or any representative of Assystem
CCPP	Combined Cycle Power Plant
CESMP	Construction Environmental and Social Management Plan
CoESMP	Commissioning Environmental and Social Management Plan
EPC	Engineering, Procurement and Construction
ESAP	Environmental & Social Action Plan
ESIA	Environmental & Social Impact Assessment
ESMP	Environmental & Social Management Plan
ESMS	Environmental and Social Management System
HSSE	Health, Safety Security and Environment
OESMP	Operation Environmental and Social Management Plan
SEP	Stakeholder Engagement Plan

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2. Introduction

The government of the Republic of Uzbekistan aims modernize and increase the electricity production in the country in order to foster economic growth.

This document is prepared for presenting the Framework for Environmental & Social Management following on from the ESIA for the project of the Combined Cycle Power Plant (CCPP) in the pursuance of the agreement mutually signed between FC "SCE-QUVVAT" LLC and JV "UzAssystem "LLC in compliance with IFC Standards. The Framework is an outline of systematic structures and management programs that will comprise the respective construction, commissioning and operational phase Environmental and Social Management Systems (ESMS). This framework has been informed by the outcomes of the ESIA and has been developed to establish structures for the management of Environmental and Social risks, impacts, opportunities and compliance associated with all phases of the Project.

In order to implement the mitigation and management measures established in the ESIA, project-specific Construction Environmental and Social Management Plan (CESMP) and Operation Environmental and Social Management Plan (OESMP) (and supplementary documents); will be developed prior to the commencement of construction, commissioning and operations respectively.

This framework has also been prepared to ensure alignment with applicable elements of the established Health, Safety Security and Environment (HSSE) Management System Framework, which is intended to ensure consistent and structured HSSE project management between projects of the Client.

It should be noted that the Project ESMS will be a living documentation and will need to be updated in relation to changes in project circumstances, activities, environmental sensitivities and future requirements defined by respective regulatory authorities and Project Lenders.

3. ENVIRONMENTAL & SOCIAL MANAGEMENT SYSTEM (ESMS)

3.1 GENERAL APPROACH TO THE DEVELOPMENT OF THE ESMS

The purpose of the ESMS is to provide a systematic structure to enable the effective implementation and management of environmental and social risks, impacts, opportunities and compliance throughout the Project lifecycle.

The management of environmental & social issues should include the following fundamental components as part of a robust ESMS:

- To identify applicable environmental & social legal requirements and other compliance obligations (such as those required by lenders);
- To determine environmental & social aspects/risks and potential impacts as early as possible for construction, commissioning and operation phase planning, including the incorporation of

environmental and social considerations into staffing requirements, process plans, programming, work orders, required authorizations, and site layout;

- To development a project specific policy related to the environmental, social considerations (including labor, HR and external stakeholders & affected communities);
- To assign environmental & social professionals, who have the experience, competence, and training necessary to assess and manage environmental impacts and risks, and carry out specialized environmental social management functions including the preparation of Project or activity specific plans and procedures that incorporate the technical requirements presented in this document;
- To prioritize management programs/ strategies with the objective of achieving an overall reduction of risk to human wellbeing and the environment, focusing on the prevention of irreversible and / or significant impacts;
- To favor strategies that eliminate the cause of the impact at its source, for example, by selecting less hazardous materials or processes that avoid the need for environmental controls;
- To incorporate controls to reduce or minimize the possibility and magnitude of undesired consequences, for example, with the application of pollution controls to reduce the levels of emitted contaminants;
- To prepare workers, nearby communities and relevant stakeholders to respond to emergencies, accidents, including providing technical and financial resources to effectively and safely control such events, and restoring workplace and community environments; and
- To improve environmental performance through a combination of ongoing monitoring of facility performance and effective accountability.

ESMS should implement by setting and reviewing requirements, determining custodianship within the project team, identifying budgets, establishing target ranges for performance and establishing appropriate data gathering techniques and controls.

Performance ranges should be refined on a regular basis as more data becomes available, in turn enabling more accurate strategy development and benchmarking. It is important that the ESMS documents are treated as living documents, to be updated and refined within a continuous process of improvement.

A proposed implementation process for ESMS is illustrated in Figure 1.

