



### QUESTIONNAIRE FOR THE MINERAL PROCESSING INDUSTRY (SECTOR-RELATED QUESTIONS)

The completion of this questionnaire is voluntary. However, replying to the relevant questions as completely as possible will facilitate and speed up the assessment of the environmental, social and human rights impacts of the project for which the German export supplies or services offered for cover are intended. This – together with the questionnaire not related to a particular sector, the completion and submission of which should also be considered in order to speed up the assessment procedure – can replace the description of the environmental, social and human rights impacts in the memorandum.

The questionnaire provides guidance on what information may be important for this sector. It is based on the World Bank/IFC General Environmental Health and Safety (EHS) Guidelines, the EHS Guidelines for Cement and Lime Manufacturing, the EHS Guidelines for Ceramic Tile and Sanitary Ware Manufacturing, the EHS Guidelines for Glass Manufacturing and the EHS Guidelines for Construction Materials Extraction. Additional information on the applicable standards can be found at the [AGA Portal](#).

This is a list of possible questions. Depending on the individual case only some of them, or perhaps also additional information, may become relevant in the course of the application procedure. Because of the specific features of each project further clarification may be required.

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## A. Cement manufacturing

### A.1. Process and resources consumption

- Please give a technical description of the individual process steps (wet/dry/semidry process etc.).
- Does a production-related connection with other (planned) facilities (electricity generation, combustion processes, etc.) exist?
- Is asbestos used? If so, please provide additional information.
- What fuels (also secondary or substitute fuels if applicable) are used? Please give details concerning the origin and quality of the fuels (sulfur content, calorific value, etc.). At what temperature are they burnt?
- Please state the resources and energy consumption after completion of the project in accordance with the table below.

Resource and energy consumption.			
Inputs per unit of product	Unit	Industry benchmark	Project Value
Fuel energy – cement	GJ/t clinker	3.0 – 4.2	
Electric energy – cement	kWh/t equivalent cement	90 – 150	
Electric energy – clinker grinding	kWh/t	40 – 45	
Materials Substitute raw materials used in production of clinker	%	2 – 10	
Substitute raw materials in production of cement	%	0 – 70/80 with blast furnace slag =0–30 with fly ash	
Source: WORLD BANK/IFC EHS Guidelines for CEMENT AND LIME MANUFACTURING 2007, page 11			

- Please state also the heat consumption and the production capacity after completion of the project in accordance with the table below:

Heat consumption and production capacity for cement manufacture kilns.				
Kiln type	Heat consumption [MJ/t clinker]		Maximum production capacity [t/day]	
	Guideline Value	Project Value	Guideline Value	Project Value
Preheater–precalciner — 3–6 stages	3000 – 3800		12000	
Preheater	3100 – 4200		4000	
Long dry	= 5000		3800	
Semidry – semiwet (Lepol)	3300 – 4500		2500	
Wet process	5000 – 6000		1500 – 2000	
Source: WORLD BANK/IFC EHS Guidelines for CEMENT AND LIME MANUFACTURING 2007, page 12				

- Where do the required raw materials come from and how are they mined?
- Does the project involve the extension of an existing and/or the opening up of a new quarry? If so, please also answer the questions in *Section E: Construction materials extraction* of this questionnaire.

## A.2. Air emissions

- Please state the expected maximum values for air emissions after the project's completion for all process steps in accordance with the table below. Occasionally, not all pollutants listed in the table are emitted or others specific to the project have to be added. Please inform us if that is the case.

Air emission levels for cement manufacturing*			
Pollutant	Unit	Guideline Value	Project Value
Particulate Matter (new kiln system)	mg/Nm³	30 <sup>(a)</sup>	
Particulate Matter (existing kilns)	mg/Nm³	100	
Dust (other point sources incl. clinker cooling, cement grinding)	mg/Nm³	50	
SO <sub>2</sub>	mg/Nm³	400	
NO <sub>x</sub>	mg/Nm³	600	
HCl	mg/Nm³	10 <sup>(b)</sup>	
Hydrogen fluoride	mg/Nm³	1 <sup>(b)</sup>	
Total Organic Carbon	mg/Nm³	10	
Dioxins-furans	mg TEQ/Nm³	0.1 <sup>(b)</sup>	
Cadmium & Thalium (Cd+Tl)	mg/Nm³	0.05 <sup>(b)</sup>	
Mercury (Hg)	mg/Nm³	0.05 <sup>(b)</sup>	
Total Metals <sup>(c)</sup>	mg/Nm³	0.5	
NOTES: *) Emissions from the kiln stack unless otherwise noted. Daily average values corrected to 273 K, 101.3 kPa, 10 percent O <sub>2</sub> , and dry gas, unless otherwise noted. a) 10 mg/Nm <sup>3</sup> if more than 40 percent of the resulting heat release comes from hazardous waste.		b) If more than 40 percent of the resulting heat release comes from hazardous waste, average values over the sample period of a minimum of 30 minutes and a maximum of 8 hours. c) Total Metals = Arsenic (As), Lead (Pb), Cobalt (Co), Chromium (Cr), Copper (Cu), Manganese (Mn), Nickel (Ni), Vanadium (V), and Antimony (Sb)	
Source: WORLD BANK/IFC EHS Guidelines for CEMENT AND LIME MANUFACTURING 2007, page 10			

- Please also provide information on the amount of emissions per product unit after the project's completion in accordance with the table below.

Emission generation				
Outputs per unit of product		Unit	Industry benchmark	Project Value
Dust		g/t equivalent cement	20 – 50	
NO <sub>x</sub>		g/t equivalent cement	600 – 800	
SO <sub>x</sub>		kg/t	0.1 – 2.0	
CO <sub>2</sub>	▪ From decar-bonation	kg/t	400 – 525	
	▪ From fuel <sup>(a)</sup>	kg/t equivalent cement	150 – 350	
Notes:				
a) Influenced by the variable quantities of fly ash and other additives used.				
Source: WORLD BANK/IFC EHS Guidelines for CEMENT AND LIME MANUFACTURING 2007, page 11				

- Please also state the (expected) emission values (in particular greenhouse gas emissions (CO<sub>2</sub>eq), dust (PM), sulfur dioxide (SO<sub>2</sub>) and nitrogen oxides (NO<sub>x</sub>) in mg/Nm<sup>3</sup>) for any steam and power generation. In the case of plants with a capacity of more than 50 MW<sub>thermic</sub> please use the questionnaire *Conventional Energy* as guideline.
- Please describe what measures are taken to avoid/reduce air emissions (including greenhouse gas emissions). Will collected dust be recycled?
- What limit values for ambient air quality are applicable in the buyer's country (please make a table available)? Please state the relevant expected emission levels. Please comment on changes in the ambient air quality before and after the project implementation. If there are no national limit values, please use the table below.

