Initial Environmental Examination

April 2017

Myanmar: Third GMS Corridor Town Development Project
“Mon State” (Part 4 of 4)

11 APPENDICES

Appendix 1 Bibliography

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Appendix 2 PC Participant List

DATE	NAME	DESIGNATION	ORGANIZATION
30 April 2015	i. Daw Mai Aster ii. U TunTunOo iii. U Win TUn	i. Deputy Director, ii. Staff Officer iii. Deputy Staff Officer	Environmental Conservation Department, Mon State, Ministry of Environmental Conservation and Forestry.
30 April 2015	i. U TheinHtwe	i. Deputy Director	Forest Department, Mawlamyine District, Ministry of Environmental Conservation and Forestry.
20 July 2015	i. U AungKo ii. Daw SoeSoeLwin	i. Deputy Director ii. Staff Officer	Meteorological Department, Mon State
22 July 2015	i. Dr. San TharTun	i. Professor	Marine Science Department, University of Mawlamyine
23 July 2015	Not Known	Representatives of General Administrative Offices, Members of Townships Development Committee	Mon State Hluttaw
	iv. Daw Mai Aster v. U TunTunOo vi. Daw ThidaNyein vii. Daw Tin New Ye	iv. Deputy Director, v. Staff Officer vi. Deputy Staff Officer vii. Deputy Staff Officer	Environmental Conservation Department, Mon State, Ministry of Environmental Conservation and Forestry.
28 Sept 2015	Yee Yee Mon	Project Manager	National Enlightenment Institute Auk Kyin Ward
28 Sept 2015	U ThaungHteik	Ward Administrator	Auk Kyin Ward
28 Sept 2015	U MyoNaing	Ward Administrator	TharYar Aye Ward
29 Sept 2015	MiKon Chan Non	Director	Mon Women's Organization
29 Sept 2015	U Min Win Bo	Regional Manager	Local Resource Center

Photos of the public consultations

MEETING AT THE ENVIRONMENTAL CONSERVATION DEPARTMENT, MON STATE.

GROUP DISCUSSION AT THE MON STATE HLUTAW ON 23 JULY 2015

DISCUSSION AT THE NATIONAL ENLIGHTENMENT INSTITEUTE ON 28 SEPTEMBER 2015

GROUP DISCUSSION AT THE MON STATE HLUTAW ON 23 JULY 2015

Appendix 3 REA Checklists

Urban Development

Screening Questions	Yes	No	Remarks
A. Project Siting Is the project area…			-
▪ Densely populated?		X	The proposed facilities (WS storage, pumping station, WTP and landfill) are located in non-populated areas.
▪ Heavy with development activities?		X	-
▪ Adjacent to or within any environmentally sensitive areas?		X	-
• Cultural heritage site	X		One proposed site for WTP for Kinponchone Dam is located close to the house of Rookamanund (Donor of KinponchoneDamBothKinponchone Dam and Three Tank Reservoirs were built in 1904. Appropriate measures have been included in the project design and in the EMP to avoid any negative impact on this heritage site.
• Protected Area		X	-
• Wetland		X	-
• Mangrove		X	-
• Estuarine		X	-
• Buffer zone of protected area		X	-
• Special area for protecting biodiversity		X	-
• Bay		X	-
B. Potential Environmental Impacts Will the Project cause…			-
▪ impacts on the sustainability of associated sanitation and solid waste disposal systems and their interactions with other urban services.		X	-
▪ deterioration of surrounding environmental conditions due to rapid urban population growth, commercial and industrial activity, and increased waste generation to the point that both manmade and natural systems are overloaded and the capacities to manage these systems are overwhelmed?		X	-
▪ degradation of land and ecosystems (e.g. loss of wetlands and wild lands, coastal zones, watersheds and forests)?		X	-

Screening Questions	Yes	No	Remarks
▪ dislocation or involuntary resettlement of people?		X	Not anticipated (no building destruction) but agricultural land or vacant land acquisition possible (but limited in size) for WWTP and composting plant
▪ disproportionate impacts on the poor, women and children, Indigenous Peoples or other vulnerable group?		X	-
▪ degradation of cultural property, and loss of cultural heritage and tourism revenues?		X	Presence of cultural physical resources (building, pagodas, temples) considered in project design and not affected
▪ occupation of low-lying lands, floodplains and steep hillsides by squatters and low-income groups, and their exposure to increased health hazards and risks due to pollutive industries?		X	-
▪ water resource problems (e.g. depletion/degradation of available water supply, deterioration for surface and ground water quality , and pollution of receiving waters?		X	Objective of project is improvement of water supply.
▪ air pollution due to urban emissions?		X	-
▪ risks and vulnerabilities related to occupational health and safety due to physical, chemical and biological hazards during project construction and operation?		X	OHS Plan to regulate safety procedures for workers and the use of PPE as a typical practice worldwide in similar construction activities
▪ road blocking and temporary flooding due to land excavation during rainy season?		X	Not anticipated. The EMP which hasbeen provided in the report will address obligations for contractors during construction
▪ noise and dust from construction activities?	X		Some noise and possibly dust nuisance anticipated but kept compliant with acceptable standards and mitigable through contractor specifications and construction monitoring. Appropriate measures have been included in the EMP to address the issues.
▪ traffic disturbances due to construction material transport and wastes?		X	Not anticipated from construction material transport because the requirements will be limited and spread over the city
▪ temporary silt runoff due to construction?	X		For new facilities (pumping station, WTP, new water supply networks, solid waste composting plant), the construction sites will be well mitigated with sediment control facilities and procedures, particularly for the activities located next or even in the river (new pumping station)
▪ hazards to public health due to ambient, household and occupational pollution, thermal inversion, and smog formation?		X	Appropriate measures have been included in the EMP to avoid any negative impact on the ambient air quality and health of workers and residents.
▪ water depletion and/or degradation?		X	Project objective is to reduce water leakages along network, (thus increasing supply without increasing pressure on resource) and to reduce pollution of surface and underground water
▪ overpumping of ground water, leading to land subsidence, lowered ground water table, and salinization?		X	Appropriate measures have been included in the EMP to avoid any negative impact on the underground water when it is implemented

Screening Questions	Yes	No	Remarks
▪ contamination of surface and ground waters due to improper waste disposal?		X	Objective of project is to improve waste collection and disposal and to reduce contamination of water bodies
▪ pollution of receiving waters resulting in amenity losses, fisheries and marine resource depletion, and health problems?		X	-
▪ large population influx during project construction and operation that causes increased burden on social infrastructure and services (such as water supply and sanitation systems)?		X	Local workforce to be used for construction. Construction sites will be of small size. No in-migration anticipated
▪ social conflicts if workers from other regions or countries are hired?		X	See above
▪ risks to community health and safety due to the transport, storage, and use and/or disposal of materials such as explosives, fuel and other chemicals during operation and construction?		X	No storage of hazardous materials is anticipated during construction or operation of the facilities, particularly fuel available in several petrol stations. Water disinfection will rely on electrolysis of salt (no chlorine gas)
▪ community safety risks due to both accidental and natural hazards, especially where the structural elements or components of the project are accessible to members of the affected community or where their failure could result in injury to the community throughout project construction, operation and decommissioning?		X	Appropriate measures have been included in the EMP to avoid any negative impact

A Checklist for Preliminary Climate Risk Screening

Screening Questions		Score	Remarks[7]
Location and Design of project	Is siting and/or routing of the project (or its components) likely to be affected by climate conditions including extreme weather related events such as floods, droughts, storms, landslides?	0	Not anticipated.
	Would the project design (e.g. the clearance for bridges) need to consider any hydro-meteorological parameters (e.g., sea-level, peak river flow, reliable water level, peak wind speed etc)?	1	Obviously, the design of components dealing with river water level or drainage will integrate trends and forecasts for rainfall and river level related to climate change
Materials and Maintenance	Would weather, current and likely future climate conditions (e.g. prevailing humidity level, temperature contrast between hot summer days and cold winter days, exposure to wind and humidity hydro-meteorological parameters likely affect the selection of project inputs over the life of project outputs (e.g. construction material)?	0	Anticipated changes in rainfall and temperature are unlikely to affect project inputs or outputs.
	Would weather, current and likely future climate conditions, and related extreme events likely affect the maintenance (scheduling and cost) of project output(s) ?	0	Anticipated changes in rainfall and temperature are unlikely to affect negatively project maintenance and output
Performance of project outputs	Would weather/climate conditions and related extreme events likely affect the performance (e.g. annual power production) of project output(s) (e.g. hydro-power generation facilities) throughout their design life time?	0	No impact

Options for answers and corresponding score are provided below:

Response	Score
Not Likely	0
Likely	1

[7] If possible, provide details on the sensitivity of project components to climate conditions, such as how climate parameters are considered in design standards for infrastructure components, how changes in key climate parameters and sea level might affect the siting/routing of project, the selection of construction material and/or scheduling, performances and/or the maintenance cost/scheduling of project outputs.

Very Likely	2

Responses when added that provide a score of 0 will be considered low risk project. If adding all responses will result to a score of 1-4 and that no score of 2 was given to any single response, the project will be assigned a medium risk category. A total score of 5 or more (which include providing a score of 1 in all responses) or a 2 in any single response, will be categorized as high risk project.

Result of Initial Screening (Low, Medium, High): Low (1)

Other Comments:_____

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Water Supply

Screening Questions	Yes	No	Remarks
A. Project Siting Is the project area…			-
▪ Densely populated?	**X**		Except water storage extension which is in a non-populated area other WS components are in urban area
▪ Heavy with development activities?		**X**	-
▪ Adjacent to or within any environmentally sensitive areas?			-
• Cultural heritage site	**X**		The KinPonChong and the Three Tanks reservoirs in Mawlamyine were built in 1904.Strict construction specifications for the contractor to preserve the original structures of the reservoirs and cultural heritage buildings when improving them.
• Protected Area		**X**	-
• Wetland		**X**	-
• Mangrove		**X**	-
• Estuarine		**X**	-
• Buffer zone of protected area		**X**	-
• Special area for protecting biodiversity		**X**	-
• Bay		**X**	-
B. Potential Environmental Impacts Will the Project cause…			-
▪ pollution of raw water supply from upstream wastewater discharge from communities, industries, agriculture, and soil erosion runoff? 1.		X	-
▪ impairment of historical/cultural monuments/areas and loss/damage to these sites?		X	-

Screening Questions	Yes	No	Remarks
▪ hazard of land subsidence caused by excessive ground water pumping?		X	-
▪ social conflicts arising from displacement of communities ?		X	-
▪ conflicts in abstraction of raw water for water supply with other beneficial water uses for surface and ground waters?		X	-
▪ unsatisfactory raw water supply (e.g. excessive pathogens or mineral constituents)?		X	-
▪ delivery of unsafe water to distribution system?		X	-
▪ inadequate protection of intake works or wells, leading to pollution of water supply?		X	-
▪ over pumping of ground water, leading to salinization and ground subsidence?		X	-
▪ excessive algal growth in storage reservoir?		X	-
▪ increase in production of sewage beyond capabilities of community facilities?		X	-
▪ inadequate disposal of sludge from water treatment plants?		X	Issue of sludge management has been clearly addressed in the design.
▪ inadequate buffer zone around pumping and treatment plants to alleviate noise and other possible nuisances and protect facilities?		X	-
▪ impairments associated with transmission lines and access roads?		X	Except very temporary and localized during extension of network
▪ health hazards arising from inadequate design of facilities for receiving, storing, and handling of chlorine and other hazardous chemicals.		X	Treatment relies on salt hydrolysis, no chlorine
▪ health and safety hazards to workers from handling and management of chlorine used for disinfection, other contaminants, and biological and physical hazards during project construction and operation?		X	Treatment relies on salt hydrolysis, no chlorine
▪ dislocation or involuntary resettlement of people?		X	
▪ disproportionate impacts on the poor, women and children, Indigenous Peoples or other vulnerable groups?		X	-
▪ noise and dust from construction activities?	X		Typical nuisances from construction activities, controllable through detailed specifications for contractors. Appropriate measures have been included in the EMP to address the issues.
▪ increased road traffic due to interference of construction activities?		X	Localized temporary increase of traffic during network extension works, but preventive measures considered

Screening Questions	Yes	No	Remarks
▪ continuing soil erosion/silt runoff from construction operations?		X	-
▪ delivery of unsafe water due to poor O&M treatment processes (especially mud accumulations in filters) and inadequate chlorination due to lack of adequate monitoring of chlorine residuals in distribution systems?		X	O&M shall be addressed in the design preparation
▪ delivery of water to distribution system, which is corrosive due to inadequate attention to feeding of corrective chemicals?		X	-
▪ accidental leakage of chlorine gas?		X	-
▪ excessive abstraction of water affecting downstream water users?		X	-
▪ competing uses of water?		X	The project will increase potable water availability and network and will not compete with other water uses. Water is abundant in the area
▪ increased sewage flow due to increased water supply		X	-
▪ increased volume of sullage (wastewater from cooking and washing) and sludge from wastewater treatment plant		X	-
▪ large population influx during project construction and operation that causes increased burden on social infrastructure and services (such as water supply and sanitation systems)?		X	Local workers to be recruited and construction sites of moderate size
▪ social conflicts if workers from other regions or countries are hired?		X	Same as above
▪ risks to community health and safety due to the transport, storage, and use and/or disposal of materials such as explosives, fuel and other chemicals during operation and construction?		X	No storage of hazardous materials is anticipated during construction or operation
▪ community safety risks due to both accidental and natural hazards, especially where the structural elements or components of the project are accessible to members of the affected community or where their failure could result in injury to the community throughout project construction, operation and decommissioning?		X	

A Checklist for Preliminary Climate Risk Screening

Screening Questions		Score	Remarks[8]
Location and Design of project	Is siting and/or routing of the project (or its components) likely to be affected by climate conditions including extreme weather related events such as floods, droughts, storms, landslides?	0	No effect on project components siting and routing
	Would the project design (e.g. the clearance for bridges) need to consider any hydro-meteorological parameters (e.g., sea-level, peak river flow, reliable water level, peak wind speed etc)?	0	The design will obviously consider potential climate change issues but this aspect is not critical for the present project
Materials and Maintenance	Would weather, current and likely future climate conditions (e.g. prevailing humidity level, temperature contrast between hot summer days and cold winter days, exposure to wind and humidity hydro-meteorological parameters likely affect the selection of project inputs over the life of project outputs (e.g. construction material)?	0	Unlikely to affect the project inputs and outputs
	Would weather, current and likely future climate conditions, and related extreme events likely affect the maintenance (scheduling and cost) of project output(s) ?	0	Unlikely to affect the project maintenance
Performance of project outputs	Would weather/climate conditions, and related extreme events likely affect the performance (e.g. annual power production) of project output(s) (e.g. hydro-power generation facilities) throughout their design life time?	1	Changing climateconditions and thelikelihood of futuredams along theThanlwin (andperhaps Attran)Rivers may increase salinity intrusion intotube wells and affectwater intake points inMawlamyine,especially duringdry seasons.

Options for answers and corresponding score are provided below:

Response	Score
Not Likely	0
Likely	1
Very Likely	2

Responses when added that provide a score of 0 will be considered low risk project. If adding all responses will result to a score of 1-4 and that no score of 2 was given to any single response, the project will be assigned a medium risk category. A total score of 5 or more (which include providing a score of 1 in all responses) or a 2 in any single response, will be categorized as high risk project.

Result of Initial Screening (Low, Medium, High):_ Low (1)_____

[8] If possible, provide details on the sensitivity of project components to climate conditions, such as how climate parameters are considered in design standards for infrastructure components, how changes in key climate parameters and sea level might affect the siting/routing of project, the selection of construction material and/or scheduling, performances and/or the maintenance cost/scheduling of project outputs.

