

# **Environmental and Social Risk Briefing**

## **Utilities & Waste Management**

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## 1. Introduction

This Environmental and Social Risk Briefing (ESRB) covers the following:

- Electricity transmission, distribution and supply;
- Water supply;
- Sewage treatment works;
- Landfill facilities (hazardous and domestic);
- Waste incineration;
- Scrap metal recovery; and
- Waste Transfer Stations.

Electricity generation is addressed in the Power Generation ESRB.

## 2. Electricity transmission and distribution

Electricity service providers are typically concerned with the transmission, distribution and delivery of competitively priced electricity to customers.

### 2.1 Transmission

Transmission is the bulk transport of high voltage electricity from generating stations to generators, distributors, suppliers and a few large industrial customers requiring high voltage electricity. The handover between transmission and distribution networks occurs at geographically dispersed substations, where the electrical voltage is reduced through the use of transformers, which are typically oil cooled.

High voltage transmission power lines may be above or below ground or in some cases, submarine.

Transmission operators play a major role in balancing the supply and demand of electricity at all times in order to ensure the security of the network supply is maintained..

### 2.2 Distribution

Distribution is the provision of electricity from the substations to customers through a low voltage distribution network. Distribution cables may be located above or below ground, and are sometimes water cooled to prevent overheating.

Electricity suppliers may operate either a transmission or distribution network or both. Electricity transmission and distribution companies often cover a discrete geographical region and commonly are licensed and regulated by Government bodies.

The construction of transmission and distribution networks can cause significant environmental impacts. Given the linear nature of the infrastructure, they usually affect a large number of property owners, but usually only a small proportion of each land parcel is affected. Care should be taken to

avoid or minimise impacts to livelihoods, for example, in areas where there is a high dependence on agriculture for income and subsistence.

### 2.3 Supply

Electricity is typically sold to households and commercial businesses via electricity suppliers who purchase energy from distribution companies and provide this to the public.

### 2.4 Decentralised Energy and Distribution System

Increasingly, decentralised energy systems and distributions are becoming more practical. A decentralised approach refers to everyday buildings playing host to devices such as solar panels, small wind turbines and combined heat and power boilers, which generate electricity as well as providing heat and hot water. The electricity created is used directly by the house or workplace and the surplus would be fed into a local network. This electricity is then locally distributed avoiding the significant loss that occurs when electricity is transported long distances. On a larger scale, community scale generation plants close to the point of demand should also be considered..

## 3. Water supply

This element of the Utilities ESRB focuses on the treatment and supply of water.

### 3.1 Abstraction and Transfer

Water for domestic supply is generally sourced from purpose built reservoirs or dams and naturally formed underground supplies (refer to Infrastructure ESRB for information on dams). Government authorities often strictly control abstraction from these sources.

Water is transferred from sources to water treatment works via a system of pipes and pumping stations located in various areas.

### 3.2 Water Treatment

In general, water is treated using a multi-barrier approach comprising coagulation and clarification, rapid gravity filtration or biological filtration and final disinfection. In addition, ozone and granular activated carbon techniques may be used for treatment of organic contaminants. Water sourced from borewells may undergo less treatment than reservoir water, as it is less contaminated. All water will undergo treatment with chlorine dioxide gas, which acts as a biocide. Sufficient treatment will result in the water being of drinking water quality.

### 3.3 Storage and Distribution

Subsequent to treatment, water is pumped in pipelines to underground storage tanks (service reservoirs), prior to distribution to consumers. Water is transferred from the service reservoirs via large capacity trunk mains underground pipelines and is either pumped or transferred by gravity. From trunk mains pipelines, the water is transferred to smaller capacity distribution pipelines and then to service connections, which supply water to individual buildings.

In addition to providing a water supply, water companies typically:

- Provide designs and quotations for new water mains and service connections, whether to serve a new development or as part of changes to a property;
- Undertake network capacity investigations;
- Undertake flow and pressure investigations;
- Provide new wastewater connections; and
- Provide connection to sewers.

## 4. Sewage Treatment Works

A sewage treatment works separates solids from liquids by physical processes and purifies the liquid by biological processes. Processes may vary but the following cycle is typical:

### 4.1 Preliminary Treatment of “Screening”

Solids like wood, paper, rags, and plastic are removed by screens, washed, dried and taken away for safe disposal at a licensed landfill. Grit and sand, which would damage pumps, is also removed and disposed of in a similar way.

### 4.2 Primary Treatment

Following screening, the remaining solids are separated from the liquid by passing the sewage through large settlement tanks, where most of the solid materials sink to the bottom. About 70% of solids settle out at this stage and are referred to as “sludge”. The sludge is used on farms as a fertiliser after further treatment called sludge treatment.

### 4.3 Secondary Treatment

Secondary treatment refers to the biological process, which relies on naturally occurring microorganisms acting to break down organic material and purify the waste liquid.

In a simple sewage treatment process, microorganisms are encouraged to grow on stones over which the sewage is trickled. The microorganisms, which need oxygen to thrive, feed on the bacteria in the sewage and purify the water. These treatment units are called percolating filters. This process can be speeded up by blowing air into tanks of sewage where the microorganisms float freely and feed on the bacteria. These treatment units are called aeration tanks.

Following either form of secondary treatment, the wastewater is settled in tanks to separate the biological sludge from the purified wastewater.

The volume of the sludge varies substantially depending on what process that has been used and depending on where in the cycle the sludge is collected. The sludge needs to be stabilised and extraction of water. There are four methods to stabilise the sludge:

- Anaerobic stabilisation;
- Aerobic stabilisation;
- Chemical stabilisation; and

- Thermal stabilisation

Typically, sludges are thickened (dewatered) to reduce the volumes transported off-site for disposal (landfill). There is no process, which completely eliminates the requirements for disposal of biosolids.

#### 4.4 Tertiary Treatment

Sometimes, further treatment is needed to improve the quality of the wastewater. This is known as tertiary treatment. Various methods may be used including sand filters, reed beds or grass plots. Disinfection, using ultra violet light to kill bacteria, is another method being used at a number of coastal sewage treatment schemes.