WHO Ambient Air Quality Guidelines <sup>1,2</sup>					
	Averaging Period	IFC Guideline Value [µg/m <sup>3</sup> ]	Guideline Value Host country	Project Value (baseline status) [µg/m <sup>3</sup> ]	Project Value (after implementation) [µg/m <sup>3</sup> ]
Sulfur dioxide (SO <sub>2</sub> )	24-hour	125 (Interim target-1) 50 (Interim target-2) 20 (guideline)			
	10 minute	500 (guideline)			
Nitrogen dioxide (NO <sub>2</sub> )	1-year	40 (guideline)			
	1-hour	200 (guideline)			

<b>Particulate Matter (PM<sub>10</sub>)</b>	1-year	70 (Interim target-1) 50 (Interim target-2) 30 (Interim target-3) 20 (guideline)			
	24-hour	150 (Interim target-1) 100 (Interim target-2) 75 (Interim target-3) 50 (guideline)			
<b>Particulate Matter (PM<sub>2.5</sub>)</b>	1-year	35 (Interim target-1) 25 (Interim target-2) 15 (Interim target-3) 10 (guideline)			
	24-hour	75 (Interim target-1) 50 (Interim target-2) 37.5 (Interim target-3) 25 (guideline)			
<b>Ozone</b>	8-hour daily maximum	160 (Interim target-1) 100 (guideline)			
<b>Notes:</b> <sup>1</sup> World Health Organization (WHO). Air Quality Guidelines Global Update, 2005. PM 24-hour value is the 99th percentile. <sup>2</sup> Interim targets are provided in recognition of the need for a staged approach to achieving the recommended guidelines.					
Source: WORLD BANK/IFC GENERAL EHS GUIDELINES 2007, page 4					

- Please describe the on-site monitoring of air emissions as well as ambient air quality levels.

### A.3. Fresh water and effluents

- How much (fresh) water is used on site? Is the water recirculated?
- Where and how is the water withdrawn?
- What wastewater streams are generated?
- How are effluents treated before they are discharged? Please also state whether effluents are discharged into a public sewage treatment system or into surface water bodies (river, lake, sea). If there are discharges, please provide information on the quantities of the wastewater streams (e.g. m<sup>3</sup>/h or l/s).
- If wastewater is discharged directly into a surface water body, please state the maximum values of the pollution levels in accordance with the table below. Occasionally, not all pollutants listed in the table are emitted or others specific to the project have to be added. Please inform us if that is the case.

Effluent levels: Cement manufacturing			
Pollutant	Unit	Guideline Value <sup>a</sup>	Project Value
pH	S.U.	6 – 9	
Total Suspended Solids (TSS)	mg/L	50	
Temperature increase	°C	<3 <sup>(a)</sup>	
a) At the edge of a scientifically established mixing zone which takes into account ambient water quality, receiving water use, potential receptors and assimilative capacity			
Source: WORLD BANK/IFC EHS Guidelines for CEMENT AND LIME MANUFACTURING 2007, page 11			

- How and where are effluents discharged? Please explicitly comment on the temperature rise at the point of discharge, describe possible effects of the discharge on the ecology of the water bodies and provide information on the condition and size of the water body (e.g. flow values, flow rate). Please give also details on protection measures.
- Please describe the measures planned to avoid/reduce/treat wastewater.
- Please describe the on-site monitoring of the effluent values.
- What national standards are applicable in the buyer's country for the discharge of sanitary sewage? How is sewage treated before it is discharged? Please state the expected maximum values for the pollution levels in the sewage. If there are no national limit values, please use the table below.

Indicative Values for Treated Sanitary Sewage Discharges <sup>1</sup>			
Pollutants	Units	Guideline Value	Project Value
pH	pH	6-9	
BOD	mg/L	30	
COD	mg/L	125	
Total nitrogen	mg/L	10	
Total phosphorus	mg/L	2	
Oil and grease	mg/L	10	
TSS	mg/L	50	
Total coliform bacteria	MPN <sup>2</sup> /100 ml	400 <sup>1</sup>	
<b>Notes:</b> <sup>1</sup> Not applicable to centralized, municipal, wastewater treatment systems which are included in EHS Guidelines for Water and Sanitation. <sup>2</sup> MPN = Most Probable Number			
Source: WORLD BANK/IFC GENERAL EHS GUIDELINES 2007, page 30			

#### A.4. Waste

- What relevant waste products are generated on site?
- What measures are taken to avoid, treat and dispose of the waste (solid/liquid) generated and where/how is it deposited?
- Please give also details on possible waste incineration processes (type and quantity of waste, incineration temperature, etc.).
- Please provide the amount of waste generated per unit of product in accordance with the table below.

Waste generation			
Outputs per unit of product	Unit	Industry benchmark	Project Value
Waste	kg/t	0.25 – 0.6 <sup>(a)</sup>	
Source: WORLD BANK/IFC EHS Guidelines for CEMENT AND LIME MANUFACTURING 2007, page 11			

## A.5. Noise

- Please state the noise impact (existing background noise level and additional noise emissions of the project) on the nearest receptors (industrial estates and residential areas) in dB(A) for day and night after completion of the project in accordance with the table below.

Noise Level Guidelines <sup>1</sup>				
Receptor	One Hour LA <sub>eq</sub> (dBA)			
	Guideline Value Daytime (07:00-22:00)	Project Value Daytime (07:00-22:00)	Guideline Value Nighttime (22:00-07:00)	Project Value Nighttime (22:00-07:00)
Residential; institutional; educational <sup>2</sup>	55		45	
Industrial; commercial	70		70	
<b>Notes:</b> <sup>1</sup> Guidelines values are for noise levels measured out of doors. Source: Guidelines for Community Noise, WHO, 1999. <sup>2</sup> For acceptable indoor noise levels for residential, institutional, and educational settings refer to WHO (1999). Quelle: WELTBANK/IFC GENERAL EHS GUIDELINES 2007, S. 53				

- Do the project's noise emissions lead to an increase of the background noise level at the nearest receptors by more than 3 dB(A)?
- How far is the nearest residential area away?
- Are noise mitigation measures necessary or planned? If so, what measures?

## A.6. Occupational health and safety

- What safety measures and/or control systems are planned to prevent accidents?
- How are safety and health (in particular with regard to dust emissions, heat, noise and vibrations, physical hazards, radiation sources) guaranteed at the workplace?
- What average and maximum noise exposure is to be expected in the production? What safety measures are taken at workplaces where the noise exposure exceeds 85 dB(A)?
- Please make accident statistics for the past two years available to us.
- How are subcontractors integrated into the health and safety measures on site?

## A.7. Health and safety of the population

- What measures are taken to minimize impacts and possible risks (e.g. due to the storage and transport of chemicals, noise, odours, dust and/or due to increased traffic) for adjacent communities?
- Please make information on infrastructure links (access roads, railway link, etc.), which may be necessary, available to us.

## B. Lime manufacturing

### B.1. Process and resources consumption

- Please give a technical description of the individual process steps, which are used at the site.
- Does a production-related connection with other (planned) facilities (electricity generation, combustion processes, etc.) exist?
- What fuels (also secondary or substitute fuels if applicable) are used? Please give details concerning the origin and quality of the fuels (sulfur content, calorific value, etc.). At what temperature are they burnt?
- Please state the resources and energy consumption after completion of the project in accordance with the table below.