: Solid waste

Screening Questions	Yes	No	Remarks
A. Project Siting Is the project area…			
▪ Densely populated?		X	-
▪ Heavy with development activities?		X	-
▪ Adjacent to or within any environmentally sensitive areas?		X	-
• Cultural heritage site		X	Appropriate measures have been included in the EMP to avoid any negative impact on the heritage sites.
• Protected Area		X	Appropriate measures have been included in the EMP to avoid any negative impacts.
• Wetland		X	Not anticipated
• Mangrove		X	Not anticipated
• Estuarine		X	Not anticipated
• Buffer zone of protected area		X	Not anticipated
• Special area for protecting biodiversity		X	Not anticipated
• Bay		X	Not anticipated
B. Potential Environmental Impacts Will the Project cause…			
▪ impacts associated with transport of wastes to the disposal site or treatment facility 2.		X	Not anticipated
▪ impairment of historical/cultural monuments/areas and loss/damage to these sites?		X	No historical/cultural impact anticipated. Appropriate measures have been included in the EMP
▪ degradation of aesthetic and property value loss?		X	Not anticipated
▪ nuisance to neighboring areas due to foul odor and influx of insects, rodents, etc.?		X	Unlikely under regular operation and maintenance of composting plants.
▪ dislocation or involuntary resettlement of people?		X	Not anticipated
▪ disproportionate impacts on the poor, women and children, Indigenous Peoples or other vulnerable groups?		X	Not anticipated
▪ risks and vulnerabilities related occupational health and safety due to physical, chemical, biological, and radiological hazards during project construction and operation?		X	Not anticipated
▪ public health hazards from odor, smoke from fire, and diseases transmitted by flies, insects, birds and rats?		X	Not anticipated
▪ deterioration of water quality as a result of contamination of receiving waters by leachate from land disposal system?		X	Not anticipated

Screening Questions	Yes	No	Remarks
▪ contamination of ground and/or surface water by leachate from land disposal system?		X	Appropriate measures have been included in the EMP to avoid any negative impact due to the leachate
▪ land use conflicts?		X	Not anticipated
▪ pollution of surface and ground water from leach ate coming form sanitary landfill sites or methane gas produced from decomposition of solid wastes in the absence of air, which could enter the aquifer or escape through soil fissures at places far from the landfill site?		X	Appropriate measures have been included in the EMP to avoid any negative impact due to the leachate and gas
▪ inadequate buffer zone around landfill site to alleviate nuisances?		X	No residence in immediate vicinity of landfill
▪ road blocking and/or increased traffic during construction of facilities?		X	Not anticipated as area is remote from dense urban areas
▪ noise and dust from construction activities?		X	Possible construction noise, but not in populated areas.
▪ temporary silt runoff due to construction?	X		Possible during excavation works of extension of landfill site. Obligations for contractors of peripheral drainage of construction zones and sediments capture facilities (sediment traps, ponds) . Appropriate measures have been included in the EMP to address the issues.
▪ hazards to public health due to inadequate management of landfill site caused by inadequate institutional and financial capabilities for the management of the landfill operation?		X	No hazards as no residential zones next to the landfill
▪ emission of potentially toxic volatile organics from land disposal site?		X	Composting plants will have appropriate air filtration facilities
▪ surface and ground water pollution from leachate and methane gas migration?		X	Design will prevent this risk
▪ loss of deep-rooted vegetation (e.g. trees) from landfill gas?		X	Probably marginal (non-forested area)
▪ explosion of toxic response from accumulated landfill gas in buildings?		X	Not anticipated
▪ contamination of air quality from incineration?		X	The incineration plant will have appropriate filtration and will be well designed to prevent incomplete combustion
▪ public health hazards from odor, smoke from fire, and diseases transmitted by flies, rodents, insects and birds, etc.?		X	No hazards as no residential zones next to the landfill sites
▪ health and safety hazards to workers from toxic gases and hazardous materials in the site?		X	Typical OHS Plan to be developed and implemented with capacity building and regular health checks
▪ large population influx during project construction and operation that causes increased burden on social infrastructure and services (such as water supply and sanitation systems)?		X	Local workforce for construction

Screening Questions	Yes	No	Remarks
▪ social conflicts if workers from other regions or countries are hired?		X	Local workforce for construction
▪ risks to community health and safety due to the transport, storage, and use and/or disposal of materials such as explosives, fuel and other chemicals during construction and operation?		X	No significant storage of Hazardous Materials required for this type of construction During operation, site not anticipated to accommodate hazardous waste
▪ community safety risks due to both accidental and natural hazards, especially where the structural elements or components (e.g., landfill or incinerator) of the project are accessible to members of the affected community or where their failure could result in injury to the community throughout project construction, operation and decommissioning?		X	Not anticipated

A Checklist for Preliminary Climate Risk Screening

Screening Questions		Score	Remarks[9]
Location and Design of project	Is siting and/or routing of the project (or its components) likely to be affected by climate conditions including extreme weather related events such as floods, droughts, storms, landslides?	0	Appropriate drainage and protection against rainfall is part of the design
	Would the project design (e.g. the clearance for bridges) need to consider any hydro-meteorological parameters (e.g., sea-level, peak river flow, reliable water level, peak wind speed etc)?	0	Site is not in a floodable zone or next to river course
Materials and Maintenance	Would weather, current and likely future climate conditions (e.g. prevailing humidity level, temperature contrast between hot summer days and cold winter days, exposure to wind and humidity hydro-meteorological parameters likely affect the selection of project inputs over the life of project outputs (e.g. construction material)?	0	Design takes consideration of projected temperature due to CC and define treatment process accordingly
	Would weather, current and likely future climate conditions, and related extreme events likely affect the maintenance (scheduling and cost) of project output(s) ?	0	No
Performance of project outputs	Would weather/climate conditions, and related extreme events likely affect the performance (e.g. annual power production) of project output(s) (e.g. hydro-power generation facilities) throughout their design life time?	0	No in a significant manner for a landfill and composting facility.

Options for answers and corresponding score are provided below:

Response	Score
Not Likely	0
Likely	1
Very Likely	2

Responses when added that provide a score of 0 will be considered low risk project. If adding all responses will result to a score of 1-4 and that no score of 2 was given to any single response, the project will be assigned a medium risk category. A total score of 5 or more (which include providing a score of 1 in all responses) or a 2 in any single response, will be categorized as high risk project.

Result of Initial Screening (Low, Medium, High):_Low (0)_____

Other Comments: Methane gas collection significantly reduces GHG emissions from waste

_____

_____

[9] If possible, provide details on the sensitivity of project components to climate conditions, such as how climate parameters are considered in design standards for infrastructure components, how changes in key climate parameters and sea level might affect the siting/routing of project, the selection of construction material and/or scheduling, performances and/or the maintenance cost/scheduling of project outputs.

Appendix 4 ADB Monitoring Template

TEMPLATE/FORMAT

Safeguard Monitoring Report

Summary:

(to be included as part of the *main* Report)

- **Summary of EMP/RP Implementation**
- **Description of monitoring activities** carried out (e.g. field visits, survey questionnaire, public consultation meetings, focus group discussions, etc)
- **Key issues**, any **corrective actions** already taken, and any **grievances**
- Recommendations

Safeguards Monitoring Report

(to be included in the annex/appendix of the *main* Report)

1. Introduction and Project Overview

Project Number and Title:	
Safeguards Category	Environment Indigenous Peoples Involuntary Resettlement
Reporting period:	
Last report date:	
Key sub-project activities since last report:	This section can include, among others, the following: • Activities of Proponent • Progress of Work (% physical completion) • Changes of Surrounding Environment • Status of Permits / Consents
Report prepared by:	

2. Environmental Performance Monitoring

a. Summary of Compliance with EMAP Requirements (Environmental Performance)

EMAP Requirements	Compliance Status (Yes, No, Partial)	Comment or Reasons for Non-Compliance	Issues for Further Action
Use environmental impact as main heading and EMAP as listing (see example below)	Use EMoP list as basis for rating/evaluating compliance (see example below)		
Rise of employment opportunities: • Job openings of the project should give priority to local communities. • Recruitment of local laborers should be stipulated in the contract for construction	• Field inspections and interviews with communities - DONE • Note each complaint case in the field – 3 COMPLAINTS RECEIVED • Set up grievance centre and report as part of monitoring action plan – NOT DONE		

b. Issues for Further Action

Issue	Required Action	Responsibility and Timing	Resolution
Old Issues from Previous Reports			
List of EMoP measures or activities not completed (last column of previous table)			

c. Other activities

- Other issues not covered by EMAP/EMoP
- Environmental monitoring as required by GOI (e.g., air quality, water sampling)

3. Involuntary Resettlement Performance Monitoring

a. Summary of Compliance with RP Requirements

RP Requirements	Compliance status Yes/No/Partial	Comment or Reasons for Compliance, Partial Compliance/Non-Compliance	Issues for Further Action[10]
Establishment of personnel in PMU/PIU			
Public consultation and socialization process		Provide information on: • Public consultation, participation activities carried out • Inclusive dates of these activities To be elaborated on in Item 5	

[10] To be elaborated further in table 3.b (Issues for Further Action)

Land area to be acquired is identified and finalised	
Land acquisition completed	
Establishment of Resettlement Site(s)	Please state: • Number of AHs to be relocated as per agreed RP • Number of AHs already relocated • Number of houses built • Status of installation of community facilities to be provided as per agreed RP
Compensation payments for affected assets is completed	Please state: • Total Number of Eligible AHs and APs (as per agreed RP) • Number of AHs and APs compensated as of this monitoring period • Total Budget allocation as per agreed RP • Total budget disbursed to AHs as of this monitoring period
Transport assistance for relocating affected households	As above
Additional assistance to vulnerable affected household	Please state: • Total Number of vulnerable AHs and APs (as per agreed RP) • Agreed forms of assistance as per RP • Number of AHs and APs assisted as of this monitoring period

Income Restoration Program	Please state progress per income restoration feature/activity and actual period of implementation
Temporary impacts have been addressed (affected properties restored to at least pre-project conditions)	Please state: • Total Number of AHs affected by temporary impacts as per agreed RP • Actual Number of AHs and total area affected by temporary impacts (if this differs from the projected number, such as in cases of unforeseen project impacts) • Status of restoring affected property
Capacity building activities	

b. Issues for Further Action

Issue	Required Action	Responsibility and Timing	Resolution
Old Issues from Previous Reports			
List of RP activities not completed (last column of previous table)			
New Issues from This Report			

4. Occupational, Health and Safety (OHS) Performance Monitoring

a. OHS for worker

Issue	Required Action	Responsibility and Timing	Resolution
Old Issues from Previous Reports			
New Issues from This Report			

b. Public Safety

Issue	Required Action	Responsibility and Timing	Resolution
Old Issues from Previous Reports			
New Issues from This Report			

5. Information Disclosure and Socialization including Capability Building

- Field Visits (sites visited, dates, persons met)
- Public Consultations and meetings (Date; time; location; agenda; number of participants disaggregated by sex and ethnic group, not including project staff; Issues raised by participants and how these were addressed by the project team)
- Training (Nature of training, number of participants disaggregated by gender and ethnicity, date, location, etc.)
- Press/Media Releases
- Material development/production (e.g., brochure, leaflet, posters)

6. Grievance Redress Mechanism

Summary:

- Number of new grievances, if any, since last monitoring period: _____
- Number of grievances resolved: _____
- Number of outstanding grievances: _____

Type of Grievance	Details (Date, person, address, contact details, etc.)	Required Action, Responsibility and Timing	Resolution
Old Issues from Previous Reports			
New Issues from This Report			

7. Conclusion

- Important results from the implementation of EMAP/EMoP and RP monitoring
- Recommendations to improve EMAP/EMoP and RP management, implementation, and monitoring

8. Attachments

- Consents / permits
- Monitoring data (water quality, air quality, etc.)

- Photographs
- Maps

Appendix 5 Myanmar EQEG (2nd draft)

The Ministry of Natural Resources and Environmental Conservation (MONREC), in exercise of the power conferred by sub-section (b) of section 42 of the 2012 Environmental Conservation Law (ECL), hereby issues the following Guidelines.

CHAPTER I
General Provisions

Objective

1. These national Environmental Quality (Emission) Guidelines (hereafter referred to as Guidelines) provide the basis for regulation and control of noise and vibration, air emissions, and effluent discharges—as provided for in sub-sections (e–g) of section 10 of the Environmental Conservation Law —from various sources in order to prevent pollution for purposes of protection of human and ecosystem health.

Definitions

2. The expressions contained in these Guidelines shall have the same meanings as are assigned to them under the ECL and Environmental Impact Assessment (EIA) Procedure. In addition thereto, the following expressions shall have the meanings given hereunder:

   (a) **Adverse impact** means any adverse environmental, social, socioeconomic, health, occupational safety or human health effect suffered or borne by any entity, natural person, or natural resource, including, but not limited to, the environment, flora and fauna, where such effect is attributable in any degree or extent to, or arises in any manner from, any action or omission on the part of the project proponent, or from the design, exploration, testing, development, construction, implementation, maintenance, operation, or decommissioning of a project or any activities related thereto.

   (b) **Concentration** means the quantity of a harmful substance in air or water with the dimension of mass per volume (or sometimes mass per mass) calculated according to a common measurement unit (e.g. milligram per liter).

   (c) **EIA Report** means a report comprising a systematic assessment of a proposed activity or project that is prepared to aid in determining whether such activity or project has the potential to significantly affect the environment, humans or other living things, and in deciding whether such activity or project should be allowed or not. The form, content and structure of the report shall be in accordance with the Ministry's requirements and guidelines, and include an Environmental Management Plan (EMP).

   (d) **Emission** means the direct or indirect release of any substance, radiation, vibration, heat or noise from individual or diffuse sources into the air, water, land or any subterranean area. Emissions include emissions of solid waste, effluent, gas, noise, odor, light, radiation, vibration or heat.

(e) **Environmental compliance certificate (ECC)** is a legal document through which the Ministry approves an Initial Environmental Examination (IEE) report or an EIA report, or an EMP.

(f) **EMP** means a document contemplated with form, content and structure in accordance with the Ministry's requirements and guidelines, which describes the measures to be taken for avoiding, preventing, mitigating, monitoring and compensating for all adverse impacts resulting from the design, exploration, testing, construction, implementation, operation, maintenance, decommissioning, closure and post-closure or other aspects of the proposed project or activity.

(g) **Good practice** means that practice which is recognized by a consensus of relevant stakeholders (including without limitation government, industry, labor, financiers, and academia) as having been adopted by leading, reputable companies of international standard, which is capable of being adhered to within the Republic of the Union of Myanmar, and which, when carried out by or in respect of an activity or project, can be expected to further reduce adverse impacts arising from an activity or project related thereto.

(h) **Guideline Values** maximum level of concentration of pollutants allowed in the emitted waste.

(i) **IEE Report** means a report comprising a systematic assessment of a proposed project or activity that is prepared to aid in determining whether or not potential impacts of a project or activity is significant, whether or not it is necessary to carry out EIA, and in deciding whether such project or activity should be allowed or not. The form, content and structure of the report shall be in accordance with the Ministry's requirements and guidelines, and include an EMP.

(j) **Ministry** means the Union Ministry assigned by the Union Government to perform the matters of environment.

(k) **Parameter** means indicators used to measure the level or concentration (population density in case of biological pollutants) against guidelines or standards. The result of measurement could be shown in either numeric or textual form.

(l) **Point of compliance** means the location on land or in water at which a given substance concentration must meet the applicable Guideline value.

(m) **Pollution** means any direct or indirect alteration, effect of the physical, thermal, chemical or biological properties of any part of the environment including land, water and atmosphere by discharging, emitting, dispersion, migration or depositing hazardous substances or wastes so as to effect beneficial use of the environment, or to affect public health, safety or welfare, or animals or plans or to contravene any condition, limitation or prohibition contained in the prior permission issued under the ECL.