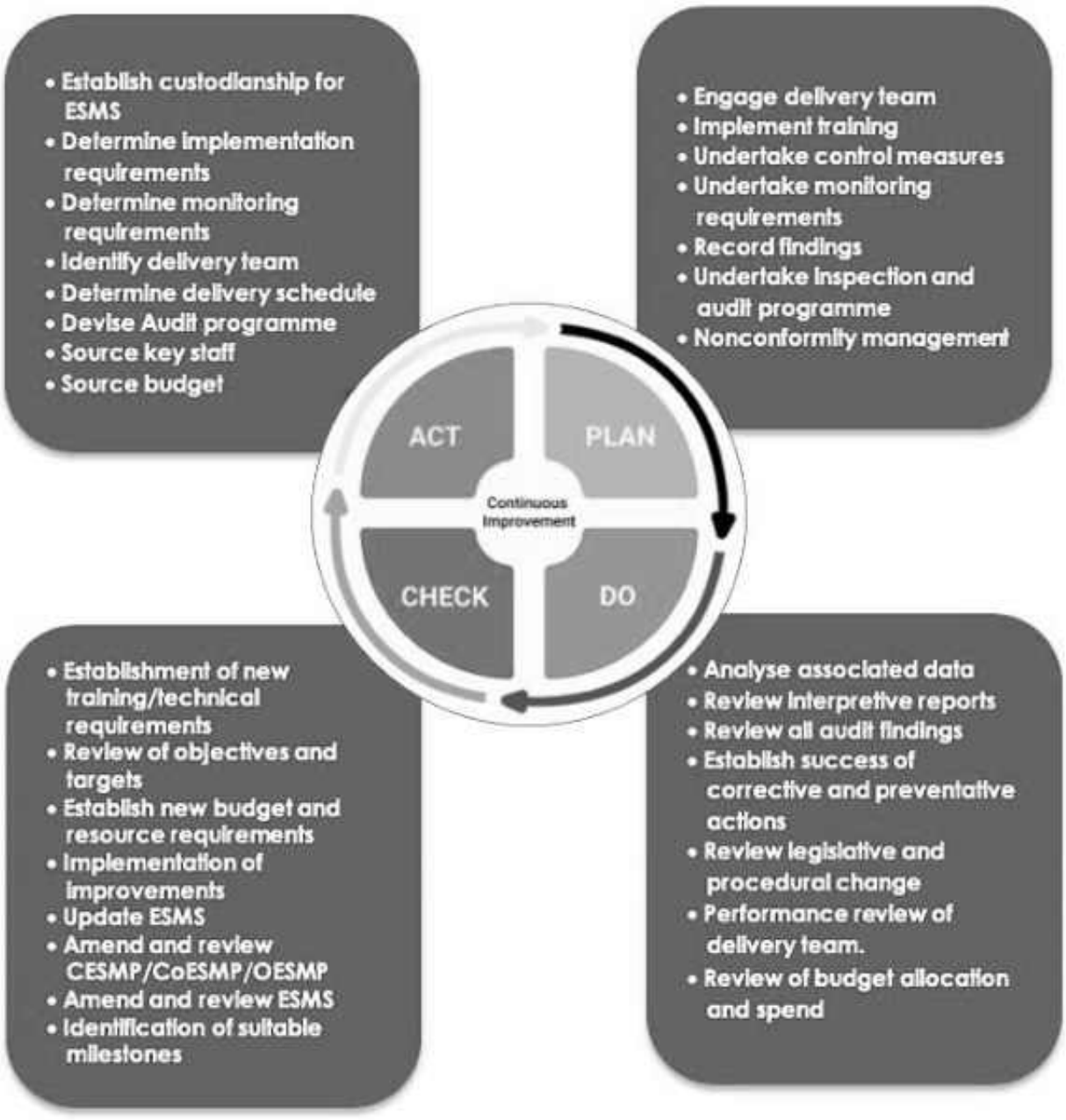

Figure 1:Implementation Process

3.2 ESMS SCOPE

The Project will develop and implement ESMSs for the construction and operational phases, respectively. The scope will need to include:

- Applicable activities and timescales for construction, commissioning and operation;
- Compliance with applicable national regulation, lender requirements and loan covenants;
- Detailed mitigation and management measures required following construction, commissioning and operational impacts identified from the ESIA;
- Roles and responsibilities for appropriate management organizational units;
- Boundaries of the ESMS that will include the project site and may include associated facilities, temporary storage areas or other storage areas, warehouses etc.;
- Key risks and management requirements related to primary supply chains, and;
- Requirements for monitoring and reporting, including measures for inspection, audit, review and preventative action.

3.3 DEVELOPMENT OF CONSTRUCTION PHASE ESMS

The construction phase ESMS will be developed and implemented by the Engineering, Procurement and Construction (EPC) Contractor and will cover all potential environmental and social risks, impacts, opportunities and related compliance associated with the Project's construction (including subcontractors and the supply chain).

The construction phase ESMS will also comprise other plans, documents, data, forms, records etc. affiliated with the construction phase of the Project that are supplementary to, and defined by the CESMP.

The CESMP will be prepared, reviewed and submitted to the Project lenders prior to the commencement of construction.

3.3.1 Development of a CoESMP

The Commissioning Environmental and Social Management Plan (CoESMP) should be prepared as the overarching, principal document that identifies scope, objectives, risks, responsibilities, desired outcomes and associated monitoring requirements of the ESMS associated with the commissioning phase of the Project.

The commissioning phase ESMS is likely to have plans, documents, data, forms, records etc. affiliated with the commissioning phase of the Project that are supplementary to, and should be defined by the CoESMP.

The CoESMP should be developed and implemented by the party or parties responsible for the commissioning of the Project and should cover all potential environmental and social impacts associated with the Project's commissioning phase such as waste water management, acid cleaning, steam blowing etc. (including potential impacts from contractor subcontractors and the supply chain).

The CoESMP should be prepared, reviewed and where necessary approved by the relevant environmental authorities (if required) and Project Lenders in advance of the commencement of commissioning activities.

3.4 DEVELOPMENT OF OPERATIONAL PHASE ESMS

The operational phase ESMS will be developed and implemented by the Operational and Maintenance Company and will cover all potential environmental and social risks, impacts, opportunities and relate compliance associated with the Project's operational phase (including potential impacts from subcontractors and the supply chain that can be influenced by the Operations and Maintenance Company).The operational phase ESMS will also comprise other plans, documents, data, forms, records etc. affiliated with the operational phase of the Project that are supplementary to, and will be defined by the OESMP.

The OESMP will be prepared, reviewed and where necessary approved by Project lenders prior to operation phase.

2.5 HSSE Management System Framework

The Client has developed a corporate level Health, Safety Security and Environment (HSSE) Management System Framework, which outlines the approach taken by the Client with respect to HSSE issues, and what should be implemented by Project Companies. The intention of the framework is to ensure consistent and well-structured HSSE management between all Projects. The HSEE Management System Framework also provides oversight for Corporate Social Responsibility (CSR) issues.

The framework established by the Client includes the following 12 elements:

- Element 1 – Leadership Commitment
- Element 2 – Measurement, Planning and Improvement
- Element 3 – Effective Communication
- Element 4 – Organization and Resources
- Element 5 – Risk Management
- Element 6 - Suppliers, Contractors and Partners
- Element 7 – Project Design, Construction and Commissioning
- Element 8 – Operations and Maintenance
- Element 9 – Emergency Response and Crisis Management
- Element10 – Incident Investigation and Analysis
- Element 11 – Auditing
- Element 12 – Management of Change

The Project ESMS shall mirror the corporate structures and benchmarks established in the HSSE management framework, whilst ensuring any additional provisions specific to the ESIA and/or requirements of the Project lenders and local regulatory context are also captured.