Resource and energy consumption.			
Inputs per unit of product	Unit	Industry benchmark	Project Value
Fuel energy – lime	GJ/t lime	4 – 4.7 mixed-feed shaft kilns 3.6 – 6 advanced shaft and rotary kilns	
Electric energy – lime	kWh/t equivalent lime	5 – 15 mixed-feed shaft kilns 20–40 advanced shaft and rotary kilns	

Source: WORLD BANK/IFC EHS Guidelines for CEMENT AND LIME MANUFACTURING 2007, page 11

- Please state also the heat and electricity consumption after completion of the project in accordance with the table below.

Average heat and electric consumption for four types of lime kilns.				
Kiln type (a)	Heat consumption [MJ/t lime]		Electric consumption [kWh/lime]	
	Guideline Value	Project Value	Guideline Value	Project Value
Shaft kilns	3600 – 4500		5 – 45	
Rotary kilns	4600 – 5400		18 – 40	
Traveling grate	3700 – 4800		31 – 38	
Gas suspension preheater	4600 – 5400		20 – 25	

Source: WORLD BANK/IFC EHS Guidelines for CEMENT AND LIME MANUFACTURING 2007, page 12

- Where do the required raw materials come from and how are they mined?
- Does the project involve the extension of an existing and/or the opening up of a new quarry? If so, please also answer the questions in *Section E: Construction materials extraction* of this questionnaire.



## B.2. Air emissions

- Please state the expected maximum values for air emissions after the project's completion for all process steps in accordance with the table below. Occasionally, not all pollutants listed in the table are emitted or others specific to the project have to be added. Please inform us if that is the case.

Air emission levels: Lime manufacturing			
Pollutant	Unit	Guideline Value <sup>a</sup>	Project Value
<b>Dust</b> (other point sources incl. clinker cooling, cement grinding)	mg/Nm <sup>3</sup>	50	
<b>SO<sub>2</sub></b>	mg/Nm <sup>3</sup>	400	
<b>NO<sub>x</sub></b>	mg/Nm <sup>3</sup>	500	
<b>HCl</b>	mg/Nm <sup>3</sup>	10	
NOTES:			
a) Daily average values corrected to 273°K, 101,3 kPa, 10% O <sub>2</sub> , and dry gas, unless otherwise noted.			
Source: WORLD BANK/IFC EHS Guidelines for CEMENT AND LIME MANUFACTURING 2007, page 11			

- Please also provide information on the amount of emissions per product unit after the project's completion in accordance with the table below.

Emission generation				
Outputs per unit of product		Unit	Industry benchmark	Project Value
Dust		g/t equivalent cement	20 – 50	
NO <sub>x</sub>		g/t equivalent cement	600 – 800	
SO <sub>x</sub>		kg/t	0.1 – 2.0	
CO <sub>2</sub>	▪ From decar-bonation	kg/t	400 – 525	
	▪ From fuel <sup>(a)</sup>	kg/t equivalent cement	150 – 350	
Notes:				
a) Influenced by the variable quantities of fly ash and other additives used.				
Source: WORLD BANK/IFC EHS Guidelines for CEMENT AND LIME MANUFACTURING 2007, page 11				

- Please also state the (expected) emission values (in particular greenhouse gas emissions (CO<sub>2</sub>eq), dust (PM), sulfur dioxide (SO<sub>2</sub>) and nitrogen oxides (NO<sub>x</sub>) in mg/Nm<sup>3</sup>) for any steam and power generation. In the case of plants with a capacity of more than 50 MW<sub>thermic</sub> please use the questionnaire *Conventional Energy* as guideline.
- Please describe what measures are taken to avoid/reduce air emissions (including greenhouse gas emissions). Will collected dust be recycled?
- What limit values for ambient air quality are applicable in the buyer's country (please make a table available)? Please state the relevant expected emission levels. Please comment on changes in the ambient air quality before and after the project implementation. If there are no national limit values, please use the table below.

WHO Ambient Air Quality Guidelines <sup>1,2</sup>					
	Averaging Period	IFC Guideline Value [µg/m³]	Guideline Value Host country	Project Value (baseline status) [µg/m³]	Project Value (after implementation) [µg/m³]
<b>Sulfur dioxide (SO<sub>2</sub>)</b>	24-hour	125 (Interim target-1) 50 (Interim target-2) 20 (guideline)			
	10 minute	500 (guideline)			
<b>Nitrogen dioxide (NO<sub>2</sub>)</b>	1-year	40 (guideline)			
	1-hour	200 (guideline)			
<b>Particulate Matter (PM<sub>10</sub>)</b>	1-year	70 (Interim target-1) 50 (Interim target-2) 30 (Interim target-3) 20 (guideline)			
	24-hour	150 (Interim target-1) 100 (Interim target-2) 75 (Interim target-3) 50 (guideline)			
<b>Particulate Matter (PM<sub>2.5</sub>)</b>	1-year	35 (Interim target-1) 25 (Interim target-2) 15 (Interim target-3) 10 (guideline)			
	24-hour	75 (Interim target-1) 50 (Interim target-2) 37.5 (Interim target-3) 25 (guideline)			
<b>Ozone</b>	8-hour daily maximum	160 (Interim target-1) 100 (guideline)			
<b>Notes:</b> <sup>1</sup> World Health Organization (WHO). Air Quality Guidelines Global Update, 2005. PM 24-hour value is the 99th percentile. <sup>2</sup> Interim targets are provided in recognition of the need for a staged approach to achieving the recommended guidelines.					
Source: WORLD BANK/IFC GENERAL EHS GUIDELINES 2007, page 4					

- Please describe the on-site monitoring of air emissions as well as ambient air quality levels.

### B.3. Fresh water and effluents

- How much (fresh) water is used on site? Is the water recirculated?
- Where and how is the water withdrawn?

- What wastewater streams are generated?
- How are effluents treated before they are discharged? Please also state whether effluents are discharged into a public sewage treatment system or into surface water bodies (river, lake, sea). If there are discharges, please provide information on the quantities of the wastewater streams (e.g. m<sup>3</sup>/h or l/s).
- If wastewater is discharged directly into a surface water body, please state the maximum values of the pollution levels in accordance with the table below. Occasionally, not all pollutants listed in the table are emitted or others specific to the project have to be added. Please inform us if that is the case.

Effluent levels: Cement manufacturing			
Pollutant	Unit	Guideline Value <sup>a</sup>	Project Value
pH	S.U.	6 – 9	
Total Suspended Solids (TSS)	mg/L	50	
Temperature increase	°C	<3 <sup>(a)</sup>	
a) At the edge of a scientifically established mixing zone which takes into account ambient water quality, receiving water use, potential receptors and assimilative capacity			
Source: WORLD BANK/IFC EHS Guidelines for CEMENT AND LIME MANUFACTURING 2007, page 11			

- How and where are effluents discharged? Please explicitly comment on the temperature rise at the point of discharge, describe possible effects of the discharge on the ecology of the water bodies and provide information on the condition and size of the water body (e.g. flow values, flow rate). Please give also details on protection measures.
- Please describe the measures planned to avoid/reduce/treat wastewater.
- Please describe the on-site monitoring of the effluent values.
- What national standards are applicable in the buyer's country for the discharge of sanitary sewage? How is sewage treated before it is discharged? Please state the expected maximum values for the pollution levels in the sewage. If there are no national limit values, please use the table below.