(n) **Pollution prevention** refers to the use of processes, practices, materials, products, substances or energy that avoids or minimizes the creation of pollutants and waste, and reduces the overall risk to the environment or human health.

(o) **Project** means any commercial, economic, agricultural, social, academic, scientific, political or other project, activity, program, business, service or undertaking, whether regarded individually or in the aggregate, the performance of which (requires any approval or is licensed, restricted, or otherwise regulated to any extent by any part of the Union government and which) may have an adverse impact.

Scope of Application

3. These Guidelines have been excerpted from the International Finance Corporation (IFC) Environmental Health and Safety (EHS) Guidelines, which provide technical guidance on good international industry pollution prevention practice for application in developing countries. The Guidelines are generally considered to be achievable in new facilities by existing technology at reasonable costs. Application of these Guidelines to existing facilities may involve the establishment of site-specific targets, with an appropriate timetable for achieving them.

4. Unless otherwise indicated, these Guidelines refer to emission sources, and are intended to prevent or minimize adverse impacts to ambient environmental quality by ensuring that pollutant concentrations do not reach or exceed ambient guidelines and standards. The Guidelines apply to projects or activities that generate noise or air emissions during any stage of the project life cycle, and / or that have either direct or indirect discharge of process waste wastewater, wastewater from utility operations or storm water to the environment

5. General and industry-specific Guidelines as specified in Annex 1 – Emissions Guidelines shall apply to any project subject to EIA Procedure, as adopted by the Ministry, in order to protect the environment and to control pollution in the Republic of the Union of Myanmar. These Guidelines specifically apply to all project types listed in the EIA Procedure under 'Categorization of Economic Activities for Assessment Purposes' which sets out projects that are subject to EIA, IEE, or EMP.

6. Provisions of the general and applicable industry-specific Guidelines shall be reflected in project EMP and ECC and together constitute a project's commitment to take necessary measures to avoid, minimize and control adverse impacts to human health, safety, and the environment through reducing the total amount of emissions generation; adopting process modifications, including waste minimization to lower the load of pollutants requiring treatment; and as necessary, application of treatment techniques to further reduce the load of contaminants prior to release or discharge.

7. Original IFC document cited in the Guidelines shall be consulted if the case EMP developers need further advices on ways to achieve the limit vales set in the annex.

8. These Guidelines supersede any existing national guideline or standard provision relating to regulation and control of noise, air, and water emissions from activities and projects subject to the EIA Procedure.

CHAPTER II
Implementation Procedures

9. As specified in Article 56 of the EIA Procedure, all projects are obliged to use, comply with and refer to applicable national guidelines or standards or international standards adopted by the Ministry. These Guidelines will henceforth be applied by the Ministry in satisfying this requirement until otherwise modified or succeeded by other guidelines or standards.

10. As specified in Article 77 of the EIA Procedure, following project approval, a project shall commence implementation strictly in accordance with the project EMP and any additional requirements set out in the project ECC, which according to Article 82 of the EIA Procedure, will encompass conditions relating to emissions. In this regard, the Ministry will require that projects shall adhere to general and applicable industry-specific guidelines as specified in Annex 1.

11. While these Guidelines are generally applicable to all projects subject to the EIA Procedure, it is the prerogative of the Ministry to decide how Guidelines should be applied to existing projects, as distinguished from new projects. If the Ministry considers that less stringent levels or measures that those provided for in these Guidelines are appropriate, in view of specific project circumstances, a full and detailed justification for any proposed alternatives is needed on an interim basis.

12. As specified in Article 95 of the EIA Procedure, projects shall engage in continuous, proactive and comprehensive self monitoring of the project and comply with applicable guidelines and standards. For purposes of these Guidelines, projects shall be responsible for the monitoring of their compliance with general and applicable industry-specific Guidelines. Projects shall be responsible for ensuring compliance at the point of compliance specified in the applicable Guidelines.

13. To demonstrate compliance with these monitoring requirements as specified in articles 97 and 98 of the EIA Procedure, projects shall submit monitoring reports to the Ministry at least every six months or more frequently as provided in the EMP and ECC. Monitoring reports shall *inter alia* document compliance, difficulties encountered in complying with EMP and ECC conditions, number and type of non-compliance with EMP and ECC, and monitoring data of prescribed environmental parameters as detailed in the EMP and ECC.

14. In instances of self-reported noncompliance or, as provided for in articles 100 and 101 of the EIA Procedure, identification of noncompliance with the EMP and ECC conditions during monitoring and inspection by the Ministry, the project is required to undertake remedial measures to bring the project into compliance within a specified time period.

15. In instances of continued noncompliance or insufficient response by the project to control emissions as specified in these Guidelines, the Ministry, as provided for in Article 112 of the EIA Procedure, shall have the right to impose penalties on a project for such breach of environmental obligations.

Annex 1
Emission Guidelines

1.0 General Environmental, Health, and Safety

1.1 Air Emissions

Projects with significant sources of air emissions, and potential for significant impacts to ambient air quality, should prevent or minimize impacts by ensuring that: (i) emissions do not result in pollutant concentrations that reach or exceed ambient quality guidelines and standards, or in their absence the current World Health Organization (WHO) Air Quality Guidelines; and emissions do not contribute a significant portion to the attainment of relevant ambient air quality guidelines or standards (i.e. not exceeding 25 percent of the applicable air quality standards to allow additional, future sustainable development in the same airshed.

1.2 Wastewater

This guideline applies to projects that have either direct or indirect discharge of process wastewater, wastewater from utility operations or storm water to the environment. It is also applicable to industrial discharges to sanitary sewers that discharge to the environment without any treatment. Process wastewater may include contaminated wastewater from utility operations, storm water, and sanitary sewage. 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.

Indicative Guideline for Treated Sanitary Sewage Discharges[11]

Parameter	Unit	Maximum Concentration
Biological oxygen demand	mg/L	30
Chemical oxygen demand	mg/L	125
Oil and grease	mg/L	10
pH	S.U.	6-9
Total coliform bacteria	MPN[a]/100 ml	400[b]
Total nitrogen	mg/L	10
Total phosphorus	mg/L	2
Total suspended solids	mg/L	50

[a] MPN = Most Probable Number

[b] Not applicable to centralized, municipal wastewater treatment systems

1.3 Noise Levels

Noise prevention and mitigation measures should be applied where predicted or measured noise impacts from a project facility or operations exceed the applicable noise level guideline at the most sensitive point of reception. Noise impacts should not exceed the levels presented below, or result in a maximum increase in background levels of 3 dBA at the nearest receptor location off-site.

Receptor	One Hour LAeq (dBA)	
	Daytime 07:00 – 22:00 (10:00 – 22:00 for Public holidays)	Nighttime 22:00 – 07:00 (22:00 – 10:00 for Public holidays)
Residential, institutional, educational	55	45
Industrial, commercial	70	70

2.0 Sector-specific Environmental, Health and Safety

2.1 Forestry

2.1.1 Board and Particle-based Products[12]

Effluent Levels

[11] Environmental, health, and safety general guidelines. 2007. International Finance Corporation, World Bank Group.

[12] Environmental, health, and safety guidelines for board and particle-based products. 2007. International Finance Corporation, World Bank Group.

Parameter	Unit	Guideline Value
5-day Biochemical oxygen demand	mg/L	50
Chemical oxygen demand	mg/L	150
Formaldehyde	mg/L	10
pH	S.U.	6-9
Temperature increase	°C	<3[a]
Total suspended solids	mg/L	50

[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

Air Emissions

Parameter	Unit	Guideline Value
Condensable volatile organic compounds	mg/Nm^3 (as carbon)	130
Formaldehyde	mg/Nm^3	20 (Wood dryers) 5 (Other sources)
Particulate matter	mg/Nm^3	20 (Medium density fiberboard) 20 (Wood dryers) 50 (Other sources)

2.1.2 Wood Treatment and Preservation[a][13]

Effluent Levels

Parameter	Unit	Guideline Value
5-day Biochemical oxygen demand	mg/L	50
Arsenic	mg/L	0.1
Chemical oxygen demand	mg/L	150
Chromium (total)	mg/L	0.5
Chromium (hexavalent)	mg/L	0.1
Copper	mg/L	0.5
Fluorides	mg/L	5
Oil and grease	mg/L	10
Pesticides (each)	mg/L	0.05
pH	S.U.	6-9
Phenols (mono- and dihydric)	mg/L	0.5
Polychlorinated dibenzo-p-dioxins / dibenzo furans	mg/L	0.1
Polycyclic aromatic hydrocarbons (each)	mg/L	0.05

[13] Environmental, health, and safety guidelines for sawmilling and wood-based products. 2007. International Finance Corporation, World Bank Group.

Temperature increase	°C	<3[b]
Total suspended solids	mg/L	50
Toxicity	To be determined on a case specific basis	

[a] Process wastewater containing chemical preservatives should be contained as part of closed loop application system

[b] At the edge of a scientifically established mixing zone which takes into account ambient water quality, receiving water use, potential receptors and assimilative capacity

2.1.3 Sawmill Facilities[10]

Air Emissions

Parameter	Unit	Guideline Value
Volatile organic compounds	mg/Nm^3	20
Wood dust	mg/Nm^3	50

2.1.4 Forest Harvesting Operations[14]

The forestry sector does not typically give rise to significant effluent discharges or point source air emissions. Where potentially contaminated water runoff or dust exists, site operations should comply with specified general ambient surface water and air quality standards.

2.1.5 Pulp and Paper Mills[15]

Effluent Levels

Parameter	Unit	Guideline Value
Bleached kraft pulp, integrated		
5-day Biochemical oxygen demand	kg/ADt[a]	1
Adsorbable organic halogen	kg/ADt	0.25
Chemical oxygen demand	kg/ADt	20
Flow	m^3/ADt	50
pH	S.U.	6-9
Total nitrogen	kg/ADt	0.2
Total phosphorus	kg/ADt	0.03

[14] Environmental, health, and safety guidelines for forest harvesting operations. 2007. International Finance Corporation, World Bank Group.

[15] Environmental, health, and safety guidelines for pulp and paper mills. 2007. International Finance Corporation, World Bank Group.

Total suspended solids	kg/ADt	1.5
Unbleached kraft pulp, integrated		
5-day Biochemical oxygen demand	kg/ADt	0.7
Chemical oxygen demand	kg/ADt	10
Flow	m^3/ADt	25
pH	S.U.	6-9
Total nitrogen	kg/ADt	0.2
Total phosphorus	kg/ADt	0.02
Total suspended solids	kg/ADt	1.0
Sulfite pulp, integrated and non-integrated		
5-day Biochemical oxygen demand	kg/ADt	2.0
Adsorbable organic halogen	kg/ADt	0.005
Chemical oxygen demand	kg/ADt	30
Flow	m^3/ADt	55
pH	S.U.	6-9
Total nitrogen	kg/ADt	0.5
Total phosphorus	kg/ADt	0.05
Total suspended solids	kg/ADt	2.0
Chemi-thermo-mechanical		
5-day Biochemical oxygen demand	kg/ADt	1.0
Chemical oxygen demand	kg/ADt	5
Flow	m^3/ADt	20
pH	S.U.	6-9
Total nitrogen	kg/ADt	0.2
Total phosphorus	kg/ADt	0.01
Total suspended solids	kg/ADt	1.0
Mechanical pulping, integrated		
5-day Biochemical oxygen demand	kg/ADt	0.5
Adsorbable organic halogen	kg/ADt	0.01
Chemical oxygen demand	kg/ADt	5.0
Flow	m^3/ADt	20
pH	S.U.	6-9
Total nitrogen	kg/ADt	0.1
Total phosphorus	kg/ADt	0.01
Total suspended solids	kg/ADt	0.5
Recycled fiber, without de-inking, integrated		
5-day Biochemical oxygen demand	kg/ADt	0.15
Adsorbable organic halogen	kg/ADt	0.005
Chemical oxygen demand	kg/ADt	1.5
Flow	m^3/ADt	10
pH	S.U.	6-9
Total nitrogen	kg/ADt	0.05
Total phosphorus	kg/ADt	0.005
Total suspended solids	kg/ADt	0.15
Recycled fiber, with de-inking, integrated		

5-day Biochemical oxygen demand	kg/ADt	0.2
Adsorbable organic halogen	kg/ADt	0.005
Chemical oxygen demand	kg/ADt	4.0
Flow	m^3/ADt	15
pH	S.U.	6-9
Total nitrogen	kg/ADt	0.1
Total phosphorus	kg/ADt	0.01
Total suspended solids	kg/ADt	0.3
Recycled fibre tissue mills		
5-day Biochemical oxygen demand	kg/ADt	0.5
Adsorbable organic halogen	kg/ADt	0.005
Chemical oxygen demand	kg/ADt	4.0
Flow	m^3/ADt	25
pH	S.U.	6-9
Total nitrogen	kg/ADt	0.25
Total phosphorus	kg/ADt	0.015
Total suspended solids	kg/ADt	0.4
Uncoated fine paper mills		
5-day Biochemical oxygen demand	kg/ADt	0.25
Adsorbable organic halogen	kg/ADt	0.005
Chemical oxygen demand	kg/ADt	2.0
Flow	m^3/ADt	15
pH	S.U.	6-9
Total nitrogen	kg/ADt	0.2
Total phosphorus	kg/ADt	0.01
Total suspended solids	kg/ADt	0.4
Coated fine paper mills		
5-day Biochemical oxygen demand	kg/ADt	0.25
Adsorbable organic halogen	kg/ADt	0.005
Chemical oxygen demand	kg/ADt	1.5
Flow	m^3/ADt	15
pH	S.U.	6-9
Total nitrogen	kg/ADt	0.2
Total phosphorus	kg/ADt	0.01
Total suspended solids	kg/ADt	0.4
Tissue mills		
5-day Biochemical oxygen demand	kg/ADt	0.4
Adsorbable organic halogen	kg/ADt	0.01
Chemical oxygen demand	kg/ADt	1.5
Flow	m^3/ADt	25
pH	S.U.	6-9
Total nitrogen	kg/ADt	0.25
Total phosphorus	kg/ADt	0.015
Total suspended solids	kg/ADt	0.4
Fiber preparation, non-wood		

5-day Biochemical oxygen demand	kg/ADt	2.0
Chemical oxygen demand	kg/ADt	30
Flow	m^3/ADt	50
pH	S.U.	6-9
Total nitrogen	kg/ADt	0.5
Total phosphorus	kg/ADt	0.05
Total suspended solids	kg/ADt	2.0

[a] kg/ADt = kilograms of pollutant per 1,000 of air dry pulp

Air Emissions

Parameter	Type of Mill	Unit	Guideline Value
Nitrogen oxide (as Nitrogen dioxide)	Kraft, bleached	kg/ADt	1.5 for hardwood pulp
			2.0 for softwood pulp
	Kraft, unbleached, integrated	kg/ADt	1.5 for hardwood pulp
			2.0 for softwood pulp
	Sulfite, integrated and non-integrated	kg/ADt	2.0
Sulfur dioxide (as Sulfur)	Kraft, unbleached, integrated	kg/ADt	0.4
	Sulfite, integrated and non-integrated	kg/ADt	1.0
	Kraft, bleached	kg/ADt	0.4
Total reduced sulfur compounds (as Sulfur)	Kraft, bleached	kg/ADt	0.2
	Kraft, unbleached, integrated		0.2
Total suspended particulates	Kraft, bleached	kg/ADt	0.5
	Kraft, unbleached, integrated		0.5
	Sulfite, integrated and non-integrated		0.15

2.2 Agribusiness / Food Production

2.2.1 Mammalian Livestock Production[16]

Effluent Levels

Parameter	Unit	Guideline Value
5-day Biochemical oxygen demand	mg/L	50
Active ingredients / Antibiotics	To be determined on a case specific basis	
Chemical oxygen demand	mg/L	250

[16] Environmental, health, and safety guidelines for mammalian livestock production. 2007. International Finance Corporation, World Bank Group.