## 5. Landfill

Landfill refers to a method for final disposal of solid waste on land. Most modern landfills are classified according to the type(s) of waste material disposed of into them.

**Hazardous Waste Landfill:** waste disposal units constructed to specific design criteria and which receive wastes meeting the local definition of hazardous waste. These landfills are generally constructed to be secure repositories for material that presents a serious hazard to human health.

**Non Hazardous Landfills:** also called modern, engineered or secure landfills, these usually have physical barriers such as liners and leachate collection systems and procedures to protect the public from exposure to the disposed wastes. The term sanitary landfill normally refers to those where municipal solid waste is disposed of, as well as other wastes high in organic material. In some countries, all landfills are sanitary landfills.

**Inert Waste Landfill:** waste disposal units that receive wastes that are chemically and physically stable and do not undergo decomposition, such as sand, bricks, concrete or gravel.

Typically a landfill facility may comprise the following components:

- A bottom liner system;
- A leachate collection and management system;
- A landfill gas management system;
- Supporting road network.
- A drainage system; and
- A final capping system.

Their function is to secure the normal landfill operations and to control the anticipated emissions generated mainly by the decomposition of organic matter, such as contaminated leachate and landfill gas.

Landfill gas, which is principally methane and carbon dioxide, arises when wastes decompose and can be potentially noxious and explosive. Landfill gas can though be harnessed to provide energy.

## 5.1 Waste Incineration

Incinerators operate by feeding wastes onto a moving grate where they are burned. The heat generated raises steam, which can be used to drive turbines to generate electricity (See Power Generation and Distribution ESRB - Energy from Biomass and Waste).

Three main technologies exist for the incineration of waste:

1. Mass burn: the simplest and most common form of incineration. Mixed waste is burnt and energy is recovered from hot combustion gases to generate electricity.
2. Fluidised Bed Combustion (FBC): non-combustible components are removed and the remaining waste shredded to produce Refuse Derived Fuel (RDF). The RDF is fed into a bed made up of sand and dolomite. Air is pumped through the base to improve efficiency.
3. Pyrolysis and Gasification: less commonly used methods and requires waste sorting and crushing. This pre-treatment leads to higher costs and uses more energy. Pyrolysis (please see Power Generation ESRB) refers to the heating of waste with no oxygen; gasification refers to the burning of waste in a low oxygen atmosphere to produce gas with low energy content.

The burning of waste produces solid incinerator bottom ash, commonly disposed of at landfills or reused in construction and finer fly ash (flue gases and combustion products).

The main pollutants of concern are dioxins, acid gases, nitrogen dioxides, heavy metals and particulate matter present in both bottom and fly ash. It is the presence of dioxins, which causes most concern due to their carcinogenic nature and the threat of bioaccumulation due to the ease of entering the human food chain.

## 5.2 Scrap Metal Recovery

In scrap metal recovery, large items are dismantled to separate metal from non-metal components, oils or other fluids are drained and non-metal components may be stripped off. The materials are then sorted and metal components are directed to a “fragmentiser” plant where they are broken up into suitable sized pieces for the melting process. Large metal objects such as cars are sheared and crushed before they are fragmentised. Non-metal items such as plastics, textiles, rubber, oils and other fluids are disposed of as waste if no viable use can be found.

Metals received on site may be oily or greasy and are cleaned using solvents. Contaminants will vary with the type of scrap metal stored and the processes carried out but may include metals (from dismantling/breaking activities), oils and fuels (from engines and storage tanks), acids (from batteries), solvents (used to clean metals), asbestos (from brake linings), acids, polychlorinated biphenols [PCBs] (toxic chemical compounds), degreasing agents and heavy metals.

## 5.3 Waste Transfer Stations

A facility for receiving and bulking up waste before its onward journey for treatment, recycling or disposal. Becoming increasingly prevalent in countries where recycling targets are high &/or pre-treatment of waste is required prior to disposal to landfill. Will often have a Materials Recycling Facility [MRF] on-site to receive, separate and sort waste materials using manual and mechanical processes.

Waste types can be anything from inert [e.g. bricks] to hazardous [e.g. municipal] to special [e.g. asbestos].

Significant quantities of waste materials may be stored at any one time in accordance with the underlying permit.



## 6. Key Sector Risks and Headline Issues

In Utilities and Waste Management operations some critical issues of particular public concern may result in reputation or credit risk to a lender or an investor, these include:

- Climate Change - greenhouse gas emissions from processing and landfills especially methane;
- Land contamination for gas storage
- Employee and Community Health and Safety in relation to gas explosion risk
- Ensuring wastewater is clean before disposal
- Water supply – sufficient quality public health
- Storage of waste materials outside of permitted activities – either quantity or type.

The following tables detail potential environmental and social risks associated with industry processes and appropriate control measures. These may include Environmental and Social Management Plans and may form part of a wider Environmental Social Management System.

## 7. Environmental and Social Risks

### 7.1 Environmental Risks

#### 7.1.1 Landfill & Sewage

Life Cycle Phase and Activity	Risks	Controls
<b>Landfill Facilities, Sewage Treatment Works, Scrap Metal Facilities, Waste Incinerators, Waste Transfer Stations</b>	<p><b>Site suitability</b> - lack of road/rail infrastructure, land value, location of community to be served, cost of meeting government/regulatory requirements, ability to achieve appropriate government/regulatory permissions</p> <p><b>Waste Arisings:</b> insufficient levels of waste materials within “catchment” of proposed waste facility.</p>	<p><b>Minimize facility footprint</b> - Project feasibility study and Environmental Impact Assessment</p>
<b>Gas Supply</b>	<p><b>Habitat depletion, fragmentation and degradation</b> - disruption to habitat, disruption to remote sites that may have significant wilderness, scenic or recreation value, transmission and distribution route selection and suitability</p>	<p><b>Minimize facility footprint</b> - Project feasibility study and Environmental Impact Assessment</p>
<b>Water Supply</b>	<p><b>Pressure on natural resources</b> - Water availability and silting of catchment area, reservoirs and underground abstractions</p> <p><b>Habitat depletion, fragmentation and degradation</b> - supply route selection and suitability , disruption to remote sites that may have significant wilderness, scenic or recreation value</p>	<p><b>Minimize facility footprint</b> - Project feasibility study and Environmental Impact Assessment</p> <p><b>Water disposal and monitoring systems</b> – adequate planning and ongoing monitoring of aquifer conditions</p>