Indicative Values for Treated Sanitary Sewage Discharges <sup>1</sup>			
Pollutants	Units	Guideline Value	Project Value
pH	pH	6-9	
BOD	mg/L	30	
COD	mg/L	125	
Total nitrogen	mg/L	10	
Total phosphorus	mg/L	2	
Oil and grease	mg/L	10	

<b>TSS</b>	mg/L	50	
<b>Total coliform bacteria</b>	MPN <sup>2</sup> /100 ml	400 <sup>1</sup>	
<b>Notes:</b> <sup>1</sup> Not applicable to centralized, municipal, wastewater treatment systems which are included in EHS Guidelines for Water and Sanitation. <sup>2</sup> MPN = Most Probable Number Source: WORLD BANK/IFC GENERAL EHS GUIDELINES 2007, page 30			

#### B.4. Waste

- What relevant waste products are generated on site?
- What measures are taken to avoid, treat and dispose of the waste (solid/liquid) generated and where/how is it deposited?
- Please give also details on possible waste incineration processes (type and quantity of waste, incineration temperature, etc.).
- Please provide the amount of waste generated per unit of product in accordance with the table below.

Waste generation			
Outputs per unit of product	Unit	Industry benchmark	Project Value
<b>Waste</b>	kg/t	0.25 – 0.6 <sup>(a)</sup>	
Source: WORLD BANK/IFC EHS Guidelines for CEMENT AND LIME MANUFACTURING 2007, page 11			

#### B.5. Noise

- Please state the noise impact (existing background noise level and additional noise emissions of the project) on the nearest receptors (industrial estates and residential areas) in dB(A) for day and night after completion of the project in accordance with the table below.

Noise Level Guidelines <sup>1</sup>				
Receptor	One Hour LA <sub>eq</sub> (dBA)			
	Guideline Value Daytime (07:00-22:00)	Project Value Daytime (07:00-22:00)	Guideline Value Nighttime (22:00-07:00)	Project Value Nighttime (22:00-07:00)
<b>Residential; institutional; educational<sup>2</sup></b>	55		45	
<b>Industrial; commercial</b>	70		70	
<b>Notes:</b> <sup>1</sup> Guidelines values are for noise levels measured out of doors. Source: Guidelines for Community Noise, WHO, 1999. <sup>2</sup> For acceptable indoor noise levels for residential, institutional, and educational settings refer to WHO (1999). Source: WORLD BANK/IFC GENERAL EHS GUIDELINES 2007, page 53				

- Do the project's noise emissions lead to an increase of the background noise level at the nearest receptors by more than 3 dB(A)?
- How far is the nearest residential area away?
- Are noise mitigation measures necessary or planned? If so, what measures?

## B.6. Occupational health and safety

- What safety measures and/or control systems are planned to prevent accidents?
- How are safety and health (in particular with regard to dust emissions, heat, noise and vibrations, physical hazards, radiation sources) guaranteed at the workplace?
- What average and maximum noise exposure is to be expected in the production? What safety measures are taken at workplaces where the noise exposure exceeds 85 dB(A)?
- Please make accident statistics for the past two years available to us.
- How are subcontractors integrated into the health and safety measures on site?

## B.7. Health and safety of the population

- What measures are taken to minimize impacts and possible risks (due to noise, odours, explosions, dust and/or due to increased traffic) for adjacent communities?
- Please make information on infrastructure links (access roads, railway link, etc.), which may be necessary, available to us.

## C. Ceramic tile and sanitary ware manufacturing

### C.1. Process and resources consumption

- Please give a technical description of the individual process steps, which are used at the site.
- Does a production-related connection with other (planned) facilities (electricity generation, combustion processes, etc.) exist?
- What fuels (also secondary or substitute fuels if applicable) are used? Please give details concerning the origin and quality of the fuels (sulfur content, calorific value, etc.). At what temperature are they burnt?
- Please state the energy consumption after completion of the project in accordance with the table below.

Energy consumption			
Inputs per unit of product	Units	Industry benchmark	Project Value
<i>Ceramic tile manufacturing — energy consumption</i>			
Thermal energy: Spray drying process	kJ/kg	900 - 2200	
Thermal energy: Drying process	kJ/kg	250 - 750	
Thermal energy: Firing: once-fired tiles (Tunnel kilns)	kJ/kg	5400 – 6300	
Thermal energy Firing: twice-fired tiles (Tunnel kilns)	kJ/kg	6000 – 7300	
Thermal energy Firing: once-fired tiles (Roller hearth kilns)	kJ/kg	1900 - 4800	
Thermal energy Firing: twice-fired tiles (Roller hearth kilns)	kJ/kg	3400 – 4600	
Electric energy Pressing	kWh/kg	50 – 150	
Electric energy Drying	kWh/kg	10 - 40	
Electric energy Firing	kWh/kg	20 – 150	

### Sanitary ware manufacturing — energy consumption

Conventional tunnel kiln	kJ/kg	9100 – 12000	
Modern tunnel kiln with light fiber insulation	kJ/kg	4200 – 6500	
Roller heath kiln	kJ/kg	3500 – 5000	
Modern shuttle kiln	kJ/kg	8500 – 11000	
Source: WORLD BANK/IFC EHS Guidelines for CERAMIC TILE AND SANITARY WARE MANUFACTURING 2007, page 9			

- Where do the required raw materials come from and how are they mined?
- Does the project involve the extension of an existing and/or the opening up of a new quarry? If so, please also answer the questions in *Section E: Construction materials extraction* of this questionnaire.

### C.2. Air emissions

- Please state the expected maximum values for air emissions after the project's completion for all process steps in accordance with the table below. Occasionally, not all pollutants listed in the table are emitted or others specific to the project have to be added. Please inform us if that is the case.

Air emission levels for ceramic tile			
Pollutant	Units	Guideline Value	Project Value
Particulate Matter	mg/Nm <sup>3</sup>	50 <sup>(a)</sup>	
SO <sub>2</sub>	mg/Nm <sup>3</sup>	400 <sup>(b)</sup>	
NO <sub>x</sub>	mg/Nm <sup>3</sup>	600 <sup>(b)</sup>	
HCL	mg/Nm <sup>3</sup>	30	
HF	mg/Nm <sup>3</sup>	5	
Lead	mg/Nm <sup>3</sup>	0.5	
Cadmium	mg/Nm <sup>3</sup>	0.2	
TOC	mg/Nm <sup>3</sup>	20	
O <sub>2</sub> content of the flue gas	%	10	
Notes: a) Dryer and kiln stacks b) Kiln operations (at 10 percent O <sub>2</sub> ).			
Source: WORLD BANK/IFC EHS Guidelines for CERAMIC TILE AND SANITARY WARE MANUFACTURING 2007, page 8			

- Please also state the (expected) emission values (in particular greenhouse gas emissions (CO<sub>2</sub>eq), dust (PM), sulfur dioxide (SO<sub>2</sub>) and nitrogen oxides (NO<sub>x</sub>) in mg/Nm<sup>3</sup>) for any steam and power generation. In the case of plants with a capacity of more than 50 MW<sub>thermic</sub> please use the questionnaire *Conventional Energy* as guideline.
- Please describe what measures are taken to avoid/reduce air emissions (including greenhouse gas emissions). Will collected dust be recycled?
- What limit values for ambient air quality are applicable in the buyer's country (please make a table available)? Please state the relevant expected emission levels. Please comment on changes in the ambient air quality before and after the project implementation. If there are no national limit values, please use the table below.