4. POLICY

The construction, commissioning and operational phases of the Project will need to develop clear statements that define policy with regards to environmental and social issues.

4.1 CLIENT POLICIES

The Client has an established HSSE and CSR Policy. This policy will need to be adapted by the Project Company to ensure full inclusion of any relevant 'social' elements. As per the HSSE Management System Framework, this policy is required to be signed by the Executive Managing Officer/CEO of the Project Company and displayed at the site at all times.

4.2 PROJECT POLICIES

It is separately expected that the Project Company (and possibly EPC Contractor and O&M Company) will establish Project specific policies that will provide the overarching direction for environmental & social management during construction, commissioning and operations respectively.

Notwithstanding any policies that may be established, the policy documents for the implementing entities (i.e. Project Company, EPC Contractor or O&M Company) will need to ensure alignment with the policy, whilst ensuring:

- Appropriate context of the Project, including the nature, scale and impacts as defined from the ESIA;
- A suitable framework for establishing appropriate environmental and social objectives;
- A commitment to fulfil all Environmental and Social compliance obligations;
- A commitment to the protection of the environment, including prevention of pollution and requirements established by the ESIA process;
- A commitment to the fair and just treatment of all staff including a commitment to:
- Provide of a safe and healthy workplace environment;
- Ensure fair and just remuneration in accordance with employment law and agreed contracts; and
- Vehemently condemn and ensure against forced or compulsory labor, child labor or discrimination.
- Zero tolerance to gender-based violence and harassment.
- Be available in English and other appropriate languages (in the geography of the Project (i.e. Uzbek and Russian), or for relevant stakeholders) in order for all personnel and visitors to understand.
- Include a commitment to continual improvement of the Environment and Social Management System.

During the construction, commissioning and operational phases, the policy should be established and signed by top management, appended to the CESMP/CoESMP/OESMP report and should be made available to all staff, contractors and sub-contractors.

5. IDENTIFICATION OF COMPLIANCE OBLIGATIONS

5.1 IDENTIFICATION OF LEGAL REQUIREMENTS

During the development of the ESMS, the applicable environmental and social legal requirements should be identified and documented, including:

- Uzbekistan Legislation and Regulations; and
- Applicable International Treaties and Conventions, signed and/or ratified by Uzbekistan.

5.2 IDENTIFICATION OF ESIA REQUIREMENTS

ESIA has developed Project and/or site-specific mitigation, management & monitoring measures that must be incorporated into all phases of the Project. Assuming approval of the ESIA by the regulatory authority and/or project lenders, these stated measures are conditions of the approval.

5.3 IDENTIFICATION OF REQUIREMENTS FROM THE ENVIRONMENTAL AUTHORITIES

The environmental clearance/permit/approval issued by Environmental Authorities to the Project must be reviewed to ensure that all construction, commissioning and operational related conditions established are managed accordingly. In case of any non-compliances, clearance/permit/approval conditions may result in a breach of legislation and permitting requirements. The environmental clearance/permit/approval shall be maintained as part of the ESMS.

5.4 IDENTIFICATION OF REQUIREMENTS FROM THE PROJECT LENDERS

In response to the ESIA, the Financial Institutions providing finance to the project will establish an Action Plan that identifies Environmental and Social requirements for the project commensurate with or supplementary to the ESIA. This is commonly known as the Environmental & Social Action Plan (ESAP). Requirements of the action plan will be a covenant of the Project loan.

During the development of the ESMS', the lenders action plan for the Project must be reviewed to ensure that all related conditions are included for compliance management. It is highlighted that non-compliance with the lenders' requirements could impact financial disbursement and other factors.

6. IDENTIFICATION OF RISKS, IMPACTS & OPPORTUNITIES

One of the principal stages in the development of the Project's ESMS will be the development of a Project specific aspects/risks register linking to potential environmental or social impacts associated with the relevant activities being undertaken at that phase of the project.

Once environmental & social aspects and associated risks have been identified and documented (i.e. specifically in accordance with the required construction methods statements or operational activities), associated controls should be developed that are commensurate to the level of anticipated severity, likelihood and any legal or lender requirements. The identification of risks and impacts is expected to be primarily aligned with the items identified in the ESIA.

When identifying the aspects/risks and associated environmental or social impacts the following should be taken into account:

- Risks, impacts and opportunities linked to the Project activities;
- Change, including planned or new development and or new/modified activities;
- Abnormal conditions and reasonably foreseeable emergency situations;
- Project timescales and potential impacts associated with seasonality;
- Stakeholder perception;
- Compliance obligations;
- Risks inherent in the supply chain in addition to those on-site; and
- Linkages with the Project's Health and Safety Management System.

The identification of aspects/risks and impacts should be documented, linked to associated proposed controls and updated as and when Project or environmental & social circumstances change.

7. COMPLIMENTARY PLANS & PROCEDURES

The CESMP, CoESMP and OESMP will also clearly define associated plans and procedures required to manage other significant environmental and social risks/impacts. The requirement for these plans are based on the mitigation and management measures as developed from the ESIA.

In alignment with the expected Project impacts, the following table provides a list of plans and procedures that are expected as a minimum to be linked to the CESMP, CoESMP and/or OESMP. This includes some key requirements for inclusion to each plan. The specific content of each plan will be dependent on the potential for environmental and social impacts for the Project as identified during the preparation of the CoESMP and OEMSP, which will directly relate to specific working methodologies (see Table 1).