### 7.1.2 Construction

Life Cycle Phase and Activity	Risks	Controls
<b>Gas and Water Supply</b>	<p><b>Atmospheric emissions:</b></p> <ul style="list-style-type: none"> <li>• Pollutants (VOC, NOX, SOX, PM10, CO, CO2, etc)</li> <li>• Greenhouse gas production</li> <li>• Dust and noise, vibration, vehicle/machinery</li> </ul> <p><b>Strain on infrastructure and public nuisance</b> - disruption to public rights of way, road networks Impact on terrestrial and aquatic ecology</p> <p><b>Habitat depletion, fragmentation and degradation</b> -</p> <ul style="list-style-type: none"> <li>• Land clearance, land disturbance, land stability</li> <li>• Erosion</li> <li>• Infrastructure development access roads, opening up of natural habitat</li> <li>• Use of remote sites that may have significant wilderness, scenic or recreation value</li> </ul> <p><b>Disruption and pollution to groundwater (hydrogeological) systems and flows</b></p> <p><b>Connections to grids</b> - requirements for national grids</p>	<p><b>Minimize facility footprint</b></p> <ul style="list-style-type: none"> <li>• Utilise an Environmental Impact Assessment and Environmental Management System</li> <li>• Ensure that all construction activities are governed by appropriate environmental management plans (e.g. land use, ecological management/habitat restoration, erosion control, water quality, spill prevention and response, etc.) and that compliance is monitored</li> <li>• Rights of way management</li> <li>• Avoidance of populated areas</li> <li>• Avoidance of sensitive areas</li> <li>• Appropriate engineering design for local conditions</li> </ul> <p><b>Emissions management</b> - Minimise unnecessary use / movement of vehicles, plant and machinery</p> <p><b>Hazardous waste, storage and disposal plans</b> - employ appropriate health and safety measures for containment of chemicals</p>
<b>Sewage Treatment Works, Landfill Facilities, Waste Incinerators, Scrap Metal Facilities, Waste Transfer</b>	<p>Habitat depletion, fragmentation and degradation -</p> <ul style="list-style-type: none"> <li>• Land acquisition, land disturbance, erosion and land stability</li> <li>• Infrastructure development e.g. access roads, opening up of natural habitat</li> </ul>	<p><b>Minimize facility footprint</b> –</p> <ul style="list-style-type: none"> <li>• Utilise an Environmental Impact Assessment and Environmental Management System</li> <li>• Ensure that all construction activities are governed by appropriate environmental management plans (e.g. land use, ecological management/habitat</li> </ul>

Life Cycle Phase and Activity	Risks	Controls
Stations	<p><b>Atmospheric emissions:</b></p> <ul style="list-style-type: none"> <li>• Pollutants (VOC, NOX, SOX, PM10, CO, CO2, etc)</li> <li>• Greenhouse gas production</li> <li>• Dust and noise</li> </ul> <p><b>Disruption and pollution of surface water (hydrological) systems and flows</b> - particularly at landfill facilities</p> <p><b>Disruption and pollution of ground water (hydrogeological) and surface water (hydrological) systems and flows</b> - including hydrocarbon and chemical spills)</p> <p><b>Impact of terrestrial and aquatic ecology</b></p>	<p>restoration, erosion control, water quality, spill prevention and response, etc.) and that compliance is monitored</p> <ul style="list-style-type: none"> <li>• Rights of way management</li> <li>• Avoidance of populated areas</li> <li>• Avoidance of sensitive areas</li> <li>• Appropriate engineering design for local conditions</li> </ul> <p><b>Emissions management</b> - Minimise unnecessary use / movement of vehicles, plant and machinery</p> <p><b>Hazardous waste, storage and disposal plans</b> - employ appropriate health and safety measures for containment of chemicals</p>

### 7.1.3 Operation

Life Cycle Phase and Activity	Risks	Controls
Gas Supply	<p><b>Natural hazards and risks</b> -</p> <p>- Gas pipeline failure due to inadequate maintenance or catastrophic failure (e.g. puncture)</p> <p><b>Atmospheric emissions:</b></p> <ul style="list-style-type: none"> <li>• Greenhouse gas emissions due to gas pipeline or gas storage leakage (methane) and compressor usage (methane, carbon dioxide)</li> </ul>	<p><b>Emergency preparedness and spill response plans</b> - management and training measures including appropriate inspection and maintenance programme of gas pipeline</p> <p>Use of Best Available Technique not Entailing Excessive Cost (BATNEEC) - especially for compression stations</p>