Oil and grease	mg/L	10
pH	S.U.	6-9
Temperature increase	°C	<3[a]
Total coliform bacteria	MPN[b]/100 ml	400
Total nitrogen	mg/L	10
Total phosphorus	mg/L	2
Total suspended solids	mg/L	50

[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

[b] MPN = Most Probable Number

2.2.2 Poultry Production[17]

Effluent Levels

Parameter	Unit	Guideline Value
5-day Biochemical oxygen demand	mg/L	50
Active ingredients / Antibiotics	To be determined on a case specific basis	
Chemical oxygen demand	mg/L	250
Oil and grease	mg/L	10
pH	S.U.	6-9
Temperature increase	°C	<3[a]
Total coliform bacteria	MPN[b]/100 ml	400
Total nitrogen	mg/L	10
Total phosphorus	mg/L	2
Total suspended solids	mg/L	50

[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

[b] MPN = Most Probable Number

2.2.3 Plantation and Annual Crop Production[18,19]

[17] Environmental, health, and safety guidelines for poultry production. 2007. International Finance Corporation, World Bank Group.

[18] Environmental, health, and safety guidelines for plantation crop production. 2007. International Finance Corporation, World Bank Group.

[19] Environmental, health, and safety guidelines for annual crop production. 2007. International Finance Corporation, World Bank Group.

Water, Soil and Produce Quality

Parameter	Media	Guideline Value
Nutrient balance	On-site soil	Nutrient surpluses should remain stable; nitrogen surplus should be preferably below 25 kg/ha/year
Pesticides	On-site soil and produce	Below applicable tolerance levels
Pesticides, nitrates, coliform or other potential agricultural contaminants	Irrigation water	Concentrations should not exceed internationally recognized guidelines (e.g. WHO Water Guidelines applicable to irrigation water quality)
Pesticides, nitrates, coliform or other potential agricultural contaminants	On-site water supplies	Concentrations should not exceed internationally recognized guidelines (e.g. WHO irrigation or drinking water guidelines for compounds potentially present in on-site groundwater wells or surface waters)

2.2.4 Aquaculture[20]

Effluent Levels

Parameter	Unit	Guideline Value
5-day Biochemical oxygen demand	mg/L	50
Active ingredients / Antibiotics	To be determined on a case specific basis	
Chemical oxygen demand	mg/L	250
Oil and grease	mg/L	10
pH	S.U.	6-9
Temperature increase	°C	<3[a]
Total coliform bacteria	MPN[b]/100 ml	400
Total nitrogen	mg/L	10
Total phosphorus	mg/L	2
Total suspended solids	mg/L	50

[20] Environmental, health, and safety guidelines for aquaculture. 2007. International Finance Corporation, World Bank Group.

[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

[b] MPN = Most Probable Number

2.2.5 Sugar Manufacturing[21]

Effluent Levels

Parameter	Unit	Guideline Value
5-day Biochemical oxygen demand	mg/L	50
Active ingredients / Antibiotics	To be determined on a case specific basis	
Biocides	mg/L	0.05
Chemical oxygen demand	mg/L	250
Oil and grease	mg/L	10
pH	S.U.	6-9
Temperature increase	°C	<3[a]
Total coliform bacteria	MPN[b]/100 ml	400
Total nitrogen	mg/L	10
Total phosphorus	mg/L	2
Total suspended solids	mg/L	50

[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

[b] MPN = Most Probable Number

2.2.6 Vegetable Oil Processing[22]

Effluent Levels

Parameter	Unit	Guideline Value
5-day Biochemical oxygen demand	mg/L	50
Active ingredients / Antibiotics	To be determined on a case specific basis	
Chemical oxygen demand	mg/L	250
Oil and grease	mg/L	10
pH	S.U.	6-9
Temperature increase	°C	<3[a]
Total coliform bacteria	MPN[b]/100 ml	400

[21] Environmental, health, and safety guidelines for sugar manufacturing. 2007. International Finance Corporation, World Bank Group.

[22] Environmental, health, and safety guidelines for vegetable oil processing. 2007. International Finance Corporation, World Bank Group.

Total nitrogen	mg/L	10
Total phosphorus	mg/L	2
Total suspended solids	mg/L	50

[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

[b] MPN = Most Probable Number

Air Emissions

Parameter	Unit	Guideline Value
Dust	mg/Nm^3	10 (dry dust) 40 (wet dust)
Hexane / Volatile organic compounds	mg/Nm^3	100

2.2.7 Dairy Processing[23]

Effluent Levels

Parameter	Unit	Guideline Value
5-day Biochemical oxygen demand	mg/L	50
Active ingredients / Antibiotics	To be determined on a case specific basis	
Chemical oxygen demand	mg/L	250
Oil and grease	mg/L	10
pH	S.U.	6-9
Temperature increase	°C	<3[a]
Total coliform bacteria	MPN[b]/100 ml	400
Total nitrogen	mg/L	10
Total phosphorus	mg/L	2
Total suspended solids	mg/L	50

[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

[b] MPN = Most Probable Number

[23] Environmental, health, and safety guidelines for diary processing. 2007. International Finance Corporation, World Bank Group.

2.2.8 Fish Processing[24]

Effluent Levels

Parameter	Unit	Guideline Value
5-day Biochemical oxygen demand	mg/L	50
Active ingredients / Antibiotics	To be determined on a case specific basis	
Chemical oxygen demand	mg/L	250
Oil and grease	mg/L	10
pH	S.U.	6-9
Temperature increase	°C	<3[a]
Total coliform bacteria	MPN[b]/100 ml	400
Total nitrogen	mg/L	10
Total phosphorus	mg/L	2
Total suspended solids	mg/L	50

[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

[b] MPN = Most Probable Number

Air Emissions

Parameter	Unit	Guideline Value
Ammonia	mg/m^3	1
Amines and amides	mg/m^3	5
Hydrogen sulfide, Sulfides, and Mercaptans	mg/m^3	2

2.2.9 Meat Processing[25]

Effluent Levels

Parameter	Unit	Guideline Value
5-day Biochemical oxygen demand	mg/L	50
Active ingredients / Antibiotics	To be determined on a case specific basis	
Chemical oxygen demand	mg/L	250
Oil and grease	mg/L	10

[24] Environmental, health, and safety guidelines for fish processing. 2007. International Finance Corporation, World Bank Group.

[25] Environmental, health, and safety guidelines for meat processing. 2007. International Finance Corporation, World Bank Group.

pH	S.U.	6-9
Temperature increase	°C	<3[a]
Total coliform bacteria	MPN[b]/100 ml	400
Total nitrogen	mg/L	10
Total phosphorus	mg/L	2
Total suspended solids	mg/L	50

[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

[b] MPN = Most Probable Number

2.2.10 Poultry Processing[26]

Effluent Levels

Parameter	Unit	Guideline Value
5-day Biochemical oxygen demand	mg/L	50
Active ingredients / Antibiotics	To be determined on a case specific basis	
Chemical oxygen demand	mg/L	250
Oil and grease	mg/L	10
pH	S.U.	6-9
Temperature increase	°C	<3[a]
Total coliform bacteria	MPN[b]/100 ml	400
Total nitrogen	mg/L	10
Total phosphorus	mg/L	2
Total suspended solids	mg/L	50

[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

[b] MPN = Most Probable Number

2.2.11 Breweries[27]

Effluent Levels

Parameter	Unit	Guideline Value

[26] Environmental, health, and safety guidelines for poultry processing. 2007. International Finance Corporation, World Bank Group.

[27] Environmental, health, and safety guidelines for breweries. 2007. International Finance Corporation, World Bank Group.

5-day Biochemical oxygen demand	mg/L	25
Active ingredients / Antibiotics	To be determined on a case specific basis	
Chemical oxygen demand	mg/L	125
Oil and grease	mg/L	10
pH	S.U.	6-9
Temperature increase	°C	<3[a]
Total coliform bacteria	MPN[b]/100 ml	400
Total nitrogen	mg/L	10
Total phosphorus	mg/L	2
Total suspended solids	mg/L	50

[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

[b] MPN = Most Probable Number

2.2.12 Food and Beverage Processing[28]

Effluent Levels

Parameter	Unit	Guideline Value
5-day Biochemical oxygen demand	mg/L	50
Active ingredients / Antibiotics	To be determined on a case specific basis	
Chemical oxygen demand	mg/L	250
Oil and grease	mg/L	10
pH	S.U.	6-9
Temperature increase	°C	<3[a]
Total coliform bacteria	MPN[b]/100 ml	400
Total nitrogen	mg/L	10
Total phosphorus	mg/L	2
Total suspended solids	mg/L	50

[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

[28] Environmental, health, and safety guidelines for food and beverage processing. 2007. International Finance Corporation, World Bank Group.

[b] MPN = Most Probable Number

Air Emissions

Emissions from food processing activities are principally associated with particulate matter and odor. Particulate matter and odor emissions from point sources such as ventilation exhaust systems and smoking units should be released through good engineering practice-designed stacks. Smoking unit emissions of particulate matter should typically not exceed 50 mg/Nm^3.

2.3 Chemicals

2.3.1 Pharmaceuticals and Biotechnology Manufacturing[29]

Effluent Levels

Parameter		Unit	Guideline Value
1,2-Dichloroethane		mg/L	0.1
5-day Biochemical oxygen demand		mg/L	30
Acetates (each)[a]		mg/L	0.5
Acetonitrile		mg/L	10.2
Active ingredient (each)		mg/L	0.05
Adsorbable organic halogen		mg/L	1
Amines (each)[b]		mg/L	102
Ammonia		mg/L	30
Arsenic		mg/L	0.1
Benzene		mg/L	0.02
Bioassays	Toxicity to fish Toxicity to Daphnia Toxicity to algae Toxicity to bacteria	T.U.[c]	2 8 16 8
Cadmium		mg/L	0.1
Chemical oxygen demand		mg/L	150
Chlorobenzene		mg/L	0.06
Chloroform		mg/L	0.013
Chromium (hexavalent)		mg/L	0.1
Dimethyl sulfoxide		mg/L	37.5
Isobutyraldehyde		mg/L	0.5

[29] Environmental, health, and safety guidelines for pharmaceuticals and biotechnology manufacturing. 2007. International Finance Corporation, World Bank Group.

Isopropanol	mg/L	1.6
Isopropyl ether	mg/L	2.6
Ketones (each)[d]	mg/L	0.2
Mercury	mg/L	0.01
Methanol / Ethanol (each)	mg/L	4.1
Methyl cellosolve	mg/L	40.6
Methylene chloride	mg/L	0.3
n-Heptane	mg/L	0.02
n-Hexane	mg/L	0.02
o-Dichlorobenzene	mg/L	0.06
Oil and grease	mg/L	10
pH	S.U.	6-9
Phenol	mg/L	0.5
Tetrahydrofuran	mg/L	2.6
Toluene	mg/L	0.02
Total nitrogen	mg/L	10
Total phosphorus	mg/L	2
Total suspended solids	mg/L	10
Xylenes	mg/L	0.01

[a] n-Amyl acetate, n-Butyl acetate, Ethyl acetate, Isopropyl acetate, Methyl formate

[b] Including Diethylamine and Triethylamine

[c] Toxicity unit (T.U.) = 100 / no effects dilution rate (%) of wastewater

[d] Including Acetone, Methyl isobutyl Ketone

Air Emissions

Parameter	Unit	Guideline Value
Active ingredient (each)	mg/Nm^3	0.15
Ammonia	mg/Sm^3	30
Arsenic	mg/Sm^3	0.05
Benzene, Vinyl chloride, Dichloroethane (each)	mg/Nm^3	1
Bromides (as Hydrogen bromide)	mg/Sm^3	3
Chlorides (as Hydrogen chloride)	mg/Sm^3	30
Ethylene oxide	mg/Sm^3	0.5
Hazardous air pollutants	kg/year	900-1,800[a]
Mutagenic substance	mg/Sm^3	0.05
Particulate matter	mg/Nm^3	20
Total Class A[b]	mg/Nm^3	20[c]
Total Class B[d]	mg/Nm^3	80[e]
Total organic carbon	mg/Nm^3	50
Volatile organic compounds	mg/Nm^3	20-150[f] 50[g]

[a] Process-based annual mass limit

[b] Class A compounds are those that may cause significant harm to human health and the environment

[c] Applicable when total Class A compounds exceed 100 g/year

[d] Class B compounds are organic compounds of less environmental impact than Class A compounds

[e] Applicable when total Class B compounds, expressed as Toluene, exceed the lower of 5 tones/year or 2 kg/hour

[f] Facilities with solvent consumption >50 tones/year

[g] Waste gases from oxidation plants

2.3.2 Coal Processing[30]

Effluent Levels

Parameter	Unit	Guideline Value
5-day Biochemical oxygen demand	mg/L	30
Cadmium	mg/L	0.1
Chemical oxygen demand	mg/L	150 (40 cooling water)
Chromium (hexavalent)	mg/L	0.1
Chromium (total)	mg/L	0.5
Cobalt	mg/L	0.5
Copper	mg/L	0.5
Cyanides	mg/L	0.5
Heavy metals (total)	mg/L	3
Iron	mg/L	3
Lead	mg/L	0.5
Manganese	mg/L	2
Mercury	mg/L	0.02
Nickel	mg/L	1
Oil and grease	mg/L	10
pH	S.U.	6-9
Phenol	mg/L	0.5
Sulphide	mg/L	1
Ammoniacal nitrogen (as Nitrogen)	mg/L	5
Total nitrogen	mg/L	10

[30] Environmental, health, and safety guidelines for coal processing. 2007. International Finance Corporation, World Bank Group.

Total phosphorus	mg/L	2
Total suspended solids	mg/L	35
Vanadium	mg/L	1
Zinc	mg/L	1

Air Emissions

Parameter	Unit	Guideline Value
Coal Preparation Plant		
Conveying, storage and preparation gas opacity	%	10
Pneumatic coal cleaning equipment opacity	%	10
Pneumatic coal cleaning equipment particulate	mg/Nm^3	40
Thermal dryer gas opacity	%	20
Thermal dryer particulate	mg/Nm^3	70
Overall		
Ammonia	mg/Nm^3	30
Carbonyl sulfide + Carbon disulfide	mg/Nm^3	3
Heavy metals (total)	mg/Nm^3	1.5
Hydrogen sulfide	mg/Nm^3	10
Mercury	mg/Nm^3	1.0
Nitrogen oxide	mg/Nm^3	200-400[a]
Particulate matter[b]	mg/Nm^3	30-50[a]
Sulfur dioxide	mg/Nm^3	150-200
Volatile organic compounds	mg/Nm^3	150

[a] Lower value for plants of >100 MW equivalent, higher value for plants of <100 MWth equivalent

[b] PM_{10} = particulate matter 10 micrometers or less in diameter

2.3.3 Natural Gas Processing[31]

Effluent Levels

Parameter	Unit	Guideline Value
5-day Biochemical oxygen demand	mg/L	50
Cadmium	mg/L	0.1
Chemical oxygen demand	mg/L	150
Chromium (total)	mg/L	0.5

[31] Environmental, health, and safety guidelines for natural gas processing. 2007. International Finance Corporation, World Bank Group.