Table 1:ESIA Required Plans and Procedures

Plan/Procedure	Project Phase	Purpose and Key Requirements
Waste Management Plan	**Construction, Commissioning & Operation**	**To identify site specific requirements for waste and wastewater treatment, containment of wastes (segregation, storage area specifications and locations), collection methodologies & transport (identification of licensed contractors and the process to engage), treatment/disposal (identification of licensed treatment and disposal sites), record keeping and reporting requirements related to waste and wastewater,** **To include measures to limit instances of contamination to soils and groundwater.**
Occupational Health & Safety Plan	**Construction, Commissioning & Operation**	**To identify the required controls for worker health and safety during the construction, commissioning and operational phases. As a minimum, this plan shall include:** • **Means of identifying and minimizing, so far as reasonably practicable, the causes of potential hazards to workers.** • **Provision of preventive and protective measures, including modification, substitution, or elimination of hazardous conditions or substances.** • **Provision of appropriate equipment to minimize risks, and requiring and enforcing its use.** • **Training of workers, and provision of appropriate incentives for them to use and**

Plan/Procedure	Project Phase	Purpose and Key Requirements
		comply with health and safety procedures and protective equipment. • **Documentation and reporting of occupational accidents, diseases and incidents.** • **Emergency prevention, preparedness and response arrangements.**
Emergency Preparedness and Response Plan	**Construction, Commissioning & Operation**	**To identify the contingencies put in place for a variety of potential emergency situations relevant to the construction, commissioning & operational phases, To outline the response mechanisms, roles and responsibilities, training requirements, internal communication, equipment and relevant engagement with external stakeholders, To establish the requirements for on-site equipment based upon the potential emergency risks, including training provisions for site personnel in regard to such equipment which include spill response and contingency in the event of accidental leaks and spills.**
Hazardous Material Storage Plan	**Construction, Commissioning & Operation**	**To identify locations for hazardous material storage, storage requirements (specifications of bunds and buildings/warehouses to ensure environmental and H&S protection, segregation requirements etc.) and handling procedures to minimize environmental risk, To outline record keeping as per chain of custodies, requirements for MSDS and roles & responsibilities. Staff involved in chemical management, procurement or overseeing on-site deliveries shall be specified in the plan and provided with training for the provisions of this plan (all training to be linked to the training plan).**
Environmental Monitoring Plan	**Construction, Commissioning & Operation**	**To demonstrate compliance with national environmental standards and lender requirements. The monitoring plan is to specify monitoring requirements for all ESIA parameters. The plan will need to include:** • **What parameters need to be monitored and measured and at what locations;** • **The methods for monitoring measurement, analysis and evaluation to ensure valid results;** • **The criteria against which compliance and performance should be measured;** • **When and at what frequency monitoring needs to be performed; and** • **How the results from monitoring and measurement should be analyzed and evaluated (independent or internal).**

Plan/Procedure	Project Phase	Purpose and Key Requirements
Traffic Management Plan	**Construction, Commissioning & Operation**	**To identify any specific requirements for heavy, or oversize loads, including timings of deliveries, specific routes (to minimize disruption), engagement mechanisms with external transport authorities (as per the SEP, e.g. local government),** **To include measures to minimize congestion, fuel use and risks to the public and site staff,** **To be guided by a Traffic Management Plan.**
Working Conditions and Terms of Employment Procedure	**Construction, Commissioning & Operation**	**To provide a plan detailing how working conditions and terms of employment are compliant with national labor, social security and occupational health and safety laws,** **To ensure that the following documents are prepared prior to the employment of workers.** • **Employment agreements and recruitment policies;** • **Equal opportunities and non-discrimination policy; and** • **Child and forced labor policies / procedures (covering recruitment fees and arrangements, as well as document (e.g. passport) retention**
Human Resources Policy (and related Procedures)	**Construction, Commissioning & Operation**	**To adapt human resource policies and procedures to appropriate to the size of the workforce required for operation and maintenance requirements,** **To prepare policies and procedures demonstrating consistency with the requirements of national legislation and lenders requirements.**
Stakeholder Engagement Plan (SEP)	**Construction, Commissioning & Operation**	**To identify project stakeholders, identify communication protocols for engagement with stakeholder,** **To identify frequency or event-based communication with stakeholders (i.e. for emergencies and specific grievances),** **To detail the grievance mechanism, or provide a reference to a separate grievance mechanism for external parties.**
Human Rights Policy	**Construction, Commissioning & Operation**	**To acquire the approval at the most senior level of the company,** **To inform relevant internal and external expertise,** **To commit the EPC's & O&M's human rights expectations of personnel, local communities, sub-contractors and other suppliers directly linked to the construction and operational phase of the project,** **To make publicly available and communicated internally and to the relevant stakeholders,** **To reflect in the other policies and procedures to embed it throughout their construction and operational phase activities.**

Plan/Procedure	Project Phase	Purpose and Key Requirements
Grievance Mechanism	**Construction, Commissioning & Operation**	**To be included within or be linked to the SEP, To identify the procedure for external parties and all site staff to be able to raise issues, concerns and opportunities for improvement for any aspect of their employment on the project including issues relating to gender-based violence and sexual exploitation, To be easily accessible (including for any vulnerable groups), non-discriminatory and provide a transparent process to raise concerns or complaints, which may be issued in an anonymous nature, To specify the roles and responsibilities of internal staff with regard to the grievance mechanism and the procedure for responding to received grievances, including the timeline for response, engagement mechanisms and record keeping.**
Security Plan	**Construction & Operation**	**To plan a security risk assessment of the reasonably foreseeable security risks (linked with security risks in the Emergency Preparedness and Response Plan), and tailored with the necessary management provisions, staffing requirements, equipment, training and defined processes to implement effective mitigation to manage or prevent these risks, To ensure applicable alignment to the necessary codes of conduct required by law enforcement under the United Nations principles for Law Enforcement Officers.**
Influx Management Plan	**Construction**	**To develop a Worker Influx Management Plan to provide a clear set of actions that will be undertaken for the management and mitigation, monitoring and evaluation of impacts related to worker influx in the Project area.**
Chance Find Procedure	**Construction**	**To identify the process for identifying and responding to a potential find of archaeology in the construction working area. To include the process for halting works in that area, sectioning off potential artefact and external communication with relevant regional authorities as consistent with SEP.**

7.1 OTHER RECOMMENDED PLANS AND PROCEDURES

Besides the required ESIA plans and procedures stated above, the following plans and procedures are also recommended for development and implementation as part of the ESMS (see Table 2).