WHO Ambient Air Quality Guidelines <sup>1,2</sup>					
	Averaging Period	IFC Guideline Value [µg/m <sup>3</sup> ]	Guideline Value Host country	Project Value (baseline status) [µg/m <sup>3</sup> ]	Project Value (after implementation) [µg/m <sup>3</sup> ]
<b>Sulfur dioxide (SO<sub>2</sub>)</b>	24-hour	125 (Interim target-1) 50 (Interim target-2) 20 (guideline)			
	10 minute	500 (guideline)			
<b>Nitrogen dioxide (NO<sub>2</sub>)</b>	1-year	40 (guideline)			
	1-hour	200 (guideline)			
<b>Particulate Matter (PM<sub>10</sub>)</b>	1-year	70 (Interim target-1) 50 (Interim target-2) 30 (Interim target-3) 20 (guideline)			
	24-hour	150 (Interim target-1) 100 (Interim target-2) 75 (Interim target-3) 50 (guideline)			
<b>Particulate Matter (PM<sub>2.5</sub>)</b>	1-year	35 (Interim target-1) 25 (Interim target-2) 15 (Interim target-3) 10 (guideline)			
	24-hour	75 (Interim target-1) 50 (Interim target-2) 37.5 (Interim target-3) 25 (guideline)			
<b>Ozone</b>	8-hour daily maximum	160 (Interim target-1) 100 (guideline)			
<b>Notes:</b> <sup>1</sup> World Health Organization (WHO). Air Quality Guidelines Global Update, 2005. PM 24-hour value is the 99th percentile. <sup>2</sup> Interim targets are provided in recognition of the need for a staged approach to achieving the recommended guidelines.					
Source: WORLD BANK/IFC GENERAL EHS GUIDELINES 2007, page 4					

- Please describe the on-site monitoring of air emissions as well as ambient air quality levels.

### C.3. Fresh water and effluents

- How much (fresh) water is used on site? Is the water recirculated?
- Where and how is the water withdrawn?
- What wastewater streams are generated?
- How are effluents treated before they are discharged? Please also state whether effluents are discharged into a public sewage treatment system or into surface water bodies (river, lake, sea). If there are discharges, please provide information on the quantities of the wastewater streams (e.g. m<sup>3</sup>/h or l/s).

- If wastewater is discharged directly into a surface water body, please state the maximum values of the pollution levels in mg/l (table “Effluent levels”). Occasionally, not all pollutants listed in the table are emitted or others specific to the project have to be added. Please inform us if that is the case.

Effluent levels for ceramic tile			
Pollutant	Units	Guideline Value	Project Value
pH	S.U.	6 – 9	
BOD <sub>5</sub>	mg/L	50	
Total Suspended Solids (TSS)	mg/L	50	
Oil and grease	mg/L	10	
Lead	mg/L	0.2	
Cadmium	mg/L	0.1	
Chromium (total)	mg/L	0.1	
Cobalt	mg/L	0.1	
Copper	mg/L	0.1	
Nickel	mg/L	0.1	
Zinc	mg/L	2	
Temperature increase	°C	<3 <sup>(a)</sup>	
a) At the edge of a scientifically established mixing zone which takes into account ambient water quality, receiving water use, potential receptors and assimilative capacity			
Source: WORLD BANK/IFC EHS Guidelines for CERAMIC TILE AND SANITARY WARE MANUFACTURING 2007, page 8			

- How and where are effluents discharged? Please explicitly comment on the temperature rise at the point of discharge, describe possible effects of the discharge on the ecology of the water bodies and provide information on the condition and size of the water body (e.g. flow values, flow rate). Please give also details on protection measures.
- Please describe the measures planned to avoid/reduce/treat wastewater.
- Please describe the on-site monitoring of the effluent values.
- What national standards are applicable in the buyer’s country for the discharge of sanitary sewage? How is sewage treated before it is discharged? Please state the expected maximum values for the pollution levels in the sewage. If there are no national limit values, please use the table below.

Indicative Values for Treated Sanitary Sewage Discharges <sup>1</sup>			
Pollutants	Units	Guideline Value	Project Value
pH	pH	6-9	
BOD	mg/L	30	
COD	mg/L	125	
Total nitrogen	mg/L	10	
Total phosphorus	mg/L	2	



<b>Oil and grease</b>	mg/L	10	
<b>TSS</b>	mg/L	50	
<b>Total coliform bacteria</b>	MPN <sup>2</sup> /100 ml	400 <sup>1</sup>	
<b>Notes:</b> <sup>1</sup> Not applicable to centralized, municipal, wastewater treatment systems which are included in EHS Guidelines for Water and Sanitation. <sup>2</sup> MPN = Most Probable Number			
Source: WORLD BANK/IFC GENERAL EHS GUIDELINES 2007, page 30			

#### C.4. Waste

- What relevant waste products are generated on site?
- What measures are taken to avoid, treat and dispose of the waste (solid/liquid) generated and where/how is it deposited?
- Please give also details on possible waste incineration processes (type and quantity of waste, incineration temperature, etc.).
- Please provide the amount of waste generated per unit of product in accordance with the table below.

Waste generation			
Output per unit of product	Unit	Industry benchmark	Project Value
<b>Glaze waste produced in tile surface glazing</b>	g/m <sup>2</sup> of tile surface	100	
<b>Sludge</b>	g/m <sup>2</sup> of tile surface	90 – 150	
<b>Solid waste — cuttings and defective tiles</b>	g/m <sup>2</sup> of tile surface	700 - 1300	
<b>Recovery and re-use of glaze in sanitary ware manufacturing</b>	m <sup>3</sup> /day	0.08 – 0.1	
<b>Glaze used per sanitary ware item</b>	kg/item	1.5 – 3	
Source: WORLD BANK/IFC EHS Guidelines for CERAMIC TILE AND SANITARY WARE MANUFACTURING 2007, page 9			

#### C.5. Noise

- Please state the noise impact (existing background noise level and additional noise emissions of the project) on the nearest receptors (industrial estates and residential areas) in dB(A) for day and night after completion of the project in accordance with the table below.

Noise Level Guidelines <sup>1</sup>				
Receptor	One Hour LA <sub>eq</sub> (dBA)			
	Guideline Value Daytime (07:00-22:00)	Project Value Daytime (07:00-22:00)	Guideline Value Nighttime (22:00-07:00)	Project Value Nighttime (22:00-07:00)
<b>Residential; institutional; educational<sup>2</sup></b>	55		45	
<b>Industrial; commercial</b>	70		70	
<b>Notes:</b> <sup>1</sup> Guidelines values are for noise levels measured out of doors. Source: Guidelines for Community Noise, WHO, 1999. <sup>2</sup> For acceptable indoor noise levels for residential, institutional, and educational settings refer to WHO (1999).				
Source: WORLD BANK/IFC GENERAL EHS GUIDELINES 2007, page 53				

- Do the project's noise emissions lead to an increase of the background noise level at the nearest receptors by more than 3 dB(A)?