Life Cycle Phase and Activity	Risks	Controls
<b>Water Supply</b>	<p><b>Natural risks and hazards</b> - water pipeline failure due to inadequate maintenance or catastrophic failure - e.g. puncture</p> <p><b>Pressure on natural resources</b> - over-exploitation of water resources</p> <p><b>Impact of terrestrial and aquatic ecology</b> - release of chlorine and other treatment chemicals</p> <p><b>Liquid waste (production and disposal)</b> - including storage and handling of water treatment solids and sludge</p>	<p><b>Emergency preparedness and spill response plans</b> - management and training measures including appropriate inspection and maintenance programme of gas pipeline</p> <p><b>Water disposal and monitoring systems</b> - adequate planning and ongoing monitoring of hydrogeological/groundwater aquifers conditions</p> <p><b>Hazardous waste, storage and disposal plans</b> - employ appropriate health and safety measures for containment hazardous materials (e.g. waste)</p>
<b>Sewage Treatment Works</b>	<p>Biological disease and pestilence - use of biological films of protozoa, fungi and bacteria involving the spread of disease</p> <p>Liquid waste (production and disposal)</p> <ul style="list-style-type: none"> <li>• Including storage and handling of water treatment solids and sludge</li> <li>• Disposal of 'screened' solids</li> <li>• Sludge disposal</li> <li>• Odour</li> </ul> <p><b>Disruption and pollution of ground water (hydrogeological) systems and flows</b> - storm water overflow, degradation of water quality, ecology and biodiversity impacts (loss of fish and aquatic</p>	<p><b>Waste management</b></p> <ul style="list-style-type: none"> <li>• Biological treatment management, controlled use of bacterial/fungal species</li> <li>• Reuse of sewage sludge e.g. as an agricultural fertiliser</li> <li>• Appropriate management of screened solids - disposal to landfill / incineration</li> </ul> <p><b>Emissions management</b> - Assessment of odour concentration, intensity, character, odour control through enclosure, venting, good housekeeping such as maintenance of plant and equipment, locating or re-locating sources of odour as far as is practicable from the site boundary and nearby residents</p>

Life Cycle Phase and Activity	Risks	Controls
	invertebrates)  <b>Impact of terrestrial and aquatic ecology</b> - death of fish due to turbidity of water  <b>Handling, storage and use of hazardous materials</b> - land contamination, storage and handling of chemicals	<b>Hazardous waste, storage and disposal plans</b> - employ appropriate health and safety measures for containment hazardous materials (e.g. waste)
<b>Landfill Facilities</b>	<b>Atmospheric emissions:</b> <ul style="list-style-type: none"> <li>• Pollutants (VOC, NOX, SOX, PM10, CO, CO2, etc)</li> <li>• Greenhouse gas production - greenhouse gases [e.g. landfill gas (methane)], explosions</li> <li>• Dust and noise - daily heavy goods vehicle (HGV) movements, dust creation</li> </ul> <b>Disruption and pollution of groundwater (hydrogeological) systems and flows</b> - through leachate  <b>Landscape scarring and visual impact</b>  <b>Biological disease and pestilence</b> - vermin and pests and resulting health and safety concerns <ul style="list-style-type: none"> <li>• Bird nuisance</li> <li>• Odour</li> </ul> <b>Meeting increasing government/regulatory standards</b>	<b>Emissions management –</b> <ul style="list-style-type: none"> <li>• Minimise unnecessary use / movement of vehicles, plant and machinery</li> <li>• Dust suppression</li> <li>• Air quality monitoring and management, Landfill Gas Management Plan</li> <li>• Assessment of odour concentration, intensity and character (i.e. unpleasantness and offensiveness) – odour management system</li> <li>• Leachate management system, leachate collection and treatment</li> </ul> <b>Pest control</b> - regular flying of predatory birds e.g. hawks to control common species e.g. sea gulls, feral pigeon, rodent and insect monitoring and control
<b>Waste Incinerators</b>	<b>Atmospheric emissions:</b> <ul style="list-style-type: none"> <li>• Pollutants (VOC, NOX, SOX, PM10, CO, CO2, etc)</li> </ul>	<b>Hazardous waste, storage and disposal plans</b> - employ appropriate health and safety measures for containment

Life Cycle Phase and Activity	Risks	Controls
	<p>e.g. hydrogen, chloride, hydrogen fluoride and sulphur dioxide,</p> <ul style="list-style-type: none"> <li>• Greenhouse gas production - greenhouse gases</li> <li>• Dust and noise – fly and bottom ash, heavy metal contamination (e.g. cadmium, mercury, arsenic, vanadium)</li> </ul> <p><b>Disruption and pollution of groundwater (hydrogeological) systems and flows - hydrocarbon / chemical spills</b></p> <p><b>Meeting increasing government/regulatory standards</b></p>	<p>hazardous materials (e.g. waste) Use of BATNEEC</p> <p><b>Emergency preparedness and spill response plans - equipment maintenance and integrity testing</b></p>
<p><b>Scrap Metal Recovery Facility</b></p>	<p><b>Atmospheric emissions:</b></p> <ul style="list-style-type: none"> <li>• Pollutants (VOC, NOX, SOX, PM10, CO, CO2, etc)</li> <li>• Greenhouse gas production - greenhouse gases</li> <li>• Dust and noise</li> </ul> <p><b>Disruption and pollution of groundwater (hydrogeological) systems and flows</b></p> <p><b>Handling, use, storage, and disposal of hazardous materials</b></p> <p><b>Habitat depletion, fragmentation and degradation - land contamination</b></p>	<p><b>Emissions management - air quality monitoring and management, Air Quality Management Plan</b></p> <p><b>Water disposal and monitoring systems - adequate planning and ongoing monitoring of hydrogeological/groundwater aquifers conditions</b></p> <p><b>Hazardous waste, storage and disposal plans - employ appropriate health and safety measures for containment hazardous materials (e.g. waste)</b></p>
<p><b>Waste Transfer Stations</b></p>	<p><b>Atmospheric emissions:</b></p> <ul style="list-style-type: none"> <li>• Pollutants (VOC, NOX, SOX, PM10, CO, CO2, etc)</li> <li>• Dust and noise</li> </ul>	<p><b>Emissions management - air quality monitoring and management, Air Quality Management Plan</b></p>

Life Cycle Phase and Activity	Risks	Controls
	<p><b>Handling, use, storage, and disposal of hazardous materials</b></p> <p><b>Storage of waste materials outside of permitted activities – either quantity or type</b></p>	<p><b>Water disposal and monitoring systems</b> - adequate planning and ongoing monitoring of hydrogeological/groundwater aquifers conditions</p> <p><b>Hazardous waste, storage and disposal plans</b> - employ appropriate health and safety measures for containment hazardous materials (e.g. waste)</p> <p><b>Regular Assessments</b> – undertake regular reviews of performance against permitted activities.</p>