Table 2: Recommended Plans and Procedures

Plan/Procedure	Project Phase	Purpose and Key Requirements
Pollution Prevention and Response Plan	**Construction, Commissioning & Operation**	**To identify site specific requirements for the prevention of pollution and how to manage pollution incidents,** **To include the identification of high-risk areas on a plan and the location of spill kits (and contents of spill kits),** **To identify required contact details in the event of an incident and contractors that are available on a quick response contract to assist with clean up where necessary this should link with the SEP for any external communications,** **To identify staff that require training in regard to the plan that includes provisions for recording of any incidents in a separate register, to ensure close out and implementation of corrective and preventative actions.**
Site Inspection & Audit Plan & Procedure	**Construction & Operation**	**To specify the timing and frequency of inspections (e.g. daily, weekly walkovers) and audits (including internal & external independent audits for the lenders as appropriate),** **To detail the methodology of such inspections and audits to ensure Environmental and Social Issues required in Uzbekistan and required by project lenders are adequately covered,** **For internal audits, to identify the audit scope (site, laydown areas, accommodation areas, sub- contractor areas etc.), audit criteria (e.g. CESMP, OESMP, ESMS), selection process for audit evidence, reporting format and auditor competence requirements,** **To specify definitions of non- conformance, observations and best practices, as well as detailing the mechanisms for issuance and follow up of Non-Conformance reports, including time periods for action and the implementation of corrective and/or preventative measure,** **To link the external independent lenders' auditors with the SEP as appropriate.**
Material handling and Storage Procedure	**Construction, Commissioning & Operation**	**To identify locations for material storage, storage requirements and handling procedures to minimize environmental and H&S risks which is linked to or inclusive of the Hazardous Material Storage Plan and H&S Plan,**

Plan/Procedure	Project Phase	Purpose and Key Requirements
		To detail specific method statements regarding the handling of materials, as well as training requirements for staff involved in such activities.
Fuel & Chemical Unloading Procedure	**Construction, Commissioning & Operation**	**To identify locations for fuel and chemical unloading, associated training requirements and associated pollution attenuation/spill response equipment that are to be in place regarding any unloading of fuel to larger tanks or chemicals to storage areas on-site linked or inclusive to the pollution prevention plan,**
Environmental & Social Training Plan	**Construction, Commissioning & Operation**	**To identify specific staff members for training and the type (i.e. classroom, practical, toolbox talks) how/when this is to be delivered, the frequency of training and whether follow up training provisions are required,** **To link the trainings to the specific content of the listed plans and procedures, or key risk activities that may be identified from on-site method statements.**

8. MONITORING

Environmental monitoring is required during both construction, commissioning and operation to evaluate whether the project is in compliance with the applicable Uzbekistan regulations/standards and applicable lender requirements.

8.1 MONITORING REQUIREMENTS FROM THE ESIA

The specific Environmental & Social Monitoring Plan to be developed for construction, commissioning and operation shall include measures recommended in parameter specific chapters of ESIA and supplemented by detailing:

- What parameters need to be monitored and measured and at what locations;
- The methods for monitoring measurement, analysis and evaluation to ensure valid results;
- The criteria against which compliance and performance should be measured;
- When and at what frequency monitoring needs to be performed;
- How the results from monitoring and measurement should be analyzed and evaluated (independent or internal);

The outcomes of the monitoring regime should ensure;

- The timing of monitoring and measurement is coordinated with the need for analysis and evaluation of results;
- The results of monitoring and measurement are reliable, reproducible and traceable; and
- Analysis and evaluation are reliable and reproducible and enable the project to report trends.

8.2 MONITORING DATA

Monitoring results should be compared against relevant standards, permit requirements, required thresholds, received complaints, audit findings, CESMP, CoESMP and OESMP requirements. The Environmental and Social Management team for the EPC Contractor or O&M Company will need to define appropriate action to follow in the instance that any exceedances in monitoring limits are confirmed or adverse impacts identified, including:

- Communication protocol in the event that an exceedance is identified;
- Internal review process of recently performed maintenance and inspection;
- Review of previous monitoring data to identify any potential associated variations or trends in results;
- Recommendations for quarantine of equipment or change in work practices; and
- Review of monitoring frequency to ensure the issue does not re-occur.

The repetition of measurements is an essential part of monitoring as it detects changes over time and should alert to potentially positive or negative effects of an activity. Adverse effects should trigger a review of mitigation measures and determination of the likely source of the impact. Should no effect be detected it may demonstrate a lack of effect, success of mitigation measures or the requirement to continue monitoring over a longer period of time.

Data from the monitoring for comparison against baseline and all previous monitoring efforts to identify trends in condition and make inferences on the success of implemented mitigation measures.

9. ORGANISATIONAL CAPACITY AND COMPETENCY

9.1 ROLES AND RESPONSIBILITIES

The ESMS' will require competent personnel to ensure effective implementation in practice.

9.1.1 Project Company (Accountable Party)

It is recommended that the Project Company specifies a staff member who will have overall accountability for environmental and social management, compliance and implementation of related Project Company policies.

This is required at the Project Company level, as the project company is the ultimate permit holder and party that is accountable for the Project.

9.1.2 EPC Contractor / O&M Company (Responsible Party)

It is expected that the Project Company will contractually delineate responsibility for environmental & social management and compliance to the EPC Contractor/O&M Company for the respective project phases.

It is therefore expected that the EPC Contractor and O&M Company will specify certain roles and responsibilities for ESMS implementation to Project staff, as recommended below.