Copper	mg/L	0.5
Cyanide (free)	mg/L	0.1
Cyanide (total)	mg/L	1
Heavy metals (total)	mg/L	5
Iron	mg/L	3
Lead	mg/L	0.1
Nickel	mg/L	1.5
Oil and grease	mg/L	10
pH	S.U.	6-9
Phenol	mg/L	0.5
Total Nitrogen	mg/L	40
Total Phosphorus	mg/L	3
Total residual chlorine	mg/L	0.2
Total suspended solids	mg/L	50
Zinc	mg/L	1

Air Emissions

Parameter	Unit	Guideline Value
Carbon monoxide	mg/Nm^3	100
Nitrogen oxide	mg/Nm^3	150[a] 50[b]
Particulate matter[c]	mg/Nm^3	10
Sulfur dioxide	mg/Nm^3	75
Volatile organic compounds	mg/Nm^3	150

[a]Applicable to facilities with a total heat input capacity of up to 300 MW

[b] Applicable to facilities with a total heat input capacity greater than 300 MW

[c] PM_{10} = particulate matter 10 micrometers or less in diameter

2.3.4 Oleochemicals Manufacturing[32]

Effluent Levels

Parameter	Unit	Guideline Value
5-day Biochemical oxygen demand	mg/L	40
Chemical oxygen demand	mg/L	150
Oil and grease	mg/L	10
pH	S.U.	6-9

[32] Environmental, health, and safety guidelines for oleochemicals manufacturing. 2007. International Finance Corporation, World Bank Group.

Total nitrogen	mg/L	30
Total phosphorus	mg/L	5
Total suspended solids	mg/L	50

Air Emissions

Parameter	Unit	Guideline Value
Volatile organic compounds	mg/Nm^3	100

2.3.5 Nitrogenous Fertilizer Production[33]

Effluent Levels

Parameter	Unit	Guideline Value
pH	S.U.	6-9
Temperature increase	°C	<3[a]
Ammonia and Nitric Acid Plants		
Ammonia	mg/L	5
Total nitrogen	mg/L	15
Total suspended solids	mg/L	30
Urea Plants		
Ammonia (prill / granulation)	mg/L	5
Urea (prill / granulation)	mg urea/L	1
Ammonium Nitrate / Calcium Ammonium Nitrate Plants		
Ammonium nitrate	mg/L	100
Ammonia	mg/L	5
Total nitrogen	mg/L	15
Total suspended solids	mg/L	30

[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

Air Emissions

Parameter	Unit	Guideline Value
Ammonia Plants		
Ammonia	mg/Nm^3	50
Total nitrogen	mg/Nm^3	300

[33] Environmental, health, and safety guidelines for nitrogenous fertilizer manufacturing. 2007. International Finance Corporation, World Bank Group.

Total suspended solids	mg/Nm^3	50
Nitric Acid Plants		
Ammonia	mg/Nm^3	10
Nitrogen oxide	mg/Nm^3	200
Nitrous oxide	mg/Nm^3	800
Particulate matter[a]	mg/Nm^3	50
Urea / Urea Ammonium Nitrate Plants		
Ammonia (prill / granulation)	mg/Nm^3	50
Particulate matter[a]	mg/Nm^3	50
Urea (prill / granulation)	mg/Nm^3	50
Ammonium Nitrate / Calcium Ammonium Nitrate Plants		
Ammonia	mg/Nm^3	50
Particulate matter[a]	mg/Nm^3	50

[a] PM_{10} = particulate matter 10 micrometers or less in diameter

2.3.6 Phosphate Fertilizer Manufacturing[34]

Effluent Levels

Parameter	Unit	Guideline Value
Ammonia	mg/L	10
Cadmium	mg/L	0.1
Fluorides	mg/L	20
	kg/ton NPK	0.03
	Kg/ton Phosphorus oxide	2
Heavy metals (total)	mg/L	10
pH	S.U.	6-9
Total nitrogen	mg/L	15
Total phosphorus	mg/L	5
Total suspended solids	mg/L	50

[34] Environmental, health, and safety guidelines for phosphate fertilizer manufacturing. 2007. International Finance Corporation, World Bank Group.

Air Emissions

Parameter	Unit	Guideline Value
Phosphoric Acid Plants		
Fluorides (gaseous as Hydrogen fluoride)	mg/Nm^3	5
Particulate matter[a]	mg/Nm^3	50
Phosphate Fertilizer Plants		
Ammonia	mg/Nm^3	50
Fluorides (gaseous as Hydrogen fluoride)	mg/Nm^3	5
Hydrogen chloride	mg/Nm^3	30
Nitrogen oxide	mg/Nm^3	500 (nitro-phosphate unit) 70 (mix acid unit)
Particulate matter[a]	mg/Nm^3	50

[a] PM_{10} = particulate matter 10 micrometers or less in diameter

2.3.7 Pesticides Formulation, Manufacturing and Packaging[35]

Effluent Levels

Parameter		Unit	Guideline Value
5-day Biochemical oxygen demand		mg/L	30
Active ingredients (each)		mg/L	0.05
Adsorbable organic halogens		mg/L	1
Ammonia		mg/L	10
Arsenic		mg/L	0.1
Bioassays	Toxicity to fish Toxicity to Daphnia Toxicity to algae Toxicity to bacteria	T.U.[a]	2 8 16 8
Chemical oxygen demand		mg/L	150
Chlorinated organics		mg/L	0.05
Chromium (hexavalent)		mg/L	0.1
Chromium (total)		mg/L	0.5
Copper		mg/L	0.5
Mercury		mg/L	0.01
Nitrorganics		mg/L	0.05

[35] Environmental, health, and safety guidelines for pesticides formulation, manufacturing and packaging. 2007. International Finance Corporation, World Bank Group.

Oil and grease	mg/L	10
pH	S.U.	6-9
Phenol	mg/L	0.5
Total phosphorus	mg/L	2
Total suspended solids	mg/L	10-20[b]
Zinc	mg/L	2

[a] T.U. = 100 / no effects dilution rate (%) of wastewater

[b] Lower value for pesticide manufacturing, higher value for pesticide formulation

Air Emissions

Parameter	Unit	Guideline Value
Ammonia, gaseous inorganic chlorine compounds	mg/Nm^3	30
Bromines, Cyanides, Fluorines, Hydrogen sulfide	mg/Nm^3	3
Chloride	mg/Nm^3	5
Chlorine	mg/Nm^3	3
Particulate matter[b]	mg/Nm^3	20, 5[a]
Total organic carbon	mg/Nm^3	50
Volatile organic compounds	mg/Nm^3	20

[a]Applicable where very toxic compounds are present

[b] PM_{10} = particulate matter 10 micrometers or less in diameter

2.3.8 Petroleum-based Polymers Manufacturing[36]

Effluent Levels

Parameter	Unit	Guideline Value
5-day Biochemical oxygen demand	mg/L	25
Adsorbable organic halogens	mg/L	0.3

[36] Environmental, health, and safety guidelines for petroleum-based polymers manufacturing. 2007. International Finance Corporation, World Bank Group.

Benzene	mg/L	0.05
Cadmium	mg/L	0.1
Chemical oxygen demand	mg/L	150
Chromium (hexavalent)	mg/L	0.1
Chromium (total)	mg/L	0.5
Copper	mg/L	0.5
Lead	mg/L	0.5
Mercury	mg/L	0.01
Nickel	mg/L	0.5
Oil and grease	mg/L	10
pH	S.U.	6-9
Phenol	mg/L	0.5
Sulphide	mg/L	1
Temperature increase	°C	<3[a]
Total nitrogen	mg/L	10
Total phosphorus	mg/L	2
Total suspended solids	mg/L	30
Toxicity	To be determined on a case specific basis	
Vinyl chloride	mg/L	0.05
Zinc	mg/L	2

[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

Air Emissions

Parameter	Unit	Guideline Value
Acrylonitrile	mg/Nm^3	5 (15 from dryers)
Ammonia	mg/Nm^3	15
Dioxin / Furans	ng TEQ/Nm^3	0.1
Formaldehyde	mg/m^3	0.15
Heavy metals (total)	mg/Nm^3	1.5
Hydrogen chloride	mg/Nm^3	10
Mercury	mg/Nm^3	0.2
Nitrogen oxides	mg/Nm^3	300
Particulate matter[a]	mg/Nm^3	20
Sulfur oxides	mg/Nm^3	500
Vinyl chloride (VCM)	g/t s-PVC g/t e-PVC	80 500
Volatile organic compounds	mg/Nm^3	20

[a] PM_{10} = particulate matter 10 micrometers or less in diameter

2.3.9 Petroleum Refining[a,37]

Effluent Levels

Parameter	Unit	Guideline Value
5-day Biochemical oxygen demand	mg/L	30
Benzene	mg/L	0.05
Benzo(a)pyrene	mg/L	0.05
Chemical oxygen demand	mg/L	150
Chromium (hexavalent)	mg/L	0.05
Chromium (total)	mg/L	0.5
Copper	mg/L	0.5
Cyanide (free)	mg/L	0.1
Cyanide (total)	mg/L	1
Iron	mg/L	3
Lead	mg/L	0.1
Mercury	mg/L	0.02
Nickel	mg/L	0.5
Oil and grease	mg/L	10
pH	S.U.	6-9
Phenol	mg/L	0.2
Sulphides	mg/L	1
Temperature increase	°C	<3[b]
Total nitrogen	mg/L	10[c]
Total phosphorus	mg/L	2
Total suspended solids	mg/L	30
Vanadium	mg/L	1

[a]Assumes an integrated petroleum refining facility

[b] At the edge of a scientifically established mixing zone which takes into account ambient water quality, receiving water use, potential receptors and assimilative capacity

[c] The effluent concentration of total nitrogen may be up to 40 mg/L in processes that include hydrogenation

Air Emissions

Parameter	Unit	Guideline Value
Hydrogen sulfide	mg/Nm^3	10

[37] Environmental, health, and safety guidelines for petroleum refining. 2007. International Finance Corporation, World Bank Group.

Nickel	mg/Nm^3	1
Nitrogen oxide	mg/Nm^3	450
Particulate matter[a]	mg/Nm^3	50
Sulfur oxide	mg/Nm^3	150 (for sulfur recovery units) 500 (for other units)
Vanadium	mg/Nm^3	5

[a] PM_{10} = particulate matter 10 micrometers or less in diameter

2.3.10 Large Volume Petroleum-based Organic Chemicals Manufacturing[38]

Effluent Levels

Parameter	Unit	Guideline Value
1,2-Dichloroethane	mg/L	1
5-day Biochemical oxygen demand	mg/L	25
Adsorbable organic halogens	mg/L	1
Benzene	mg/L	0.05
Cadmium	mg/L	0.1
Chemical oxygen demand	mg/L	150
Chromium (hexavalent)	mg/L	0.1
Chromium (total)	mg/L	0.5
Copper	mg/L	0.5
Lead	mg/L	0.5
Mercury	mg/L	0.01
Nickel	mg/L	0.5
Oil and grease	mg/L	10
pH	S.U.	6-9
Phenol	mg/L	0.5
Sulphide	mg/L	1
Temperature increase	°C	<3[a]
Total nitrogen	mg/L	10
Total phosphorus	mg/L	2
Total suspended solids	mg/L	30
Vinyl chloride (VCM)	mg/L	0.05
Zinc	mg/L	2

[38] Environmental, health, and safety guidelines for large volume petroleum-based organic chemicals manufacturing. 2007. International Finance Corporation, World Bank Group.

[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

Air Emissions

Parameter	Unit	Guideline Value
1,2-Dichloroethane	mg/Nm^3	5
Acrylonitrile	mg/Nm^3	0.5 (incineration) 2 (scrubbing)
Ammonia	mg/Nm^3	15
Benzene	mg/Nm^3	5
Caprolactam	mg/m^3	0.1
Dioxin / Furans	ng TEQ/Nm^3	0.1
Ethylene	mg/Nm^3	150
Ethylene oxide	mg/m^3	2
Formaldehyde	mg/m^3	0.15
Heavy metals (total)	mg/Nm^3	1.5
Hydrogen chloride	mg/Nm^3	10
Hydrogen cyanide	mg/m^3	2
Hydrogen sulfide	mg/m^3	5
Mercury and compounds	mg/Nm^3	0.2
Nitrobenzene	mg/m^3	5
Nitrogen oxides	mg/Nm^3	300
Organic sulfide and Mercaptans	mg/m^3	2
Particulate matter[a]	mg/Nm^3	20
Phenols, Cresols and Xylols (as Phenol)	mg/Nm^3	10
Sulfur oxides	mg/m^3	100
Vinyl chloride (VCM)	mg/Nm^3	5
Volatile organic compounds	mg/Nm^3	20

[a] PM_{10} = particulate matter 10 micrometers or less in diameter

2.3.11 Large Volume Inorganic Compounds Manufacturing and Coal Tar Distillation[39]

Effluent Levels

Parameter	Unit	Guideline Value
pH	S.U.	6-9

[39] Environmental, health, and safety guidelines for large volume inorganic compounds manufacturing and coal tar distillation. 2007. International Finance Corporation, World Bank Group.

Temperature increase	°C	<3[a]
Ammonia Plants		
Ammonia	mg/L	10[b]
Total suspended solids	mg/L	30
Nitric Acid Plants		
Ammonia	mg/L	10
Nitrates	mg/L	25
Total suspended solids	mg/L	30
Sulfuric Acid Plants		
Phosphorus	mg/L	5
Fluoride	mg/L	20
Total suspended solids	mg/L	30
Phosphoric Acid Plants		
Phosphorus	mg/L	5
Fluoride	mg/L	20
Total suspended solids	mg/L	30
Hydrofluric Acid Plants		
Fluorides	kg/ton HF	1
Suspended solids	kg/ton HF	1
	mg/L	30
Chlor-alkali / Hydrochloric Acid Plants		
Adsorbable organic halogens	mg/L	0.5
Chemical oxygen demand	mg/L	150
Chlorine	mg/L	0.2
Mercury	mg/L	0.05
	g/ton chlorine	0.1
Sulphides	mg/L	1
Total suspended solids	mg/L	20
Toxicity to fish eggs	T_F	2
Soda Ash Plants		
Ammonia (as Nitrogen)	mg/L	10
Phosphorus	kg/ton	0.2
Suspended solids	kg/ton	270
Total suspended solids	mg/L	30
Carbon Black Plants		
Chemical oxygen demand	mg/L	100
Total suspended solids	mg/L	20
Coal Tar Distillation Plants		
5-day Biochemical oxygen demand	mg/L	35 (monthly average) 90 (daily maximum)
Anthracene, Naphthalene and Phenanthrene (each)	µg/L	20 (monthly average) 60 (daily maximum)
Total suspended solids	mg/L	50 (monthly average) 160 (daily maximum)

[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

[b] Load based guideline: 0.1 kg/ton of product

Air Emissions

Parameter	Unit	Guideline Value
Ammonia Plants		
Ammonia	mg/Nm^3	50
Nitrogen oxide	mg/Nm^3	300
Particulate matter	mg/Nm^3	50
Nitric Acid Plants		
Ammonia	mg/Nm^3	10
Nitrogen oxide	mg/Nm^3	300
Nitrous oxide	mg/Nm^3	800
Sulfuric Acid Plants		
Hydrogen sulfide	mg/Nm^3	5
Nitrogen oxide	mg/Nm^3	200
Sulfur dioxide	mg/Nm^3	450 (2 kg/ton acid)
Sulfur trioxide	mg/Nm^3	60 (0.075 kg/ton acid)
Phosphoric / Hydrofluoric Acids Plants		
Fluorides (gaseous as Hydrogen fluoride)	mg/Nm^3	5
Particulate matter[a] / Calcium fluoride	mg/Nm^3	50 (0.10 kg/ton phosphate rock)
Chlor-alkali / Hydrochloric Acid Plants		
Chlorine gas	mg/Nm^3	1 (partial liquefaction) 3 (complete liquefaction)
Hydrogen chloride	ppmv	20
Mercury	mg/Nm^3	0.2 (annual average emission of 1 g/ton chlorine)
Soda Ash Plants		
Ammonia	mg/Nm^3	50
Hydrogen sulfide	mg/Nm^3	5
Nitrogen oxide	mg/Nm^3	200
Particulate matter[a]	mg/Nm^3	50
Carbon Black Plants		
Carbon monoxide	mg/Nm^3	500
Nitrogen oxide	mg/Nm^3	600
Particulate matter[a]	mg/Nm^3	30
Sulfur dioxide	mg/Nm^3	850
Volatile organic compounds	mg/Nm^3	50
Coal Tar Distillation Plants		
Particulate matter[a]	mg/Nm^3	50
Tar fume	mg/Nm^3	10
Volatile organic compounds	mg/Nm^3	50

[a] PM_{10} = particulate matter 10 micrometers or less in diameter

2.4 Oil and Gas

2.4.1 Offshore Oil and Gas Development[40]

The following table presents effluent performance standards for offshore oil and gas development. These guidelines are primarily applicable to discharges in offshore locations (e.g. greater than 12 nautical miles from shore). Additional guidance on applicable standards is provided in the General EHS Guidelines.