- How far is the nearest residential area away?
- Are noise mitigation measures necessary or planned? If so, what measures?

## C.6. Occupational health and safety

- What safety measures and/or control systems are planned to prevent accidents?
- How are safety and health (in particular with regard to respiratory hazards, heat, noise and vibrations, physical and electrical hazards) guaranteed at the workplace?
- What average and maximum noise exposure is to be expected in the production? What safety measures are taken at workplaces where the noise exposure exceeds 85 dB(A)?
- Please make accident statistics for the past two years available to us.
- How are subcontractors integrated into the health and safety measures on site?

## C.7. Health and safety of the population

- What measures are taken to minimize impacts and possible risks (e.g. due to the storage and transport of chemicals, due to noise, odours, dust and/or due to increased traffic) for adjacent communities?
- Please make information on infrastructure links (access roads, railway link, etc.), which may be necessary, available to us.

## D. Glass manufacturing

### D.1. Process and resources consumption

- Please give a technical description of the individual process steps, which are used at the site.
- Does a production-related connection with other (planned) facilities (electricity generation, combustion processes, etc.) exist?
- What fuels (also secondary or substitute fuels if applicable) are used? Please give details concerning the origin and quality of the fuels (sulfur content, calorific value, etc.). At what temperature are they burnt?
- Please state the resources and energy consumption after completion of the project in accordance with the table below.

Resource and energy consumption			
Inputs per unit of product	Unit	Guideline Value	Project Value
<b>Fuels</b>			
Specific fuel consumption for container glass regenerative end port furnaces with production > 200 ton/day	GJ/tonne melted	3.9	
Specific fuel consumption for float furnaces with production 400–500 ton/day	GJ/tonne melted	5.5	
Specific fuel consumption for borosilicate glass unit melters with production 10–15 ton/day	GJ/tonne melted	9	
<b>Electricity</b>			
Specific electricity use	kWh/tonne melted	110	

Water			
Water consumption per unit of production	m <sup>3</sup> /tonne melted	4	
Source: WORLD BANK/IFC EHS Guidelines for GLASS MANUFACTURING 2007, page 10			

- Where do the required raw materials come from and how are they mined?
- Does the project involve the extension of an existing and/or the opening up of a new quarry? If so, please also answer the questions in *Section E: Construction materials extraction* of this questionnaire.

## D.2. Air emissions

- Please state the expected maximum values for air emissions after the project's completion for all process steps in accordance with the table below. Occasionally, not all pollutants listed in the table are emitted or others specific to the project have to be added. Please inform us if that is the case.

Air emission levels for glass manufacturing			
Pollutant	Units	Guideline Value	Project Value
<b>Particulate Matter</b>			
Natural gas	mg/Nm <sup>3</sup>	100 <sup>(a)</sup>	
Other fuels		50 <sup>(a)</sup>	
<b>SO<sub>2</sub></b>	mg/Nm <sup>3</sup>	700 – 1500 <sup>(b)</sup>	
<b>NO<sub>x</sub></b>	mg/Nm <sup>3</sup>	1000	
<b>HCL</b>	mg/Nm <sup>3</sup>	30	
<b>Fluorides</b>	mg/Nm <sup>3</sup>	5	
<b>Lead</b>	mg/Nm <sup>3</sup>	5	
<b>Cadmium</b>	mg/Nm <sup>3</sup>	0.2	
<b>Arsenic</b>	mg/Nm <sup>3</sup>	1	
<b>Other heavy metals (total)</b>	mg/Nm <sup>3</sup>	5 <sup>(c)</sup>	
a) Where toxic metals are present, not to exceed 20 mg/Nm <sup>3</sup> . To achieve dust emissions of 50 mg/Nm <sup>3</sup> installation of secondary treatments (bag filters or electrostatic precipitators) is necessary. Good operating conditions of the furnace and adoption of primary measures can achieve emission levels of 100 mg/Nm <sup>3</sup> . b) 700 mg/Nm <sup>3</sup> for natural gas firing. 1 500 mg/Nm <sup>3</sup> for oil firing. c) 1 mg/Nm <sup>3</sup> for selenium.			
Source: WORLD BANK/IFC EHS Guidelines for GLASS MANUFACTURING 2007, page 9			

- Please also provide information on the amount of emissions per product unit after the project's completion in accordance with the table below.

Emission load generation					
Outputs per unit of product <sup>(a)</sup>	Units	Flat-glass furnaces		Containerglass furnaces	
		Industry Benchmark	Project Value	Industry Benchmark	Project Value
Particulate matter	kg/tonne glass melted	0.02 – 0.1		0.002-0.22	
	mg/Nm <sup>3</sup>	5.0 – 4.0		1 - 35	
NO <sub>x</sub>	kg/tonne glass melted	1.1 – 2.9		<0.75	
	mg/Nm <sup>3</sup>	495 – 1250		<400	
SO <sub>x</sub>	kg/tonne glass melted	0.54 – 4.0		0.2 – 3.5	
	mg/Nm <sup>3</sup>	200 – 1700		100 – 1650	
HCL	kg/tonne glass melted	<0.01 – 0.08		0.01 – 0.07	
	mg/Nm <sup>3</sup>	4.0 – 30		7 – 30	
HF	kg/tonne glass melted	<0.002- 0.01		= 0.02	
	mg/Nm <sup>3</sup>	<1.0 – 4.0		= 1 – 6	
Metals	kg/tonne glass melted	<0.001		<0.001	
	mg/Nm <sup>3</sup>	<1.0		<1.0	
Source: WORLD BANK/IFC EHS Guidelines for GLASS MANUFACTURING 2007, page 11					

- Please also state the (expected) emission values (in particular greenhouse gas emissions (CO<sub>2</sub>eq), dust (PM), sulfur dioxide (SO<sub>2</sub>) and nitrogen oxides (NO<sub>x</sub>) in mg/Nm<sup>3</sup>) for any steam and power generation. In the case of plants with a capacity of more than 50 MW<sub>thermic</sub> please use the questionnaire *Conventional Energy* as guideline.
- Please describe what measures are taken to avoid/reduce air emissions (including greenhouse gas emissions). Will collected dust be recycled?
- What limit values for ambient air quality are applicable in the buyer's country (please make a table available)? Please state the relevant expected emission levels. Please comment on changes in the ambient air quality before and after the project implementation. If there are no national limit values, please use the table below.