PROJECT MANAGEMENT

In order to effectively implement the Project ESMS, management will need to:

- Ensure that resources needed for the implementation of the ESMS are available (human and financial resources);
- Communicate the importance of effective environmental & social management for all those involved in the day-to-day management of the Project;
- Direct and support employees to contribute towards the effective implementation of the ESMS;
- Ensure appropriate lines of communication on environmental and social issues, including providing of any required data to legal bodies and lenders; and
- Ensure regular performance monitoring (such as inspections and audits) and review of the ESMS are undertaken to ensure that it remains appropriate to the purpose and context of the project, and that any change of direct and indirect impacts is identified and managed accordingly.

RESPONSIBLE PERSON FOR ENVIRONMENTAL & SOCIAL MANAGEMENT

The EPC Contractor and O&M Company will need to delegate responsibility for implementation of the ESMS and wider environmental and social management and compliance to a full-time member of staff at the Project site.

This person may be the HSE Manager or the Environmental and Safety Manager, a member of the HSSE Team or a specific Environmental & Safety Officer. Regardless of the 'title' of this role, this person will be the primary project contact beneath the Project Company to implement the ESMS and will report to management, who will further report to the Project Company.

It is expected that such a role will be filled by a competent person with ideally 10 years of experience in the environmental & social fields, including at least 3-years of site-based experience.

A guide for the applicable Environmental & Social responsibilities of this role are listed below:

- Implement and manage the ESMS;
- Oversee and ensure execution of the environmental and social management programs by other project parties;
- Monitor the workplace to ensure environmental and social compliance (including for sub-contractors and supplier- as per the scope of the ESMS);
- Liaise with regulators and/or other authorities on environmental & social matters;
- Advise management on matters pertaining to the environmental and/or social elements;
- Investigate environmental and social issues, incidents and non-conformances, implement corrective actions and report those to the management/relevant authorities;
- Maintain applicable environmental and social records as required by the ESMS (e.g. incident registers, NCR reports, corrective action reports, grievance register etc.);
- Ensure monitoring programs are implemented by qualified personnel and report the results to the Project management for review and as a basis for continuous improvement;
- Be responsible for communications regarding environmental and social reporting and any third-party audits (e.g. periodic monitoring as required by the projects lenders);
- Display and monitor site bulletin boards to ensure they remain 'live' and 'up-to- date' with relevant environmental & social information;
- Coordinate, plan, formulate and/or deliver environmental and social induction training to all project personnel (including subcontractors) as well as regular toolbox talk environmental training sessions;
- Organize programs and activities to promote environmentally responsible conduct in the prevention of injury, ill health and environmental impact throughout the workforce;
- Manage the external grievance mechanism, and address inquiries, complaints and other communications received via this mechanism;
- Stop any unsafe activity which is not compliant with environmental legislation or lender requirements, and correct such work practice and/or conditions before allowing work to resume/commence;
- Act as point of contact for any sub-contractor with regard to environmental issues;
- Ensure that each sub-contractor is aware, compliant and implementing the requirements of the ESMPs;
- Review subcontractor's personnel, qualifications, competency and environmental performance; and
- Undertake regular internal ESMS audits to assess compliance and implement corrective & preventative actions – audits are to include all sub-contractors at the project.

ASSISTANT FOR ENVIRONMENTAL & SOCIAL MANAGEMENT

The Assistant to the 'Responsible Person for Environmental & Social Management' will be the second level project personnel (during construction and operation) to implement the ESMS and will report to

the responsible manager. It is expected that such a role will be filled by a competent person with relevant qualifications and at least 5 years of experience in the environmental & social field, including at least 2-years of site-based experience.

A guide for the responsibilities of this role are listed below:

- Ensure implementation of requirements and mitigation measures of the ESMS management programs at all times;
- Implement monitoring programs as per the applicable Environmental & Social Monitoring Plan and report the results to the responsible E&S manager;
- Supervise and ensure personnel and subcontractors comply and adhere to environmental regulations and lender requirements;
- Conduct daily and weekly site inspections and report the outcomes to the responsible manager including information on: sub-contractors on site, observations, non-compliances, environmental incidents, spills, leaks and volumes, internal and external grievances, emergencies, training conducted and number of staffs trained and monitoring records;
- Accountable for the overall environmental and social performance of personnel and sub-contractors and working under their charge and supervision;
- Investigate environmental incidents and communicate the investigation results and proposed corrective action to the responsible person; Attend E&S meetings to contribute to a safe and healthy working environment.
- Support the responsible E&S person in delivering environmental and social induction training to all Project personnel (including subcontractors) as well as regular toolbox talk environmental training sessions;
- Check and ensure that the workforce is allocated and provided with adequate training, information and instruction to competently perform work in a safe and controlled manner – specifically in regard to method statement and the required plans and procedures; and
- Stop any activity which is not compliant with environmental legislation or project environmental and social requirements and rectify non-compliance environmental and social conditions promptly.

9.2 ENVIRONMENTAL & SOCIAL AWARENESS AND TRAINING

In order for environmental and social control measures to be effective, staff will need to be aware of specific responsibilities and required actions associated with their element of work.

Tailored training requirements relevant to elements of works will need to be developed and defined as part of the ESMS (i.e. site personnel associated with waste management should require training on relevant components of the waste management plan).

For a training program to be successful, it is vital to:

- Select a trainer with appropriate knowledge, skills and experience (often peer- level training is effective);
- Make training specific to the audience;
- Ensure training is engaging and relevant; and
- Follow up and refresh training to keep abreast of changes in site conditions.

In order to record identified training needs, training type and frequency required for each staff role, commensurate with the requirements of the ESMS, should be identified. Records of associated training should be held to include the following.

- Description of training;
- Purpose of training;
- Date;
- Location;
- Attendee; and
- Trainer.

9.2.1 Induction and Orientation

The Contractor (EPC and O&M Company) must ensure that all their employees and subcontractors working on the site are provided with induction and regular training, as frequently as necessary to achieve a level of awareness and competence appropriate to their assigned tasks before they commence their tasks.