### 7.1.3 Decommissioning

Life Cycle Phase and Activity	Risks	Controls
<b>Planning and Execution</b>	<b>Land rehabilitation and restoration</b> - Site remediation/clean-up	Rehabilitation and Remediation Management Plan
<b>Landfill Facilities, Sewage Treatment Works, Scrap Metal Facilities, Waste Incinerators, Waste Transfer Stations</b>	<b>Site suitability</b> - lack of road/rail infrastructure, land value, location of community to be served, cost of meeting government/regulatory requirements	<b>Minimize facility footprint</b> - Project feasibility study and Social Impact Assessment
<b>Gas and Water Supply</b>	<b>Site / route suitability</b> - disruption and impact on local communities.	<b>Minimize facility footprint</b> - Project feasibility study and Social Impact Assessment

## 7.2 Social Risks



### 7.2.1 Project Feasibility and Planning

Life Cycle Phase and Activity	Risks	Controls
Landfill Facilities, Sewage Treatment Works, Scrap Metal Facilities, Waste Incinerators, Waste Transfer Stations	<b>Site suitability</b> - lack of road/rail infrastructure, land value, location of community to be served, cost of meeting government/regulatory requirements	<b>Minimize facility footprint</b> - Project feasibility study and Social Impact Assessment
Gas and Water Supply	<b>Site / route suitability</b> - disruption and impact on local communities.	<b>Minimize facility footprint</b> - Project feasibility study and Social Impact Assessment

### 7.2.2 Construction

Life Cycle Phase and Activity	Risks	Controls
Gas and Water Supply	<p><b>Community health and safety</b> - noise, vibration, dust creation, odour, emissions and air quality</p> <p><b>Strain on infrastructure</b> - strain on transport networks and local infrastructure movements, social conflict and unrest</p> <p><b>Communicable diseases</b> - spread of diseases to local/foreign populations</p> <p><b>Land acquisition - displacement</b> - loss of land leading to poverty, social disruption, migration, involuntary</p>	<p><b>Minimize facility footprint</b> - right of way access management</p> <p><b>Community relations management</b> - awareness raising and information dissemination on project</p> <p><b>Social / community baseline assessment</b> - establish community profiles (e.g. social hierarchy, ethnic groups, socio-cultural and religious practices, skills profile) and public services/resources in a project area</p> <p><b>Stakeholder consultation and management</b> - Stakeholder</p>

Life Cycle Phase and Activity	Risks	Controls
	<p>resettlement requiring relocation and compensation claims (particularly for dams and reservoirs)</p> <p><b>Land acquisition - loss of access</b> - impact on livelihoods and land value</p> <p><b>Loss of livelihood - economic displacement</b> - job competition, esp. people without formal land title, conflict between locals and outsiders</p> <p><b>Employee Health and Safety</b> - Employment and poor labour standards, child labour</p> <p><b>Disruption of Social / community cohesion and exclusion of vulnerable groups</b></p> <ul style="list-style-type: none"> <li>• Breakdown of social networks and structures</li> <li>• Socio-economic exclusion of ethnic minorities and indigenous peoples</li> <li>• Socio-cultural tensions between local and foreign workforce from influx and outflow of migrants/ temporary workers and attraction of seasonal residents to project area</li> </ul> <p><b>Stakeholder/Public Consultation and disclosure</b> - social conflict and unrest due to operations and inadequate information disclosure and explanation of project impacts</p>	<p>identification and governmental/national/regional/local consultation</p> <p><b>Community / stakeholder relations management</b></p> <ul style="list-style-type: none"> <li>• Management of interface between local communities and outsiders through stakeholder identification and consultation (including governmental/national/regional/local stakeholders)</li> <li>• Community awareness raising and information dissemination on project</li> <li>• Management of community tensions, grievances and concerns through formal grievance mechanism</li> </ul> <p><b>Community investment and development</b> - community investment (both long and short term) e.g. health care facilities, micro-finance initiatives and access to employment</p> <ul style="list-style-type: none"> <li>• Site Security Plans</li> </ul> <p><b>Community health and safety Plans</b> - vaccinations and awareness raising on communicable diseases</p> <p><b>Responsible human resources policies</b> - maximisation of local employment</p> <p><b>Resettlement and relocation management</b> - proper</p>

Life Cycle Phase and Activity	Risks	Controls
	<p><b>Local procurement and business, unregulated trade</b></p> <p><b>Host country governance, national economy and revenue transparency</b> - sustainable growth and inflation, bribery, corruption and extortion</p> <p><b>Strain on infrastructure and public nuisance</b> - Strain on transport networks and local infrastructure and ability of social services to absorb new/foreign populations (supply and demand) including water resources, power, health, education, housing</p>	<p>compensation, restoration of livelihoods and living standards</p> <p><b>Cultural heritage / archaeology management</b> - identification, classification and protection of cultural / archaeological sites in accordance with the country's laws/international standards and conventions</p> <p><b>Procurement and supply chain management</b></p> <p><b>Partnering with and supporting host governments</b></p> <ul style="list-style-type: none"> <li>• Encourage revenue transparency and good governance</li> <li>• Compliance with national / regional / local regulations</li> </ul>
<p><b>Sewage Treatment Works, Landfill Facilities, Waste Incinerators, Scrap Metal Facilities, Waste Transfer Stations</b></p>	<p>Community health and safety - noise, vibration, dust creation, odour, traffic movements, emissions and air quality, social conflict and unrest</p> <p>Communicable diseases - spread of diseases to local/foreign populations</p> <p>Land acquisition - displacement - loss of land leading to poverty, social disruption, migration, involuntary resettlement requiring relocation and compensation claims (particularly for dams and reservoirs)</p> <p>Loss of livelihood - economic displacement esp. income</p>	<p>Community relations management - awareness raising and information dissemination on project and cultural awareness training</p> <p>Social / community baseline assessment - establish community profiles (e.g. social hierarchy, ethnic groups, socio-cultural and religious practices, skills profile) and public services/resources in a project area</p> <p>Community / stakeholder relations management</p> <ul style="list-style-type: none"> <li>• Management of interface between local communities and outsiders through stakeholder identification and consultation (including</li> </ul>