WHO Ambient Air Quality Guidelines <sup>1,2</sup>					
	Averaging Period	IFC Guideline Value [µg/m <sup>3</sup> ]	Guideline Value Host country	Project Value (baseline status) [µg/m <sup>3</sup> ]	Project Value (after implementation) [µg/m <sup>3</sup> ]
Sulfur dioxide (SO <sub>2</sub> )	24-hour	125 (Interim target-1) 50 (Interim target-2) 20 (guideline)			
	10 minute	500 (guideline)			
Nitrogen dioxide (NO <sub>2</sub> )	1-year	40 (guideline)			
	1-hour	200 (guideline)			

<b>Particulate Matter (PM<sub>10</sub>)</b>	1-year	70 (Interim target-1) 50 (Interim target-2) 30 (Interim target-3) 20 (guideline)			
	24-hour	150 (Interim target-1) 100 (Interim target-2) 75 (Interim target-3) 50 (guideline)			
<b>Particulate Matter (PM<sub>2.5</sub>)</b>	1-year	35 (Interim target-1) 25 (Interim target-2) 15 (Interim target-3) 10 (guideline)			
	24-hour	75 (Interim target-1) 50 (Interim target-2) 37.5 (Interim target-3) 25 (guideline)			
<b>Ozone</b>	8-hour daily maximum	160 (Interim target-1) 100 (guideline)			
<b>Notes:</b> <sup>1</sup> World Health Organization (WHO). Air Quality Guidelines Global Update, 2005. PM 24-hour value is the 99th percentile. <sup>2</sup> Interim targets are provided in recognition of the need for a staged approach to achieving the recommended guidelines.					
Source: WORLD BANK/IFC GENERAL EHS GUIDELINES 2007, page 4					

- Please describe the on-site monitoring of air emissions as well as ambient air quality levels.

### D.3. Fresh water and effluents

- How much (fresh) water is used on site? Is the water recirculated?
- Where and how is the water withdrawn?
- What wastewater streams are generated?
- How are effluents treated before they are discharged? Please also state whether effluents are discharged into a public sewage treatment system or into surface water bodies (river, lake, sea). If there are discharges, please provide information on the quantities of the wastewater streams (e.g. m<sup>3</sup>/h or l/s).
- If wastewater is discharged directly into a surface water body, please state the maximum values of the pollution levels in mg/l (table "Effluent levels"). Occasionally, not all pollutants listed in the table are emitted or others specific to the project have to be added. Please inform us if that is the case.

Effluent levels for glass manufacturing			
Pollutant	Units	Guideline Value	Project Value
pH	S:U:	6 – 9	
Total Suspended Solids (TSS)	mg/L	30	
COD	mg/L	130	
Oil and grease	mg/L	10	
Lead	mg/L	0.1	
Antimony	mg/L	0.3	
Arsenic	mg/L	0.1	
Fluorides	mg/L	5	
Boric acid	mg/L	2	
Temperature increase	°C	<3 <sup>(a)</sup>	
a At the edge of a scientifically established mixing zone which takes into account ambient water quality, receiving water use, potential receptors and assimilative capacity			
Source: WORLD BANK/IFC EHS Guidelines for GLASS MANUFACTURING 2007, page 9			

- How and where are effluents discharged? Please explicitly comment on the temperature rise at the point of discharge, describe possible effects of the discharge on the ecology of the water bodies and provide information on the condition and size of the water body (e.g. flow values, flow rate). Please give also details on protection measures.
- Please describe the measures planned to avoid/reduce/treat wastewater.
- Please describe the on-site monitoring of the effluent values.
- What national standards are applicable in the buyer's country for the discharge of sanitary sewage? How is sewage treated before it is discharged? Please state the expected maximum values for the pollution levels in the sewage. If there are no national limit values, please use the table below.

Indicative Values for Treated Sanitary Sewage Discharges <sup>1</sup>			
Pollutants	Units	Guideline Value	Project Value
pH	pH	6-9	
BOD	mg/L	30	
COD	mg/L	125	
Total nitrogen	mg/L	10	
Total phosphorus	mg/L	2	
Oil and grease	mg/L	10	
TSS	mg/L	50	
Total coliform bacteria	MPN <sup>2</sup> /100 ml	400 <sup>1</sup>	
<b>Notes:</b> <sup>1</sup> Not applicable to centralized, municipal, wastewater treatment systems which are included in EHS Guidelines for Water and Sanitation. <sup>2</sup> MPN = Most Probable Number			
Source: WORLD BANK/IFC GENERAL EHS GUIDELINES 2007, page 30			

#### D.4. Waste

- What relevant waste products are generated on site?
- What measures are taken to avoid, treat and dispose of the waste (solid/liquid) generated and where/how is it deposited?
- Please give also details on possible waste incineration processes (type and quantity of waste, incineration temperature, etc.).

#### D.5. Noise

- Please state the noise impact (existing background noise level and additional noise emissions of the project) on the nearest receptors (industrial estates and residential areas) in dB(A) for day and night after completion of the project in accordance with the table below.

Noise Level Guidelines <sup>1</sup>				
	One Hour LA <sub>eq</sub> (dBA)			
Receptor	Guideline Value Daytime (07:00-22:00)	Project Value Daytime (07:00-22:00)	Guideline Value Nighttime (22:00-07:00)	Project Value Nighttime (22:00-07:00)
Residential; institutional; educational <sup>2</sup>	55		45	
Industrial; commercial	70		70	
<b>Notes:</b> <sup>1</sup> Guidelines values are for noise levels measured out of doors. Source: Guidelines for Community Noise, WHO, 1999. <sup>2</sup> For acceptable indoor noise levels for residential, institutional, and educational settings refer to WHO (1999). Source: WORLD BANK/IFC GENERAL EHS GUIDELINES 2007, page 53				

- Do the project's noise emissions lead to an increase of the background noise level at the nearest receptors by more than 3 dB(A)?
- How far is the nearest residential area away?
- Are noise mitigation measures necessary or planned? If so, what measures?

#### D.6. Occupational health and safety

- What safety measures and/or control systems are planned to prevent accidents?
- How are safety and health (in particular with regard to respiratory hazards, heat, noise, physical and electrical hazards) guaranteed at the workplace?
- What average and maximum noise exposure is to be expected in the production? What safety measures are taken at workplaces where the noise exposure exceeds 85 dB(A)?
- Please make accident statistics for the past two years available to us.
- How are subcontractors integrated into the health and safety measures on site?

#### D.7. Health and safety of the population

- What measures are taken to minimize impacts and possible risks (e.g. due to the storage and transport of chemicals, due to noise, odours, dust and/or due to increased traffic) for adjacent communities?
- Please make information on infrastructure links (access roads, railway link, etc.), which may be necessary, available to us.

## **E. Construction materials extraction**

### **E.1. Raw materials and extraction method**

- What raw materials are to be quarried/mined and for what purpose?
- Who is the owner and who is the operator of the construction material extraction operation?
- Please give a technical description of the extraction methods employed.
- Are explosives used? If so, please describe use, storage, etc.
- Does a production-related connection with other (planned) facilities (electricity generation, combustion processes, etc.) exist?

### **E.2. Site**

- How far is the nearest residential area away?
- How much land is consumed by the quarrying/mining?
- Please provide information on visual impacts on the landscape.
- Does the extraction cause conflicts over the land use and how are these addressed? Does the project involve the expropriation of land and/or resettlements (both physical (relocation or loss of shelter) and economic resettlements (loss of assets or access to assets that leads to loss of income sources or other means of livelihood))?
- What measures are taken to protect the soil and, where necessary, neighbouring water bodies against erosion and contamination?
- Are any sensitive areas (national parks and other protected areas identified by national or international law as well as sensitive locations of international, national or regional importance such as wetlands, forests with high biodiversity value, areas of archaeological or cultural significance and areas of importance for indigenous peoples and other vulnerable groups) located in the surroundings of the site? Is protected flora and fauna affected by the extraction?
- Is it necessary to construct new access roads? Please describe the area through which such roads will lead (ownership, sensitive areas, etc.).
- Please describe the measures of the mine management, decommissioning and rehabilitation plans.