All Contractor employees and Subcontractors must be made aware of the regulatory requirements and must be inducted into the requirements of the CESMP, CoESMP and OESMP accordingly. All Contractor employees and Subcontractors must also be made aware that each worker is responsible to make certain that their site activities do not cause pollution to the air, land, or groundwater.

The CESMP, CoESMP and OESMP should identify the necessary Environmental and Social requirements to be covered by site induction. This will include as a minimum:

- Environmental emergency response procedures (e.g. in the event of an explosion or fire; procedures to undertake in the case of oil or chemical spills);
- Key Occupational Health & Safety training and information regarding internal incident and emergency response processes;
- The environmental controls chosen to be implemented by the Contractor;
- Raising awareness for any activities that are known to have the potential to be hazardous to the environment, and how to avoid such hazards;
- Reporting procedures listed in the ESMP (in case of an environmental incident or complaint), and appropriate contact telephone numbers;
- Site-specific issues such as site boundaries, location of waste and recycling bins, refueling and vehicle maintenance points, storage of plant and equipment;
- The proximity or sensitivity of nearby residents and communities to the Project;
- Cultural awareness training to prevent any conflicts with the local communities;
- Internal grievance procedures and allowances for worker welfare;
- Site monitoring plans; and
- The outcomes and penalties of inappropriate environmental behavior.

9.2.2 Toolbox Talks

Toolbox talks are a useful way of providing on-site training to disseminate good practice and provide regular reminders on induction and training content. It is recommended that toolbox talks are held regularly for site personnel and supervisory staff.

Required toolbox talks topics and frequencies should be identified within associated risk assessments, method statements plan or procedures.

As a minimum, the toolbox talks will cover relevant updates on health, safety and environmental topics including waste management and waste segregation procedures; correct storage of fuels, oils and chemicals and spill response procedures etc. Employees will also learn how to minimize all potential environmental impacts including noise, air and water pollution, waste minimization and disposal, and other environmental controls specific to the work activity. The toolbox talks will also include code of conduct to prevent & respond to Gender Based Violence issues (Sexual Exploitation and Abuse/Sexual harassment).

A register stating the topic of training or induction conducted, with the employees' names and the dates of training and induction and trained details, must be kept up to date at the worksite office to ensure that all staff on the site have had the required training.

10. AUDIT PROGRAM

Auditing is an integral requirement of any management system and should be considered as a continual process to ensure the successful implementation of the ESMS.

10.1 INTERNAL AUDITS

The ESMS will need to establish, implement and maintain an internal audit program that identifies the frequency, methods, responsibilities, planning requirements and reporting of audits and inspections.

When establishing an audit and inspection program, the organization should consider the potential frequency and significance of environmental and social risks relative to the construction and operational phase and adjust the audit scope and frequency accordingly.

When developing and undertaking audits the following will need to be established:

- Define scope, audit criteria and the objectives of each audit;
- Select audit staff competent in the audit process and subject matter; and
- Ensure that audit results are reported to relevant senior management.

The frequency of audits will be undertaken on a level commensurate to the risks and impacts of the Project, whilst the frequency will be subject to review according to the identified level of compliance and anticipated risks attributable to specific construction and commissioning stage/activities.

During operations, the frequency shall be bi-annual as a minimum (depending on risks attributable to specific operational activities), and the audit criteria may also vary depending on any external certification that may be linked to the ESMS.

10.2 AUDITS

It is expected that the Client corporate HSSE team will audit the Project's management system on an annual basis as a minimum.

10.3 LENDERS MONITORING AND REPORTING

Monitoring requirements will be established with the lenders and monitoring reports will be provided and reported to the lenders. These reports are likely to be based upon site visits to evaluate the implementation of both the ESAP (a covenant to the loan), and the suitability & effective of the established ESMS in practice.

11. EMERGENCY PREPAREDNESS AND RESPONSE

The likelihood of an E&S incident can be minimized by effective risk management planning and development of applicable response plans as part of an ESMS.

All risk assessments and method statements will need to include consideration of the potential for environmental incidents. Suitable incident response equipment, should be maintained at appropriate locations on site and Project staff be suitably trained to use such equipment and respond to such emergencies.

The Project will prepare and implement an Emergency Preparedness and Response Plan to include requirements for co-ordination with the applicable external agencies (i.e. emergency services), impacted stakeholders and legal authorities in the instance that a pollution incident occurs.

The plan will identify procedures for reasonably foreseeable emergency situations. As per the HSSE Management System Framework, this is required to include drills at the Project site and any relevant training to specifically involved personnel.

When establishing the Emergency Preparedness and Response Plan, the following should be considered:

- The most appropriate method for responding to an emergency situation;
- Internal and external communication process;
- The action required to prevent or mitigate environmental impacts;
- Mitigation and response actions to be taken for different types of emergency situations;
- The need for post-emergency evaluation to determine and implement corrective and preventative actions;
- Periodic testing of planned emergency response actions;
- Training of emergency response;
- A list of key personnel and aid agencies, including contact details (such as fire department, spillage clean-up services);
- Evacuations routes and assembly points; and
- The possibility of the need for mutual assistance from neighboring organizations/projects.

11.1 INCIDENTS

Incident investigation and analysis will need to be undertaken in co-ordination with the provision of Element 10 established in the HSSE Management System Framework.

In summary, this requires clear processes for incident reporting, response, investigation, analysis, follow up and documentation.

12. NON-CONFORMITY AND CORRECTIVE ACTION

12.1 NON-CONFORMITY

All non-conformances identified during audits, inspections and monitoring activities should be recorded and followed up as non-conformity.