Life Cycle Phase and Activity	Risks	Controls
	<p>and land depreciation</p> <p>Land acquisition - loss of access - impact on livelihoods and land value, compensation claims, temporary/permanent relocation of communities (particularly for dam and reservoir construction)</p> <p>Employee health and safety - Employment and Labour standards - child labour and human rights</p> <p>Disruption of social / community cohesion and exclusion of vulnerable groups –</p> <ul style="list-style-type: none"> <li>• Breakdown of social networks and structures</li> <li>• Socio-economic exclusion of ethnic minorities and indigenous people</li> <li>• Socio-cultural tensions between local and foreign workforce from influx and outflow of migrants/ temporary workers and attraction of seasonal residents to project area</li> </ul> <p>Stakeholder/public consultation and disclosure - social conflict and unrest due to operations and inadequate information disclosure and explanation of project impacts</p> <p>Local procurement and business, unregulated trade</p> <p>Host country governance, national economy and</p>	<p>governmental/national/regional/local stakeholders)</p> <ul style="list-style-type: none"> <li>• Community awareness raising and information dissemination on project</li> <li>• Management of community tensions, grievances and concerns through formal grievance mechanism</li> </ul> <p>Community investment and development - community investment (both long and short term) e.g. health care facilities, micro-finance initiatives and access to employment</p> <p>Site security plans</p> <p>Community health and safety plans - vaccinations and awareness raising on communicable diseases</p> <p>Resettlement and relocation management - proper compensation, restoration of livelihoods and living standards</p> <p>Human resources policies - maximization of local employment</p> <p>Cultural heritage / archaeology management - identification, classification and protection of cultural / archaeological sites in accordance with the country's laws/international standards and conventions</p>

Life Cycle Phase and Activity	Risks	Controls
	<p>revenue transparency - sustainable growth and inflation, bribery, corruption and extortion</p> <p>Strain on infrastructure and public nuisance - strain on transport networks and local infrastructure and ability of social services to absorb new/foreign populations (supply and demand) including water resources, power, health, education, housing</p>	<p><b>Supply chain sustainability</b></p> <ul style="list-style-type: none"> <li>• Procurement and supply chain management including all sponsor developed Environmental Impact Statements are reviewed by independent third party reviewer</li> </ul> <p><b>Partnering with and supporting host governments</b></p> <ul style="list-style-type: none"> <li>• Encourage revenue transparency and good governance</li> <li>• Compliance with national / regional / local regulations</li> </ul>

### 7.2.3 Operation

Life Cycle Phase and Activity	Risks	Controls
<p><b>Gas Supply</b></p>	<p><b>Employee health and safety</b> - employment and labour standards</p> <p><b>Community health and safety</b> - noise, vibration, odour, traffic movement, emissions and air quality</p> <p>Natural hazards and risks - gas pipeline/storage failure and gas leaks from distribution network or customer homes</p> <p><b>Supply chain sustainability</b> - security of supply and</p>	<p><b>Employee health and safety plans</b> - procedures and training</p> <p><b>Emergency preparedness and spill response plans</b> - equipment maintenance and integrity testing Emergency Response and Crisis Planning</p> <p><b>Community relations management</b> - awareness raising and information dissemination on project and cultural awareness training</p>

Life Cycle Phase and Activity	Risks	Controls
	<p>provision of ongoing supply to customers</p> <p><b>Employee health and safety</b> - employment and labour standards Worker health and safety during inspections/maintenance</p> <p><b>Community health and safety</b> - Noise, vibration, dust creation, vehicular movement, emissions and air quality during routine or emergency maintenance work</p> <p><b>Fuel poverty of vulnerable customers</b> - bad publicity/press</p> <p><b>Employee health and safety</b> - Employment and poor labour standards</p> <p><b>Disruption of social / community cohesion and exclusion of vulnerable groups</b></p> <ul style="list-style-type: none"> <li>• Breakdown of social networks and structures</li> <li>• Socio-economic exclusion of ethnic minorities and indigenous peoples</li> <li>• Socio-cultural tensions between local and foreign workforce from influx and outflow of migrants/ temporary workers and attraction of seasonal residents to project</li> </ul> <p><b>Stakeholder / public consultation and disclosure</b> - social conflict and unrest due to operations and inadequate information disclosure and explanation of</p>	<p><b>Social / community baseline assessment</b> - establish community profiles (e.g. social hierarchy, ethnic groups, socio-cultural and religious practices, skills profile) and public services/resources in a project area</p> <p><b>Stakeholder consultation and management Stakeholder identification and governmental/national/regional/local consultation</b></p> <p><b>Community Relations</b> - implementation of fuel poverty programmes to assist vulnerable customers</p> <p><b>Community investment and development</b> - community investment (both long and short term) e.g. health care facilities, micro-finance initiatives and access to employment</p> <p><b>Community / stakeholder relations management</b></p> <ul style="list-style-type: none"> <li>• Management of interface between local communities and outsiders through stakeholder identification and consultation (including governmental/national/regional/local stakeholders)</li> <li>• Community awareness raising and information dissemination on project and cultural awareness training</li> <li>• Management of community tensions, grievances</li> </ul>