Effluent Levels

Parameter	Guideline
Drilling fluids and cuttings (Non-aqueous drilling fluid)	Non-aqueous drilling fluid – re-inject or ship-to-shore, no discharge to sea Drilled cuttings – re-inject or ship-to-shore, no discharge except: – Oil concentration lower than 1% by weight on dry cuttings – Mercury – maximum 1 mg/kg dry weight in stock barite – Cadmium – maximum 3 mg/kg dry weight in stock barite – Discharge via a caisson at least 15 m below sea surface
Drilling fluids and cuttings (Water-based drilling fluid)	Water-based drilling fluid – re-inject or ship-to-shore, no discharge to sea except: – In compliance with 96-hr LC-50 of SPP-3% volume toxicity test first for drilling fluids or alternatively testing based on standard toxicity assessment species[a] (preferably site-specific species) Water-based drilling fluids and cuttings – re-inject or ship-to-shore, no discharge to sea except: – Mercury – 1 mg/kg dry weight in stock barite – Cadmium – 3 mg/kg dry weight in stock barite – Maximum chloride concentration must be less that four time's ambient concentration of fresh or brackish receiving water – Discharge via a caisson at least 15 m below sea surface
Produced water	Re-inject – Discharge to sea maximum one day oil and grease discharge should not exceed 42 mg/L; 30 day average should not exceed 29 mg/L
Completion and well work-over fluids	Ship-to-shore or re-inject – No discharge to sea except: – Maximum one day oil and grease discharge should not exceed 42 mg/L; 30 day average should not exceed 29 mg/L – Neutralize to attain a pH of 5 or more
Produced sand	Ship-to-shore or re-inject – No discharge to sea except when oil concentration lower than 1% by weight on dry sand

[40] Environmental, health, and safety guidelines for offshore oil and gas development. 2007. International Finance Corporation, World Bank Group.

Hydrotest water	– Send to shore for treatment and disposal – Discharge offshore following environmental risk analysis, careful selection of chemicals – Reduce use of chemicals
Cooling water	The effluent should result in a temperature increase of no more than 3°C at edge of the zone where initial mixing and dilution take place; where the zone is not defined, use 100 m from point of discharge
Desalination brine	Mix with other discharge waste streams if feasible[b]
Sewage	Compliance with MARPOL 73/78[b]
Food waste	Compliance with MARPOL 73/78[b]
Storage displacement water	Compliance with MARPOL 73/78[b]
Bilgewater	Compliance with MARPOL 73/78[b]
Deck drainage (non-hazardous and hazardous drains)	Compliance with MARPOL 73/78[b]

[a] 96-hr LC-50: Concentration in parts per million or percent of the suspended particulate phase from sample that is lethal to 50 percent of the test organism exposed to that concentration for a continuous period of 96 hours.

[b] In nearshore waters, carefully select discharge location based on environmental sensitivities and assimilative capacity of receiving waters.

2.4.2 Onshore Oil and Gas Development[41]

Effluent Levels

Parameter	Guideline
Drilling fluids and cuttings	Treatment and disposal in accordance with applicable standards provided in the General EHS Guidelines
Produced sand	Treatment and disposal in accordance with applicable standards provided in the General EHS Guidelines
Produced water	Treatment and disposal in accordance with applicable standards provided in the General EHS Guidelines For discharge to surface waters or to land: – Total hydrocarbon content 10 mg/L – pH 6-9 – Biochemical oxygen demand 25 mg/L – Chemical oxygen demand 125 mg/L – Total suspended solids 35 mg/L – Phenols 0.5 mg/L – Sulfides 1 mg/L

[41] Environmental, health, and safety guidelines for onshore oil and gas development. 2007. International Finance Corporation, World Bank Group.

	– Heavy metals (total)[a] 5 mg/L – Chlorides 600 mg/L (average), 1,200 mg/L maximum
Hydrotest water	Treatment and disposal in accordance with applicable standards provided in the General EHS Guidelines For discharge to surface waters or to land, apply standards specified for Produced Water
Completion and well work-over fluids	Treatment and disposal in accordance with applicable standards provided in the General EHS Guidelines For discharge to surface waters or to land: – Total hydrocarbon content 10 mg/L – pH 6-9
Storm water drainage	Storm water runoff should be treated through an oil / water separation system able to achieve oil and grease concentration of 10 mg/L
Cooling water	The effluent should result in a temperature increase of no more than 3°C at edge of the zone where initial mixing and dilution take place; where the zone is not defined, use 100 m from point of discharge
Sewage	Treatment as per General EHS Guidelines, including discharge requirements
Air emissions	Treatment as per General EHS Guidelines Emission concentrations as per General EHS Guidelines, and: – Hydrogen sulfide 5 mg/Nm^3

[a] Heavy metals include: Arsenic, Cadmium, Chromium, Copper, Lead, Mercury, Nickel, Silver, Vanadium and Zinc

2.4.3 Liquefied Natural Gas Facilities[42]

Effluent Levels

Parameter	Guideline
Hydrotest water	Treatment and disposal as per General EHS Guidelines For discharge to surface waters or to land: – Total hydrocarbon content 10 mg/L – pH 6-9 – 5-day Biochemical oxygen demand 25 mg/L – Chemical oxygen demand 125 mg/L – Total suspended solids 35 mg/L – Phenols 0.5 mg/L – Sulfides 1 mg/L – Heavy metals (total) 5 mg/L – Chlorides 600 mg/L (average), 1,200 mg/L maximum

[42] Environmental, health, and safety guidelines for liquefied natural gas facilities. 2007. International Finance Corporation, World Bank Group.

Hazardous storm water drainage	Storm water runoff should be treated through an oil / water separation system able to achieve oil and grease concentration of 10 mg/L
Cooling water	The effluent should result in a temperature increase of no more than 3°C at edge of the zone where initial mixing and dilution take place; where the zone is not defined, use 100 m from point of discharge Free chlorine (total residual oxidant in estuarine / marine water) concentration in cooling / cold water discharges (to be sampled at point of discharge) should be maintained at 0.2 parts per million
Sewage	Treatment as per General EHS Guidelines, including discharge requirements Provision of facilities to receive liquefied natural gas tanker effluents may be required (see Ports and Harbors guidelines)

Air Emissions

Air emissions from liquefied natural gas facilities should be controlled through the application of techniques describes in the General EHS Guidelines.

2.5 Infrastructure

2.5.1 Tourism and Hospitality Development[43]

Tourism and hospitality effluents levels and air emissions should be managed in a manner consistent with the conventional treatment and discharge of sanitary wastewater as specified in General EHS Guidelines.

2.5.2 Railways[44]

Emissions from new engines used in the propulsion of locomotives and rail cars should be consistent with internationally recognized emissions limit values for nitrogen oxides, particulate

[43] Environmental, health, and safety guidelines for tourism and hospitality development. 2007. International Finance Corporation, World Bank Group.

[44] Environmental, health, and safety guidelines for railways. 2007. International Finance Corporation, World Bank Group.

matter, carbon monoxide, and total hydrocarbons. Effluents from maintenance facilities should be treated to a level consistent with the requirements of a local sewer network operation or, if discharged to surface waters, according to the guideline values provided for Metals, Plastics and Rubber Products Manufacturing, which provide treated effluent guideline values applicable to metals machining, cleaning, and plating and finishing processes, including painting. Site-specific discharge levels may be established for sewer and process effluents from maintenance facilities and terminals based on the availability of publicly-operated sewage collection and treatment systems or, if discharged directly to surface waters, on the receiving water use classification as described in General EHS Guidelines.

2.5.3 Ports, Harbors and Terminals[45]

Given the nature of port operations where there are few stationary effluents (e.g. wastewater and storm water) it is difficult to continuously monitoring most emissions and effluents. Discrete point source sanitary wastewater and storm water should meet requirements described in General EHS Guidelines.

2.5.4 Airports[46]

Airport operations should establish site-specific discharge levels based on the requirements of publicly-operated sewage collection and treatment systems or, if discharged directly to surface waters, according to requirements described in General EHS Guidelines.

2.5.5 Airlines[47]

Aircraft air emissions and noise levels should meet the certification requirements established by the International Civil Aviation Organizations for their year of manufacture. Emission and effluents from heavy maintenance facilities should be treated to a level consistent with the requirements of a local sewer network operation or, if discharged to surface waters, according to the guideline

[45] Environmental, health, and safety guidelines for ports, harbors and terminals. 2007. International Finance Corporation, World Bank Group.

[46] Environmental, health, and safety guidelines for airports. 2007. International Finance Corporation, World Bank Group.

[47] Environmental, health, and safety guidelines for airlines. 2007. International Finance Corporation, World Bank Group.

values provided for Metals, Plastics and Rubber Products Manufacturing, which provide treated effluent guideline values applicable to metals machining, cleaning, and plating and finishing processes, including painting. Site-specific discharge levels may be established for sewer and process effluents from maintenance facilities and terminals based on the availability of publicly operated sewage collection and treatment systems or, if discharged directly to surface waters, on the receiving water use classification as described in General EHS Guidelines.

2.5.6 Shipping[48]

For vessels engaged in national traffic only, environmental performance requirements are usually dictated by the flag state's maritime administration. Vessels engaged in international routes should also comply with environmental requirements set out in international regulations, primarily effluent standards for oil and grease and sewage as described in Annex I and IV of MARPOL, emissions standards for ozone depleting substances, and maritime diesel engine emissions and shipboard incinerator emissions described in Annex VI of MARPOL.

2.5.7 Gas Distribution Systems[49]

Although there are no significant point source effluents or emissions for the gas distribution sector, fugitive emissions (from city gate and regulating stations, underground piping, and third party damage) from gas distribution systems constitute a significant portion of the overall atmospheric losses from the natural gas transmission and distribution industry. Gas distribution system should: i) conduct volume reconciliation programs as an indicator of leakages by comparing delivered amounts against sales to customers, and ii) implement inspection and maintenance programs to maintain and upgrade infrastructure and minimize fugitive gas emissions.

2.5.8 Toll Roads[50]

[48] Environmental, health, and safety guidelines for shipping. 2007. International Finance Corporation, World Bank Group.

[49] Environmental, health, and safety guidelines for gas distribution systems. 2007. International Finance Corporation, World Bank Group.

[50] Environmental, health, and safety guidelines for toll roads. 2007. International Finance Corporation, World Bank Group.

While roads do not typically give rise to significant point source effluents or air emissions, operators should comply with General EHS Guidelines, especially with regard to effluents or emissions from road maintenance facilities.

2.5.9 Telecommunications[51]

While telecommunications activities do not typically give rise to significant point source effluents or air emissions, site operations should comply with General EHS Guidelines, especially with regard to effluents or emissions during construction operations or from administrative and maintenance facilities. Additionally site operations should comply with guidance on exposure limits for general public exposure to electric and magnetic fields as set out by the International Commission on Non-ionizing Radiation Protection as summarized below.

Frequency	Electric Field (V/m)	Magnetic Field (μT)
3 – 150 kHz	87	6.25
10 – 400 MHz	28	0.092
2 – 300 GHz	61	0.20

2.5.10 Crude Oil and Petroleum Product Terminals[52]

Storm water runoff should be treated through an oil / water separation system to achieve oil and grease concentration of less than 10 mg/L. Process effluent discharge quality should be established on a site-specific basis, taking into account effluent characteristics and receiving water use. Volatile organic compounds emitted during crude oil and petroleum product terminal storage activities have the potential to be significant from an environmental perspective. Best industry practice should be followed to control emissions of volatile organic compounds resulting from: evaporative losses during storage; from operational activities such as filling, withdrawal,

[51] Environmental, health, and safety guidelines for telecommunications. 2007. International Finance Corporation, World Bank Group.

[52] Environmental, health, and safety guidelines for crude oil and petroleum product terminals. 2007. International Finance Corporation, World Bank Group.

additive blending, and loading / unloading of transport links; and due to leaks from seals, flanges, and other types of equipment connections.

2.5.11 Retail Petroleum Networks[53]

Storm water runoff should be treated through an oil / water separation system able to achieve an oil and grease concentration of less than 15 mg/L. The main sources of emissions to air include evaporative losses of volatile organic compounds of fuel product from storage, particularly during bulk deliveries, and during dispensing operations. Best industry practice should be followed to prevent and control the emission of volatile organic compounds from storage and working losses which apply to most bulk fuel storage tanks, piping and pump systems.

2.5.12 Health Care Facilities[54]

Effluent Levels

Parameter	Unit	Guideline Value
5-day Biochemical oxygen demand	mg/L	50
Cadmium	mg/L	0.05
Chemical oxygen demand	mg/L	250
Chlorine (total residual)	mg/L	0.2
Chromium (total)	mg/L	0.5
Lead	mg/L	0.1
Mercury	mg/L	0.01
Oil and grease	mg/L	10
pH	S.U.	6-9
Phenols	mg/L	0.5
Polychlorinated dibenzodioxin and dibenzofuran	Ng/L	0.1
Temperature increase	°C	<3[a]
Total coliform bacteria	MPN[b]/100 ml	400
Total suspended solids	mg/L	50

[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

[b] MPN = Most Probable Number

[53] Environmental, health, and safety guidelines for retail petroleum networks. 2007. International Finance Corporation, World Bank Group.

[54] Environmental, health, and safety guidelines for health care facilities. 2007. International Finance Corporation, World Bank Group.