Non-conformances are instances where Project compliance obligations (such as a legal requirement, or ESMS requirement) are not being fulfilled, or cannot be evidenced. Examples of non-conformity include, but are not limited to:

- Breach of an environmental standard;
- Commencement of works without an approved risk assessment and method statement that covers environmental issues identified herein;
- No review of risk assessment and method statements following any significant changes in requirements that could adversely impact the environment;
- Appointment of a waste transport/disposal service provider that is not appropriately licensed;
- Failure to comply with waste storage/disposal requirements as identified by risk assessment and/or method statement;
- Failure to comply with chemical storage and/or handling requirements;
- Un-containable or uncontrollable spills of fuels or chemicals;
- Undertaken works outside the scope defined within the risk assessment and method statement; and,
- Discharge of untreated, contaminated waste water to the environment.
- Each non-conformance and near miss will be recorded utilizing a developed reporting process. All NCRs and near misses shall include the following information:
- Location and description of the non-conformance and the criteria/requirement that has been breached;
- The proposed corrective action including who holds responsibility for undertaking this action;
- The proposed preventative action to ensure against reoccurrence of the non- compliance;
- Any required monitoring and follow up; and
- Key performance indicators and a deadline for the successful completion of the corrective and preventive action.

12.2 CORRECTIVE ACTION

Any situation or condition that is non-conforming or otherwise poses an imminent risk to the environment, or social welfare should be immediately resolved.

It is expected that a corrective action plan will be developed to respond to individual NCRs. The corrective action plan shall include determination of root cause, proposed actions, timelines, required resources and any changes needed to ESMS documentation. The corrective action plan should be approved by a responsible person for managing the ESMS.

Records of implemented corrective actions shall also be maintained.

If a situation or condition cannot be corrected immediately, temporary measures such as necessary for the protection of the environment should be implemented.

13. STAKEHOLDER ENGAGEMENT

The project has developed a SEP, which will be implemented during both construction, commissioning and operations. This will also need to be updated and made applicable prior to the operational phase. The SEP includes a suitable grievance mechanism to allow local community complaints to be raised in a clear process.

Note: All processes relating to Stakeholder Engagement should refer to the Project Specific Stakeholder Engagement Plan (SEP).

Stakeholder engagement can be described as a systematic effort to understand and involve stakeholders and their concerns in the Project activities and decision-making processes. Stakeholders are defined as any group or individual who can affect, or can be affected by, the Project.

The main objectives for stakeholder engagement are:

- To inform the relevant stakeholders about the Project;
- To capture views and concerns of the relevant stakeholders with regard to the project;
- To enhance ownership of the project within the host community;
- To provide a basis for stakeholder participation in impact identification and mitigation.

For Projects that have environmental and social impacts, consultation is not a single conversation but a series of opportunities to create understanding about the Project among those that are likely to be affected or might have an interest in it, and to learn how these stakeholders view the project and its related risks, impacts, opportunities, and mitigation measures. Listening to stakeholder concerns and feedback can be a valuable source of information to help identify environmental and social risks (real and perceived) and improve project management.

13.1 GRIEVANCE MECHANISM

13.1.1 Internal Grievances

The SEP includes a grievance procedure for workers to raise workplace concerns. The procedure includes an appropriate level of management and address concerns promptly, using an understandable and transparent process that provides timely feedback to those concerned, without any retribution. The mechanism allows for anonymous complaints to be raised and addressed.

The grievance mechanism must not impede access to other judicial or administrative remedies that might be available under the law or through existing arbitration procedures, or substitute for grievance mechanisms provided through collective agreements.

All staff will need to be informed of the grievance procedure during their induction to the project and the procedure will be made readily available and easily accessible.

13.1.2 External (Third-Party) Grievances

The SEP also includes a procedure for external grievances that establishes methods to receive and register communications from external stakeholders (Project Affected Persons and Interest based stakeholders). This includes:

- A method to screen and assess the issues raised and determine how to address them;
- A method to provide, track, and document responses, if any; and

- A method to adjust the ESMS management program, as appropriate, in response to external grievances.

The grievance procedure shall be reviewed and updated (as applicable) to ensure it remains scaled to the risks and adverse impacts of the project and include consideration of any affected stakeholders.

It must seek to resolve concerns promptly, using an understandable and transparent consultative process that is culturally appropriate and readily accessible, and at no cost and without retribution to the party that originated the issue or concern. The mechanism should not impede access to judicial or administrative remedies.

14. COMMUNICATION

The ESMS will establish, implement and maintain processes needed for internal and external communication relevant to environmental and social performance of the Project.

Lines of communication relevant to the construction phase will be clearly defined within the CESMP and CoESMP whilst lines of communication relevant to the operational phase will be clearly defined within the OESMP.

Associated processes will establish:

- What will be communicated
- When it will be communicated
- With whom to communicate
- How to communicate
- When establishing communication processes relevant to the ESMS, particular note will be made to
- Compliance obligations, including any reporting requirements to the environmental authorities
- Reporting requirements required by the Project lenders.

15. DATA MANAGEMENT AND RECORD KEEPING

The implementation of the ESMS will generate data, that will be required to be managed. The appropriate management of records is a requirement of any successful ESMS and can be used to track progress, review effectiveness and demonstrate compliance.

The ESMS relevant to both the construction, commissioning and operational phases should include the collation of the records including (but not limited to) the following:

- Environmental and Social induction and training records;
- Relevant records of competence/qualifications;
- Accident Investigation Reports;
- Grievance register;
- Internal Audits reports (including close-out);
- Non-Conformance Reports;
- Incident Reports;
- Environmental & Social Inspection & Audit Reports (including corrective action reports);
- Environmental & Social Monitoring Results;
- Waste Manifest Forms and Chain of Custodies;
- Environmental & Social Risk Assessments and Method statements;
- Equipment & Social Inspections/Certifications;
- Independent Audit Reports for Lenders (including corrective action reports); and
- Emergency events.

Such records will need to be included on the ESMS register and updated as applicable.

16. REVIEW

The ESMS should be regularly reviewed according to changes in construction, commissioning or operational activities and in response to results from monitoring, audits and inspection.

Reviews should be conducted at a frequency to ensure adequacy of the ESMS and to ensure that all potentially significant adverse aspects are identified and that associated control measures are appropriate to the Project.

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