Life Cycle Phase and Activity	Risks	Controls
	<p>project impacts</p> <p><b>Local procurement and business, unregulated trade</b></p> <p><b>Host country governance, national economy and revenue transparency</b> - sustainable growth and inflation, bribery, corruption and extortion</p>	<p>and concerns through formal grievance mechanism</p> <p><b>Site security plans</b></p> <p><b>Supply chain sustainability</b></p> <ul style="list-style-type: none"> <li>• Procurement and supply chain management including all sponsor developed Environmental Impact Statements are reviewed by independent third party reviewer</li> </ul> <p><b>Partnering with and supporting host governments</b></p> <ul style="list-style-type: none"> <li>• Encourage revenue transparency and good governance</li> <li>• Compliance with national / regional / local regulations</li> </ul> <p><b>International standards, guidelines and industry best practice</b> - ensure that operations follow IFC Guidelines and where possible the Voluntary and Equator Principles (please see Regulation and Best Practice below)</p>
<p><b>Water Supply</b></p>	<p>Natural hazards and risks - water pipeline failure -, security of supply /and provision of ongoing supply of water</p> <p><b>Communicable diseases</b> - Control of disease and contaminants in water supply (water quality) - security of supply and community health</p>	<p><b>Emergency preparedness and spill response plans</b></p> <ul style="list-style-type: none"> <li>• Equipment maintenance and integrity testing</li> <li>• Emergency Response and Crisis Planning</li> <li>• Including appropriate inspection and maintenance programme</li> <li>• Adequate controls, testing, planning, and ongoing monitoring of hydrogeological conditions</li> </ul>

Life Cycle Phase and Activity	Risks	Controls
	<p>Pressure on natural resources - Over-exploitation of water resources leading to community water shortage</p> <p>Employee health and safety - Worker health and safety during inspections/maintenance</p> <p><b>Community health and safety –</b></p> <ul style="list-style-type: none"> <li>• Noise, vibration, dust creation, vehicular movement, emissions and air quality during routine or emergency maintenance work</li> <li>• Release of chlorine and other treatment chemicals</li> </ul> <p><b>Employee health and safety -</b> Employment and poor labour standards</p> <p>Disruption of social / community cohesion and exclusion of vulnerable groups –</p> <ul style="list-style-type: none"> <li>• Breakdown of social networks and structures</li> <li>• Socio-economic exclusion of ethnic minorities and indigenous peoples</li> <li>• Socio-cultural tensions between local and foreign workforce from influx and outflow of migrants/ temporary workers and attraction of seasonal residents to project</li> </ul> <p><b>Stakeholder / public consultation and disclosure -</b> social conflict and unrest due to operations and</p>	<p><b>Hazardous waste, storage and disposal plans -</b> employ appropriate health and safety measures for containment hazardous materials (e.g. waste)</p> <p><b>Social / community baseline assessment -</b> establish community profiles (e.g. social hierarchy, ethnic groups, socio-cultural and religious practices, skills profile) and public services/resources in a project area</p> <p><b>Stakeholder consultation and management</b> Stakeholder identification and governmental/national/regional/local consultation</p> <p><b>Site security plans</b></p> <p><b>Community / stakeholder relations management</b></p> <ul style="list-style-type: none"> <li>• Management of interface between local communities and outsiders through stakeholder identification and consultation (including governmental/national/regional/local stakeholders)</li> <li>• Community awareness raising and information dissemination on project and cultural awareness training</li> <li>• Management of community tensions, grievances and concerns through formal grievance mechanism</li> </ul>



Life Cycle Phase and Activity	Risks	Controls
	<p>inadequate information disclosure and explanation of project impacts</p> <p><b>Local procurement and business, unregulated trade</b></p> <p><b>Host country governance, national economy and revenue transparency</b> - sustainable growth and inflation, bribery, corruption and extortion</p>	<p><b>Community investment and development</b> - community investment (both long and short term) e.g. health care facilities, micro-finance initiatives and access to employment</p> <p><b>Responsible human resources policies</b> - maximization of local employment</p> <p><b>Supply chain sustainability</b> –</p> <ul style="list-style-type: none"> <li>• Procurement and supply chain management including all sponsor developed Environmental Impact Statements are reviewed by independent third party reviewer</li> </ul> <p><b>Partnering with and supporting host governments</b></p> <ul style="list-style-type: none"> <li>• Encourage revenue transparency and good governance</li> <li>• Compliance with national / regional / local regulations</li> </ul>
<p><b>Sewage Treatment Works</b></p>	<p><b>Community health and safety</b> - noise, vibration, odour, traffic movements, emissions and air quality</p>	<p><b>Emissions management</b> –</p> <ul style="list-style-type: none"> <li>• Assessment of odour concentration, intensity - odour control, management and recording of complaints</li> <li>• Minimise unnecessary use / movement of vehicles, plant and machinery</li> </ul>
<p><b>Landfill Facilities</b></p>	<p><b>Strain on infrastructure and public nuisance</b> - strain on transport networks and local infrastructure, odour nuisance and public opposition</p>	<p><b>Emissions management</b> –</p> <ul style="list-style-type: none"> <li>• Minimise unnecessary use / movement of vehicles, plant and machinery</li> </ul>

Life Cycle Phase and Activity	Risks	Controls
	<p><b>Biological disease and pestilence</b> - vermin and pests</p> <p><b>Employee health and safety</b> - employment and poor labour standards, child labour</p>	<ul style="list-style-type: none"> <li>• Dust suppression</li> </ul>
<p><b>Waste Incinerators</b></p>	<p><b>Community health and safety</b> - noise, vibration, dust creation, odour, traffic movements, emissions and air quality,</p> <p><b>Land acquisition - displacement</b> - loss of land leading to poverty, social disruption, migration, involuntary resettlement requiring relocation and compensation claims (particularly for dams and reservoirs) Loss of livelihood - economic displacement esp. income and land depreciation</p> <p><b>Land acquisition - loss of access</b> - impact on livelihoods and land value, compensation claims, temporary/permanent relocation of communities (particularly for dam and reservoir construction)</p> <p><b>Employment health and safety</b> - Employment and poor labour standards</p> <p><b>Stakeholder / public consultation and disclosure</b> - NGOs, local and national advocacy groups, badly managed social and community relations, negative exposure, compensation claims</p>	<p><b>Community relations management</b> - awareness raising and information dissemination on project and cultural awareness training</p> <p><b>Stakeholder consultation and management</b> - stakeholder identification and governmental/national/regional/local consultation</p> <p><b>Community / stakeholder relations management –</b></p> <ul style="list-style-type: none"> <li>• Management of interface between local communities and outsiders through stakeholder identification and consultation (including governmental/national/regional/local stakeholders)</li> <li>• Community awareness raising and information dissemination on project and cultural awareness training</li> <li>• Management of community tensions, grievances and concerns through formal grievance mechanism</li> </ul> <p><b>Community investment and development</b> - community investment (both long and short term) e.g. health care</p>