Air Emissions (for hospital waste incineration facilities)

Parameter	Unit	Guideline Value
Antimony, Arsenic, Lead, Chromium, Cobalt, Copper, Manganese, Nickel, Vanadium	mg/Nm^3	0.5
Cadmium + Thalium	mg/Nm^3	0.05
Carbon monoxide	mg/Nm^3	50
Hydrogen chloride	mg/Nm^3	10
Hydrogen fluoride	mg/Nm^3	1
Mercury	mg/Nm^3	0.05
Nitrogen oxide	mg/Nm^3	200-400[a]
Polychlorinated dibenzodioxin and dibenzofuran	ng/Nm^{3}TEQ	0.1
Sulfur dioxide	mg/Nm^3	50
Total organic carbon	mg/Nm^3	10
Total particulate matter	mg/Nm^3	10

[a] 200 mg/m^3 for new plants or for existing plants with a nominal capacity exceeding 6 tons per hour, 400 mg/m^3 for existing incinerators with a nominal capacity of 6 tons per hour or less

2.5.13 Waste Management Facilities[55]

Effluent Levels

Parameter	Unit	Guideline Value			
		Hazardous Waste Landfills		Municipal Solid Waste Landfills	
		Daily Max.	Monthly Average	Daily Max	Monthly Average
5-day Biochemical oxygen demand	mg/L	220	56	140	37
Ammonia (as Nitrogen)	mg/L	10	4.9	10	4.9
Analine	mg/L	0.024	0.015	-	-
Arsenic	mg/L	1.1	0.54	-	-
a-Terpineol	mg/L	0.042	0.019	0.033	0.016
Banzoic acid	mg/L	0.119	0.073	0.12	0.071
Chromium (total)	mg/L	1.1	0.46	-	-
Naphthalene	mg/L	0.059	0.022	-	-
p-Cresol	mg/L	0.024	0.015	0.025	0,014

[55] Environmental, health, and safety guidelines for waste management facilities. 2007. International Finance Corporation, World Bank Group.

pH	S.U.	6-9	6-9	6-9	6-9
Phenol	mg/L	0.048	0.029	0.026	0,015
Pyridine	mg/L	0.072	0.025	-	-
Total suspended solids	mg/L	88	27	88	27
Zinc	mg/L	0.535	0.296	0.2	0.11

Air Emissions

Parameter	Unit	Guideline Value[a]
Cadmium	mg/m^3	0.05-0.1 (0.5–8 hour average)
Carbon monoxide	mg/m^3	50-150
Hydrochloric acid	mg/m^3	10
Hydrogen fluoride	mg/m^3	1
Mercury	mg/m^3	0.05-0.1 (0.5–8 hour average)
Nitrogen oxide	mg/m^3	200-400 (24 hour average)
Polychlorinated dibenzodioxin and dibenzofuran	ng TEQ/m^3	0.1
Sulfur dioxide	mg/m^3	50 (24 hour average)
Total metals	mg/m^3	0.5-1 (0.5–8 hour average)
Total suspended particulates	mg/m^3	10 (24 hour average)

[a]Applicable to both municipal solid waste and hazardous waste incinerators

2.5.14 Water and Sanitation[56]

Water quality of potable water supply systems should meet national drinking water standards or, in their absence, the WHO Guidelines for Drinking Water Quality throughout the distribution network. Effluent water quality should meet internationally accepted standards such as summarized for the European Union below. Treated wastewater re-use and sludge quality for land application should be consistent with WHO Guidelines for the Safe Use of Wastewater, Excreta and Greywater.

Effluent Levels

Parameter	Unit	Guideline Value

[56] Environmental, health, and safety guidelines for water and sanitation. 2007. International Finance Corporation, World Bank Group.

5-day Biochemical oxygen demand	mg/L	25
Chemical oxygen demand	mg/L	125
Total nitrogen	mg/L	15
Total phosphorus	mg/L	2
Total suspended solids	mg/L	35

2.6 General Manufacturing

2.6.1 Cement and Lime Manufacturing[57]

Effluent Levels

Parameter	Unit	Guideline Value
pH	S.U.	6-9
Temperature increase	°C	<3[a]
Total suspended solids	mg/L	50

[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

Air Emissions (for cement manufacturing)

Parameter	Unit	Guideline Value
Cadmium + Thallium	mg/Nm^3	0.05
Dioxins / Furans	mg TEQ/Nm^3	0.1
Dust (other point sources including clinker cooling, cement grinding)	mg/Nm^3	50
Hydrogen chloride	mg/Nm^3	10
Hydrogen fluoride	mg/Nm^3	1
Mercury	mg/Nm^3	0.05
Nitrogen oxide	mg/Nm^3	600
Particulate matter (existing kilns)	mg/Nm^3	100
Particulate matter (new kiln system)	mg/Nm^3	30
Sulfur dioxide	mg/Nm^3	400
Total metals[a]	mg/Nm^3	0.5
Total organic carbon	mg/Nm^3	10

[a] Total metals are Arsenic, Lead, Cobalt, Chromium, Copper, Manganese, Nickel, Vanadium and Antimony

[57] Environmental, health, and safety guidelines for cement and lime manufacturing. 2007. International Finance Corporation, World Bank Group.

Air Emissions (for lime manufacturing)

Parameter	Unit	Guideline Value
Dust	mg/Nm^3	50
Sulfur dioxide	mg/Nm^3	400
Nitrogen oxide	mg/Nm^3	500
Hydrogen chloride	mg/Nm^3	10

2.6.2 Ceramic Tile and Sanitary Ware Manufacturing[58]

Effluent Levels (for ceramic tile)

Parameter	Unit	Guideline Value
5-day Biochemical oxygen demand	mg/L	50
Cadmium	mg/L	0.1
Chromium (total)	mg/L	0.1
Cobalt	mg/L	0.1
Copper	mg/L	0.1
Lead	mg/L	0.2
Nickel	mg/L	0.1
Oil and grease	mg/L	10
pH	S.U.	6-9
Temperature increase	°C	<3[a]
Total suspended solids	mg/L	50
Zinc	mg/L	2

[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

Air Emissions (for ceramic tile)

Parameter	Unit	Guideline Value

[58] Environmental, health, and safety guidelines for ceramic tile and sanitary ware manufacturing. 2007. International Finance Corporation, World Bank Group.

Cadmium	mg/Nm^3	0.2
Hydrogen chloride	mg/Nm^3	30
Hydrogen fluoride	mg/Nm^3	5
Lead	mg/Nm^3	0.5
Nitrogen oxide	mg/Nm^3	600[a]
Particulate matter	mg/Nm^3	50[b]
Sulfur dioxide	mg/Nm^3	400[a]
Total organic carbon	mg/Nm^3	20

[a] Kiln operations

[b] Dryer and kiln stacks

2.6.3 Glass Manufacturing[59]

Effluent Levels

Parameter	Unit	Guideline Value
Antimony	mg/L	0.3
Arsenic	mg/L	0.1
Boric acid	mg/L	2
Chemical oxygen demand	mg/L	130
Fluorides	mg/L	5
Lead	mg/L	0.1
Oil and grease	mg/L	10
pH	S.U.	6-9
Temperature increase	°C	<3[a]
Total suspended solids	mg/L	30

[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

Air Emissions

Parameter	Unit	Guideline Value
Arsenic	mg/Nm^3	1
Cadmium	mg/Nm^3	0.2
Fluorides	mg/Nm^3	5
Hydrogen chloride	mg/Nm^3	30
Lead	mg/Nm^3	5
Nitrogen oxide	mg/Nm^3	1,000

[59] Environmental, health, and safety guidelines for glass manufacturing. 2007. International Finance Corporation, World Bank Group.

Other heavy metals (total)		mg/Nm^3	5[a]
Particulates	Natural gas Other fuels	mg/Nm^3	100[b] 50[b]
Sulfur dioxide		mg/Nm^3	700–1,500[c]

[a] 1 mg/Nm^3 for Selenium

[b] Where toxic metals are present, not to exceed 20 mg/Nm^3; to achieve dust emissions of 50 mg/Nm^3 installation of secondary treatments (bag fillers or electrostatic precipitators) is necessary

[c] 700 mg/Nm^3 for natural gas firing, 1,500 mg/Nm^3 for oil firing

2.6.4 Construction Materials Extraction[60]

Construction materials extraction operations do not typically generate point sources or effluents or emissions with the possible exception of dewatering effluents which may contain suspended solids. The implementation of total suspended solids prevention and control strategies should target concentrations of 50 mg/L at the point of discharge. Storm water flows should be managed so as to achieve the General EHS Guidelines for wastewater discharges. The principle sources of air emission are fugitive dust from earth works and materials handling and transport facilities. Prevention and control of air emissions should be sufficient to satisfy General EHS Guidelines for ambient air quality.

2.6.5 Textiles Manufacturing[61]

Effluent Levels[a]

Parameter	Unit	Guideline Value
5-day Biochemical oxygen demand	mg/L	30
Adsorbable organic halogens	mg/L	1
Ammonia	mg/L	10
Cadmium	mg/L	0.02
Chemical oxygen demand	mg/L	160
Chromium (haxavalent)	mg/L	0.1
Chromium (total)	mg/L	0.5
Cobalt	mg/L	0.5
Color	m^{-1}	7 (436 nm, yellow)

[60] Environmental, health, and safety guidelines for construction materials extraction. 2007. International Finance Corporation, World Bank Group.

[61] Environmental, health, and safety guidelines for textiles manufacturing. 2007. International Finance Corporation, World Bank Group.

		5 (525 nm, red) 3 (620 nm, blue)
Copper	mg/L	0.5
Nickel	mg/L	0.5
Oil and grease	mg/L	10
Pesticides	mg/L	0.05–0.10[a]
pH	S.U.	6–9
Phenol	mg/L	0.5
Sulfide	mg/L	1
Temperature increase	°C	<3[b]
Total coliform bacteria	MPN[a]/100 ml	400
Total nitrogen	mg/L	10
Total phosphorus	mg/L	2
Total suspended solids	mg/L	50
Toxicity to fish eggs	T.U. 96h	2
Zinc	mg/L	2

[a] 0.05 mg/L for total pesticides (organophosphorus pesticides excluded); 0.10 mg/L for organophosphorus pesticides

[b] At the edge of a scientifically established mixing zone which takes into account ambient water quality, receiving water use, potential receptors and assimilative capacity

Air Emissions

Parameter	Unit	Guideline Value
Ammonia	mg/Nm^3	30
Carbon disulfide	mg/Nm^3	150
Chlorine	mg/Nm^3	5
Formaldehyde	mg/Nm^3	20
Hydrogen sulfide	mg/Nm^3	5
Particulates	mg/Nm^3	50[a]
Volatile organic compounds	mg/Nm^3	2/20/50/75/100/150[b,c]

[a] As the 30-minute mean for stack emissions

[b] Calculated as total carbon

[c] As the 30-minute mean for stack emissions: 2 mg/Nm^3 for volatile organic compounds classified as carcinogenic or mutagenic with mass flow greater than or equal to 10 g/hour; 20 mg/Nm^3 for discharges of halogenated volatile organic compounds with a mass flow equal or greater than 100 g/hour; 50 mg/Nm^3 for waste gases from drying of large installations (solvent consumption > 15 tons/year); 75 mg/Nm^3 for coating application processes for large installations (solvent consumption > 15 tons/year); 100 mg/Nm^3 for small installations (solvent consumption < 15 tons/year); if solvent is recovered from emissions and reused, the limit value is 150 mg/Nm^3

2.6.6 Tanning and Leather Finishing[62]

Effluent Levels (for tanning and leather finishing)

Parameter	Unit	Guideline Value
5-day Biochemical oxygen demand	mg/L	50
Ammonia	mg/L	10
Chemical oxygen demand	mg/L	250
Chloride	mg/L	1,000
Chromium (hexavalent)	mg/L	0.1
Chromium (total)	mg/L	0.5
Oil and grease	mg/L	10
pH	S.U.	6-9
Phenols	mg/L	0.5
Sulfate	mg/L	300
Sulfide	mg/L	1.0
Temperature increase	°C	<3[a]
Total coliform bacteria	MPN[b]/100 ml	400
Total nitrogen	mg/L	10
Total phosphorus	mg/L	2
Total suspended solids	mg/L	50

[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

[b] MPN = Most Probable Number

Air Emissions (for leather finishing)

Pollutant	Unit	Guideline Value
Upholstery leather (= 4 g add-on / square feet	Kg of hazardous air pollutant loss per 100 m^2 of leather processed	1.3 / 0.2
Upholstery leather (< 4 g add-on / square feet		3.3 / 1.2
Water resistant / specialty leather		2.7 / 2.4
Non-water resistant leather		1.8 / 1.1

2.6.7 Semiconductors and Electronics Manufacturing[63]

[62] Environmental, health, and safety guidelines for tanning and leather finishing. 2007. International Finance Corporation, World Bank Group.

[63] Environmental, health, and safety guidelines for semiconductors and electronics manufacturing. 2007. International Finance Corporation, World Bank Group.

Effluent Levels

Parameter	Unit	Guideline Value
5-day Biochemical oxygen demand	mg/L	50
Adsorbable organic halogens	mg/L	0.5
Ammonia	mg/L	10
Arsenic	mg/L	0.1
Cadmium	mg/L	0.1
Chemical oxygen demand	mg/L	160
Chromium (hexavalent)	mg/L	0.1
Chromium (total)	mg/L	0.5
Copper	mg/L	0.5
Cyanide (free)	mg/L	0.1
Cyanide (total)	mg/L	1
Fluoride	mg/L	5
Lead	mg/L	0.1
Mercury	mg/L	0.01
Nickel	mg/L	0.5
Oil and grease	mg/L	10
pH	S.U.	6-9
Selenium	mg/L	1
Silver	mg/L	0.1
Temperature increase	°C	<3[a]
Tin	mg/L	2
Total phosphorus	mg/L	2
Total suspended solids	mg/L	50
Zinc	mg/L	2

[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

Air Emissions

Parameter	Unit	Guideline Value
Acetone	mg/Nm^3	150
Ammonia	mg/Nm^3	30
Arsine and arsenic compounds	mg/Nm^3	0.5
Hydrogen chloride	mg/Nm^3	10
Hydrogen fluoride	mg/Nm^3	5
Inorganic hazardous air pollutants[a]	Ppmv	0.42
Organic hazardous air pollutants[a]	Ppmv	20
Phosphine	mg/Nm^3	0.5
Volatile organic compounds[b]	mg/Nm^3	20

[a]Industry-specific hazardous air pollutants include: Antimony compounds, Arsenic compounds, Arsine, Carbon tetrachloride, Catechol, Chlorine, Chromium compounds, Ethyl acrilate, Ethylbenzene, Elthylene glycol, Hydrochloric acid, Hydrofluoric acid, Lead compounds,

Methanol, Methyl isobutyl ketone, Methylene chloride, Nickel compounds, Perchloroethylene, Phosphine, phosphorus, Toluene, 1,1,1-trichloroethane, Trichloroethylene (phased-out), and Xylenes

[b] Applicable to surface cleaning processes

2.6.8 Printing[64]

Effluent Levels

Parameter	Unit	Guideline Value
5-day Biochemical oxygen demand	mg/L	30
Adsorbable organic halogens	mg/L	1
Aluminum	mg/L	3
Cadmium	mg/L	0.1
Chemical oxygen demand	mg/L	150
Chromium (haxavalent)	mg/L	0.1
Chromium (total)	mg/L	0.5
Copper	mg/L	0.5
Cyanide	mg/L	0.2
Iron	mg/L	3
Lead	mg/L	1
Oil and grease	mg/L	10
pH	S.U.	6–9
Silver	mg/L	0.5
Temperature increase	°C	<3[a]
Total phosphorus	mg/L	2
Total suspended solids	mg/L	50
Toxicity	To be determined on a case specific basis	
Zinc	mg/L	0.5

[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

Air Emissions

[64] Environmental, health, and safety guidelines for printing. 2007. International Finance Corporation, World Bank Group.

Parameter	Unit	Guideline Value
Isocyanates	mg/Nm^3	0.1[a]
Nitrogen oxide	mg/Nm^3	100 – 500[b]
Particulates	mg/Nm^3	50[c]
Volatile organic halogens[d]	mg/Nm^3	100[d,e]
		20[d,f]
		75[d,g]
		100[d,h]

[a] As 30 minute mean for contained sources, excluding particulates; from all processes / activities using Isocyanates

[b] As 30 minute mean for contained sources; from turbines, reciprocating engines or boilers used as volatile organic compounds abatement equipment

[c] As 30 minute mean for contained sources; from all processes / activities

[d] Calculated as Total carbon

[e] Heatset web offset printing with 15–25 tons/year solvent consumption

[f] Heatset web offset printing with >25 tons/year solvent consumption

[g] Publication rotogravure with >25 tons/year solvent consumption

[h] Other rotogravure, flexography, rotary screen printing, laminating, or varnishing units (>15 tons/year solvent consumption); rotary screen on textile / card board (>30 tons/year solvent consumption

2.6.9 Foundries[65]

Effluent Levels

Parameter	Unit	Guideline Value
Aluminum	kg/t	0.02[a]
Ammonia	mg/L (as Nitrogen)	5
Cadmium	mg/L	0.01
Chemical oxygen demand	mg/L	125
Chromium (total)	mg/L	0.5
Copper	mg/L	0.5
Fluoride	mg/L (as Fluorine)	5
Iron	mg/L	5
Lead	mg/L	0.2

[65] Environmental, health, and safety guidelines for foundries. 2007. International Finance Corporation, World Bank Group.