### **E.3. Air emissions**

- What limit values for ambient air quality are applicable in the buyer's country (please make a table available)? Please state the relevant expected emission levels. Please comment on changes in the ambient air quality before and after the project implementation. If there are no national limit values, please use the table below.



# WHO Ambient Air Quality Guidelines<sup>1,2</sup>

	Averaging Period	IFC Guideline Value [µg/m³]	Guideline Value Host country	Project Value (baseline status) [µg/m³]	Project Value (after implementation) [µg/m³]
<b>Sulfur dioxide (SO<sub>2</sub>)</b>	24-hour	125 (Interim target-1) 50 (Interim target-2) 20 (guideline)			
	10 minute	500 (guideline)			
<b>Nitrogen dioxide (NO<sub>2</sub>)</b>	1-year	40 (guideline)			
	1-hour	200 (guideline)			
<b>Particulate Matter (PM<sub>10</sub>)</b>	1-year	70 (Interim target-1) 50 (Interim target-2) 30 (Interim target-3) 20 (guideline)			
	24-hour	150 (Interim target-1) 100 (Interim target-2) 75 (Interim target-3) 50 (guideline)			
<b>Particulate Matter (PM<sub>2.5</sub>)</b>	1-year	35 (Interim target-1) 25 (Interim target-2) 15 (Interim target-3) 10 (guideline)			
	24-hour	75 (Interim target-1) 50 (Interim target-2) 37.5 (Interim target-3) 25 (guideline)			
<b>Ozone</b>	8-hour daily maximum	160 (Interim target-1) 100 (guideline)			

## Notes:

<sup>1</sup> World Health Organization (WHO). Air Quality Guidelines Global Update, 2005. PM 24-hour value is the 99th percentile.

<sup>2</sup> Interim targets are provided in recognition of the need for a staged approach to achieving the recommended guidelines.

Source: WORLD BANK/IFC GENERAL EHS GUIDELINES 2007, page 4

- Please describe what measures are taken to avoid/reduce emissions (e.g. encasing, water spraying).
- Please describe the on-site monitoring of air emissions as well as ambient air quality levels.

#### E.4. Fresh water and effluents

- How much (fresh) water is used on site? Is the water recirculated?
- Where and how is the water withdrawn?
- What wastewater streams are generated?
- Is a negative influence on shallow groundwater storeys and their use (drinking water, agriculture) to be expected?
- What measures are taken to protect the groundwater?
- How are effluents treated before they are discharged? Please also state whether effluents are discharged into a public sewage treatment system or into surface water bodies (river, lake, sea). If there are discharges, please provide information on the quantities of the wastewater streams (e.g. m<sup>3</sup>/h or l/s).
- How much Acid Mine Drainage (AMD) is generated? What measures are taken to treat and/or avoid AMD?
- How and where are effluents discharged? Please explicitly comment on the temperature rise at the point of discharge, describe possible effects of the discharge on the ecology of the water bodies and provide information on the condition and size of the water body (e.g. flow values, flow rate). Please give also details on protection measures.
- Please describe the measures planned to avoid/reduce/treat wastewater.
- Please describe the on-site monitoring of the effluent values.
- What national standards are applicable in the buyer's country for the discharge of sanitary sewage? How is sewage treated before it is discharged? Please state the expected maximum values for the pollution levels in the sewage. If there are no national limit values, please use the table below.

Indicative Values for Treated Sanitary Sewage Discharges <sup>1</sup>			
Pollutants	Units	Guideline Value	Project Value
pH	pH	6-9	
BOD	mg/L	30	
COD	mg/L	125	
Total nitrogen	mg/L	10	
Total phosphorus	mg/L	2	
Oil and grease	mg/L	10	
TSS	mg/L	50	
Total coliform bacteria	MPN <sup>2</sup> /100 ml	400 <sup>1</sup>	
<b>Notes:</b> <sup>1</sup> Not applicable to centralized, municipal, wastewater treatment systems which are included in EHS Guidelines for Water and Sanitation. <sup>2</sup> MPN = Most Probable Number			
Source: WORLD BANK/IFC GENERAL EHS GUIDELINES 2007, page 30			

### E.5. Waste

- What relevant waste products are generated on site?
- What measures are taken to avoid, treat and dispose of the waste (solid/liquid) generated and where/how is it deposited?
- Where and how are excavated and mined materials that are not utilized stored and/or disposed of?

### E.6. Noise

- Please state the noise impact (existing background noise level and additional noise emissions of the project) on the nearest receptors (industrial estates and residential areas) in dB(A) for day and night after completion of the project in accordance with the table below.

Noise Level Guidelines <sup>1</sup>				
Receptor	One Hour LA <sub>eq</sub> (dBA)			
	Guideline Value Daytime (07:00-22:00)	Project Value Daytime (07:00-22:00)	Guideline Value Nighttime (22:00-07:00)	Project Value Nighttime (22:00-07:00)
Residential; institutional; educational <sup>2</sup>	55		45	
Industrial; commercial	70		70	
<b>Notes:</b> <sup>1</sup> Guidelines values are for noise levels measured out of doors. Source: Guidelines for Community Noise, WHO, 1999. <sup>2</sup> For acceptable indoor noise levels for residential, institutional, and educational settings refer to WHO (1999). Source: WORLD BANK/IFC GENERAL EHS GUIDELINES 2007, page 53				

- Do the project's noise emissions lead to an increase of the background noise level at the nearest receptors by more than 3 dB(A)?
- Please describe possible impacts of vibrations on the surroundings?
- Are noise and vibration mitigation measures necessary or planned? If so, what measures?

### E.7. Occupational health and safety

- How are safety and health (in particular with regard to respiratory hazards, noise, physical hazards, machine safety, explosives) guaranteed at the workplace?
- What average and maximum noise exposure is to be expected in the production? What safety measures are taken at workplaces where the noise exposure exceeds 85 dB(A)?
- Please make accident statistics for the past two years available to us.
- How are subcontractors integrated into the health and safety measures on site?

## E.8. Health and safety of the population

- What measures are taken to minimize impacts and possible risks (e.g. due to noise, vibrations, landslides, dust, water abstraction, explosions and/or due to increased traffic) for adjacent communities?
- Please make information on infrastructure links (access roads, railway link, etc.), which may be necessary, available to us.

## F. Additional information

Additional information on the **Common Approaches**, our **environmental, social and human rights due diligence** and the **applicable standards** can be found at:

<https://agaportal.de/en/main-navigation/schnellzugriff-aga-konsortium/verantwortung>

The **World Bank/IFC EHS Guidelines** can be found on the website:

[http://www.ifc.org/wps/wcm/connect/topics\\_ext\\_content/ifc\\_external\\_corporate\\_site/ifc+sustainability/our+approach/risk+management/ehsguidelines](http://www.ifc.org/wps/wcm/connect/topics_ext_content/ifc_external_corporate_site/ifc+sustainability/our+approach/risk+management/ehsguidelines).