Life Cycle Phase and Activity	Risks	Controls
		<p>facilities, micro-finance initiatives and access to employment</p> <p><b>Site security plans</b></p> <p><b>Employee health and safety plans</b> - procedures and training</p> <p><b>Human Resources policies</b> - maximization of local employment</p> <p><b>Supply chain sustainability</b> –</p> <ul style="list-style-type: none"> <li>• Procurement and supply chain management including all sponsor developed Environmental Impact Statements are reviewed by independent third party reviewer</li> </ul> <p><b>Partnering with and supporting host governments</b></p> <ul style="list-style-type: none"> <li>• Encourage revenue transparency and good governance</li> <li>• Compliance with national / regional / local regulations</li> </ul>
<p><b>Scrap Metal Recovery Facility/ Waste Transfer Stations</b></p>	<p><b>Community health and safety</b> - noise, vibration, dust creation, odour, traffic movements, emissions and air quality</p> <p><b>Loss of livelihood</b> - economic displacement, job competition, loss of income</p>	<p><b>Community relations management</b> - awareness raising and information dissemination on project and cultural awareness training</p> <p><b>Stakeholder consultation and management</b> - Stakeholder identification and governmental/national/regional/local</p>

Life Cycle Phase and Activity	Risks	Controls
	<p><b>Disruption of Social / community cohesion and exclusion of vulnerable groups</b></p> <ul style="list-style-type: none"> <li>• Breakdown of social networks and structures</li> <li>• Socio-economic exclusion of ethnic minorities and indigenous peoples</li> <li>• Socio-cultural tensions between local and foreign workforce from influx and outflow of migrants/ temporary workers and attraction of seasonal residents to project</li> </ul> <p><b>Employee health and safety - employment and labour standards</b></p>	<p>consultation</p> <p><b>Employee health and safety plans - procedures and training</b></p> <p><b>Responsible human resources policies - maximization of local employment</b></p>

#### 7.2.4 Decommissioning

Life Cycle Phase and Activity	Risks	Controls
<p><b>Planning and Execution</b></p>	<p><b>Loss of livelihood - economic displacement - loss of income, dependency on project related jobs</b></p> <p><b>Land acquisition - land rehabilitation and restoration</b> Site remediation / clean-up – potential removal of non-permitted waste materials.</p>	<p>Rehabilitation and remediation management plan</p>

## 8. Key considerations

1. Does the operation hold all necessary environmental authorisations and permits and is the operation in full compliance with their requirements?
2. Are there any outstanding/forthcoming Site Improvement Plan requirements attached to their environmental authorisations and permits [often these have time limits for implementation]?
3. Have any complaints been made against site operators or are there any outstanding prosecutions?
4. Has any on-site waste/sewage sludge disposal ever taken place? How are waste products treated and disposed of in general?
5. Does the company discharge effluent to a surface watercourse?
6. Are there any extraordinarily high-risk site-specific issues (e.g. incineration of hazardous as opposed to municipal waste); does the facility handle scrap metals contaminated with hazardous substances?
7. Is the company sufficiently financially robust to meet environmental responsibilities attached to site licenses, including decommissioning, rehabilitation and restoration costs?
8. What procedures and/or resources exist to manage environmental risks (e.g. environmental management systems, auditing arrangements, dedicated personnel etc.)? Has an Environmental Impact Assessment been commissioned where required?
9. What Monitoring & Control steps are you proposing to ensure continued compliance with all necessary environmental authorisations and permits; e.g. customer to re-demonstrate as part of annual review of facilities?
10. Have affected communities been involved in a public engagement process? Are identified risks being managed appropriately? Is a fit for purpose Grievance Mechanism in place?

## 9. Regulation and Best Practice

In the case of almost all large-scale new build, expansion and development projects an environmental and social Impact Assessment will be required particularly where project debt financing is being sought. A comprehensive ESIA undertaken to international standards allows both the project sponsor and the investors to assess the full range of potential environmental and social impacts related to a project development, operation and decommissioning. Part of the ESIA process is to design appropriate mitigation measures and to set a framework for the monitoring the performance of these measures on a long-term basis. This limits and controls compliance and remediation costs as well as long term credit and reputation risks.

## 10. Additional resources

### Multilateral:

- 1) [IFC Performance Standards](#)
- 2) [EU Directive for Waste Management](#)
- 3) [EU Policies: Integrated Pollution prevention and control.](#)
- 4) [ILO Standards](#)
- 5) [Voluntary Principles Security and Human Rights](#)
- 6) [World Health Organization \(WHO\) Best Practice guide to small-scale incineration](#)

### Government:

- 1) [Environment Agency UK Monitoring Guidance notes for emission levels](#)
- 2) [Health and Safety Executive Guidance for Employers for the Control of Noise at Work Regulations 2005](#)
- 3) [UK Department for the Environment, Food and Rural Affairs \(DEFRA\)](#)
- 4) [Code of Practice on Odour Nuisance from Sewage Treatment Works](#)
- 5) [Environment Agency \(UK\) Business and Commercial Waste](#)
- 6) [Netregs \(Industry guidance, UK\) Information on waste with legislation](#)
- 7) [Health Canada Guidelines on Noise in the Workplace](#)
- 8) [Traffic Noise Information and Recommendations](#)
- 9) [Canada Labour Code Federal Law and Regulations](#)

### Industry Association:

- 1) [Ofgem Best Practice guidelines for gas and electricity network operator credit cover.](#)