Nickel	mg/L	0.5
Oil and grease	mg/L	10
pH	S.U.	6-9
Phenol	mg/L	1
Temperature increase	°C	<3[b]
Tin	mg/L	2
Total suspended solids	mg/L	35
Zinc	mg/L	0.5

[a]Aluminum smelting and casting

[b] At the edge of a scientifically established mixing zone which takes into account ambient water quality, receiving water use, potential receptors and assimilative capacity

Air Emissions

Parameter	Unit	Guideline Value
Amines	mg/Nm^3	5
Carbon monoxide	mg/Nm^3	200[a]
		150[b]
Chloride	mg/Nm^3	5[c]
Chlorine	mg/Nm^3	5
Copper and compounds	mg/Nm^3	5-20[d]
Fluoride	mg/Nm^3	5[e]
Hydrogen sulfide	ppm v/v	5
Lead, cadmium and their compounds	mg/Nm^3	1-2[f]
Nickel, Cobalt, Chromium, Tin and their compounds	mg/Nm^3	5
Nitrogen oxide	mg/Nm^3	400[g]
		120[h]
		150[i]
Oil Aerosol / mist	mg/Nm^3	5[j]
Particulate matter	mg/Nm^3	20[k]
		50[l]
Polychlorinated dibenzodioxin and dibenzofuran	ng TEQ/m^3	0.1
Sulfur dioxide	mg/Nm^3	400[g]
		50[m]
		120[g]
Volatile organic compounds	mg/Nm^3	20[n]
		30[g]
		15[0]

[a] Non-ferrous metal melting (aluminum)

[b] Thermal sand reclamation systems and solvent based investment foundry coating, shelling, and setting operation

[c] Furnace emissions where chloride flux is used

[d] Higher value applicable to copper and its alloy producing processes

[e] Furnace emissions where fluoride flux is used

[f] Higher value applicable to non-ferrous metal foundries from scrap

[g] Non-ferrous metal melting (shaft furnaces)

[h] From thermal sand reclamation systems / regeneration units

[i] Maximum emissions level considered on best available technology base and based on cold blast cupola furnaces

[j] Ferrous metal melting (maximum emissions level considered on best available technology base and based on cokeless cupola furnaces)

[k] Particulate matter emissions when toxic metals are present

[l] Particulate matter emissions when toxic metals are not present

[m] Ferrous metal melting (cupola furnaces)

[n] Ferrous metal melting (electric arc furnaces); cupola furnaces may have higher emissions levels (up to 1,000 mg/Nm^3)

[o] Cold box molding and core making shop

2.6.10 Integrated Steel Mills[66]

Effluent Levels

Parameter	Unit	Guideline Value
Ammonia	mg/L (as Nitrogen)	5
Cadmium	mg/L	0.01
Chemical oxygen demand	mg/L	250
Chromium (hexavalent)	mg/L	0.1
Chromium (total)	mg/L	0.5
Copper	mg/L	0.5
Cyanides (free)	mg/L	0.1
Cyanides (total)	mg/L	0.5
Fluoride	mg/L (as Fluorine)	5
Iron	mg/L	5
Lead	mg/L	0.2
Mercury	mg/L	0.01
Nickel	mg/L	0.5

[66] Environmental, health, and safety guidelines for integrated steel mills. 2007. International Finance Corporation, World Bank Group.

Oil and grease	mg/L	10
pH	S.U.	6-9
Phenol	mg/L	0.5
Polycyclic aromatic hydrocarbons	mg/L	0.05
Sulfides	mg/L	0.1
Temperature increase	°C	<3[a]
Tin	mg/L	2
Total nitrogen	mg/L	30
Total phosphorus	mg/L	2
Total suspended solids	mg/L	35
Toxicity	To be determined on a case specific basis	
Zinc	mg/L	2

[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

Air Emissions

Parameter	Unit	Guideline Value
Ammonia	mg/Nm^3	30
Benzo(a)pirene	mg/Nm^3	0.1
Cadmium	mg/Nm^3	0.2
Carbon monoxide	mg/Nm^3	100 (electric arc furnace)
		300 (coke oven)
Chromium	mg/Nm^3	4
Fluoride	mg/Nm^3	5
Hydrogen chloride	mg/Nm^3	10
Hydrogen fluoride	mg/Nm^3	10
Hydrogen sulfide	mg/Nm^3	5
Lead	mg/Nm^3	2
Nickel	mg/Nm^3	2
Nitrogen oxide	mg/Nm^3	500
		750 (coke oven)
Oil mist	mg/Nm^3	15
Particulate matter	mg/Nm^3	20-50[a]
Polychlorinated dibenzodioxin and dibenzofuran	ng TEQ/m^3	0.1
Sulfur dioxide	mg/Nm^3	500
Tar fume	mg/Nm^3	5
Volatile organic compounds	mg/Nm^3	20

[a] Lower value where toxic metals are present

2.6.11 Base Metal Smelting and Refining[67]

Effluent Levels (for nickel, copper, lead, zinc and aluminum smelting and refining)

Parameter	Unit	Guideline Value
Aluminum	mg/L	0.2
Arsenic	mg/L	0.05
Cadmium	mg/L	0.05
Chemical oxygen demand	mg/L	50
Copper	mg/L	0.1
Fluoride	mg/L	5
Hydrocarbons	mg/L	5
Lead	mg/L	0.1
Mercury	mg/L	0.01
Nickel	mg/L	0.1
pH	S.U.	6-9
Temperature increase	°C	<3[a]
Total suspended solids	mg/L	20
Toxicity	To be determined on a case specific basis	
Zinc	mg/L	0.2

Air Emissions (for nickel, copper, lead, zinc and aluminum smelting and refining – varying by metal type / smelting process)

Parameter	Unit	Guideline Value
Acid mists / gases	mg/Nm^3	50
Ammonia	mg/Nm^3	5
Arsine	mg/Nm^3	0.5
Carbon monoxide and carbonyls	mg/Nm^3	5
Chlorine	mg/Nm^3	0.5
Dioxins	Ng TEQ/m^3	0.1-0.5
Dust	mg/Nm^3	1-5
Hydrogen chloride	mg/Nm^3	5
Hydrogen fluoride	mg/Nm^3	0.5

[67] Environmental, health, and safety guidelines for base metal smelting and refining. 2007. International Finance Corporation, World Bank Group.

Mercury	mg/Nm^3	0.02
Nitrogen oxides	mg/Nm^3	100-300
Polyfluorinated hydrocarbons	Anode effects/ cell /day	0.1
Sulfur dioxide	mg/Nm^3	< 50-200
Total fluoride	mg/Nm^3	0.8
Total organic carbon	mg/Nm^3	5-50
Volatile organic compounds / solvents	mg/Nm^3	5-15

2.6.12 Metal, Plastic, Rubber Products Manufacturing[68]

Effluent Levels

Parameter	Unit	Guideline Value
Aluminum	mg/L	3
Ammonia	mg/L	10
		20 (electroplating)
Arsenic	mg/L	0.1
Cadmium	mg/L	0.1
Chemical oxygen demand	mg/L	250
Chromium (haxavalent)	mg/L	0.1
Chromium (total)	mg/L	0.5
Copper	mg/L	0.5
Cyanides (free)	mg/L	0.2
Cyanides (total)	mg/L	1
Fluorides	mg/L	20
Iron	mg/L	3
Lead	mg/L	0.2
Mercury	mg/L	0.01
Nickel	mg/L	0.5
Oil and grease	mg/L	10
pH	S.U.	6-9
Phenols	mg/L	0.5
Silver	mg/L	0.2
Sulfide	mg/L	1
Temperature increase	°C	<3[a]
Tin	mg/L	2
Total nitrogen	T.U. 96h	15
Total phosphorus	mg/L	5

[68] Environmental, health, and safety guidelines for metal, plastic, rubber products manufacturing. 2007. International Finance Corporation, World Bank Group.

Total suspended solids	mg/L	50
		25 (electroplating)
Toxicity	To be determined on a case specific basis	
Volatile organic halogens	mg/L	0.1
Zinc	mg/L	2

[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

Air Emissions

Parameter	Unit	Guideline Value
Ammonia	mg/Nm^3	50
Hydrogen chloride	mg/Nm^3	10
Nitrogen oxides	mg/Nm^3	350
Particulate matter (metal surface treatments)	mg/Nm^3	5
Particulate matter (plastic processing)	mg/Nm^3	3
Total organic carbon (rubber vulcanization)	mg/Nm^3	80
Volatile halogenated hydrocarbons (metal surface treatments)	mg/Nm^3	20
Volatile organic compounds (metal and plastic coating)	mg/Nm^3	100 (up to 15 ton/year solvent consumption)
		75 (more than 15 ton/year solvent consumption)
		50 (drying processes)
Volatile organic compounds (rubber conversion)	mg/Nm^3	20[a]
Volatile organic compounds(surface cleaning)	mg/Nm^3	20-75[b]

[a] Facilities with solvent consumption greater than 15 ton/year.

[b] 20 mg/Nm^3 for waste gases from surface cleaning using VOC classified as carcinogenic, mutagenic or toxic to reproduction; 75 mg/Nm^3 for waste gases from other surface cleaning.

2.7 Mining[69]

Effluent Levels

Parameter	Unit	Guideline Value
5-day Biochemical oxygen demand	mg/L	50
Arsenic	mg/L	0.1

[69] Environmental, health, and safety guidelines for mining. 2007. International Finance Corporation, World Bank Group.

Cadmium	mg/L	0.05
Chemical oxygen demand	mg/L	150
Chromium (hexavalent)	mg/L	0.1
Copper	mg/L	0.3
Cyanide	mg/L	1
Cyanide (free)	mg/L	0.1
Cyanide (weak acid dissociable)	mg/L	0.5
Iron (total)	mg/L	2
Lead	mg/L	0.2
Mercury	mg/L	0.002
Nickel	mg/L	0.5
Oil and grease	mg/L	10
pH	S.U.	6-9
Phenols	mg/L	0.5
Temperature	°C	<3 degree differential
Total suspended solids	mg/L	50
Zinc	mg/L	0.5

2.8 Power

2.8.1 Wind Energy[70]

Wind energy facilities do not typically generate process effluents and emissions during operations. Wastewater discharges, air emissions and solid wastes related to construction and decommissioning activities should comply with General Guidelines. Noise impacts during operations should not exceed the levels stipulated in the General Guidelines, nor result in a maximum increase in background levels of 3 dB at the nearest receptor location.

2.8.2 Geothermal Power Generation[71]

[70] Environmental, health, and safety guidelines for wind energy. 2007. International Finance Corporation, World Bank Group.

[71] Environmental, health, and safety guidelines for geothermal power generation. 2007. International Finance Corporation, World Bank Group.

Spent geothermal fluids are typically re-injected to the host rock formation, resulting in minor effluent volumes involving reject water. If spent geothermal fluids are not re-injected, effluents should meet site-specific discharge levels for surface water as stipulated in the General Guidelines. Minor air emissions of hydrogen sulfide, mercury vapor, and sulfur dioxide may arise as fugitive emissions from the cooling tower if the condensation process involves direct contact of steam with cooling water. Although geothermal energy projects do not normally generate significant point source emissions during construction and operations, hydrogen sulfide and other types of emissions should not result in ambient concentrations exceeding internationally recognized guidelines (e.g. WHO Air Quality Guidelines).

2.8.3 Electric Power Transmission and Distribution[72]

The power transmission and distribution sector does not typically give rise to significant effluents or air emissions. Where potentially contaminated water run-off or dust exists, site operations should comply with General Guidelines for surface water quality and air quality. Exposure limits for general public exposure to electric and magnetic fields should comply with International Commission on Non-ionized Radiation Protection guidelines for limiting general public exposure to time-varying electric, magnetic and electromagnetic fields (up to 300 GHz).

Frequency	Electric Field (V/m)	Magnetic Field (μT)
50 Hz	5000	100
60 Hz	4150	83

2.8.4 Thermal Power[73]

Effluent Levels

Parameter	Unit	Guideline Value
Arsenic	mg/L	0.5
Cadmium	mg/L	0.1
Chromium (total)	mg/L	0.5
Copper	mg/L	0.5
Iron	mg/L	1
Lead	mg/L	0.5
Mercury	mg/L	0.005
Oil and grease	mg/L	10
pH	S.U.	6-9

[72] Environmental, health, and safety guidelines for electric power transmission and distribution. 2007. International Finance Corporation, World Bank Group.

[73] Environmental, health, and safety guidelines for thermal power. 2007. International Finance Corporation, World Bank Group.

Temperature increase[a]	°C	<3
Total residual chlorine	mg/L	0.2
Total suspended solids	mg/L	50
Zinc		1

[a] Temperature increase due to discharge of once-through cooling water

Air Emissions (applicable to non-degraded airsheds)

Combustion Technology / Fuel	Parameter / Guideline Values		
	Particulate matter	Sulfur dioxide	Nitrogen oxides
Combustion turbine			
Fuels other than natural gas (unit > 50 MW)	50 mg/Nm^3	Use of ≤ 1% Sulfur fuel	152 ppm
Natural gas (all turbine types; unit > 50 MW)	N/A	N/A	51 ppm
Boiler			
Liquid fuels (plant > 600 MW)	50 mg/Nm^3	200 mg/Nm^3	400 mg/Nm^3
Liquid fuels (plant 50-600 MW)	50 mg/Nm^3	900 mg/Nm^3	400 mg/Nm^3
Natural gas	N/A	N/A	240 mg/Nm^3
Other gaseous fuels	50 mg/Nm^3	400 mg/Nm^3	240 mg/Nm^3
Solid fuels (plant > 600 MW)	50 mg/Nm^3	200 mg/Nm^3	510 mg/Nm^3
Solid fuels (plant 50-600 MW)	50 mg/Nm^3	900 mg/Nm^3	510 mg/Nm^3
Reciprocating engine			
Biofuels / gaseous fuels other than natural gas	50 mg/Nm^3	N/A	30% higher than for other fuels
Liquid fuels (plant > 300 MW)	50 mg/Nm^3	585 mg/Nm^3	740 mg/Nm^3
Liquid fuels (plant 50-300 MW)	50 mg/Nm^3	1170 mg/Nm^3	1460 mg/Nm^3
Natural gas	N/A	N/A	200 mg/Nm^3

Annex 1
Unit Table

No	Unit	Expression
1.	mg/L	milligram of pollutant per liter
2.	mg urea/L	milligram of urea per liter
3.	µg/L	Microgram of pollutant per liter
4.	ng/L	nanogram of pollutant per liter
5.	MPN	Most Probable Number
6.	S.U.	Standard Unit
7.	dBA	Decibel
8.	mg/m^3	milligram of pollutant per cubic meter
9.	mg/Sm^3	milligram per standard cubic meter
10.	mg/Nm^3	milligram of pollutant per normal cubic meter (273K, 1 atm)
11.	°C	Degree Celsius
12.	kg/ADt	kilograms of pollutant per 1,000 of air dry pulp
13.	m^3/ADt	volume in cubic meter per 1,000 of air dry pulp
14.	kg/ton NPK	kilogram per one ton of compound fertilizer
15.	kg/ton Phosphorus oxide	kilogram per one ton of Phosphorus oxide
16.	kg/ton HF	kilogram per one ton of HF
17.	mg/kg	milligram of pollutant per kilogram
18.	TEQ	Toxic Equivalent (for dioxins and related compounds)
19.	V/m	volts per meter
20.	µT	micro tesla
21.	m^{-1}	per meter
22.	T.U.	Toxicity Unit (100 / no effects dilution rate (%) of wastewater)
23.	T.U. 96h	Toxicity Unit for 96 hour
24.	ppm	parts per million
25.	ppmv	parts per million (volume)