Introduction

This guideline is designed to be used by EBRD Financial Intermediaries (FIs) to understand the nature of environmental and social (E&S) risks associated with this sector and suggested actions for businesses to manage these E&S risks. It also provides guidance for FIs on potential due diligence questions to discuss with management to understand how their business is managing these E&S risks. This guideline focuses on material E&S risks; it is not an exhaustive list of E&S risks. In managing E&S risks, all businesses should be compliant with relevant E&S laws and regulations. Where applicable, these include European Union legislation, which may also be taken as a benchmark for good practice.

This guideline covers the production of non-ferrous metals from mineral concentrate and moulding of these metals to at or near their finished shape. The production of concentrated mineral from ore, including the production of alumina, is covered in the guideline on Mineral Processing.

Reference NACE codes:

- 24.4 Manufacture of basic precious and other non-ferrous metals.
- 24.5 Casting of metals

Material risks

Below is an overview of the material risks present in non-ferrous metal processing.

<table>
<thead>
<tr>
<th>E&amp;S Risk Category</th>
<th>Environment</th>
<th>Health and safety</th>
<th>Labour</th>
<th>Community</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Key E&amp;S Risks</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(In order of materiality)</td>
<td>Affect the natural environment</td>
<td>Affect the health or safety of employees</td>
<td>Affect workplace conditions and the treatment of employees</td>
<td>Affect the health and safety, livelihoods, and environment of the community and wider public</td>
</tr>
<tr>
<td>Air Emissions</td>
<td>✓</td>
<td>✗</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Ground and groundwater contamination</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Energy Consumption</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Waste management and wastewater</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Hazardous Materials</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

¹ This guideline outlines some relevant legislation but does not provide an exhaustive list of applicable laws and regulations.
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Solid Waste</td>
<td>☑</td>
<td></td>
<td></td>
<td>☑</td>
<td>9</td>
</tr>
<tr>
<td>Occupational Health and</td>
<td>☑</td>
<td>☑</td>
<td></td>
<td></td>
<td>9</td>
</tr>
<tr>
<td>Safety</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. <strong>Process description</strong></td>
<td>4</td>
</tr>
<tr>
<td>2. <strong>Key E&amp;S Risks</strong></td>
<td>5</td>
</tr>
<tr>
<td>3. <strong>Financial implications</strong></td>
<td>11</td>
</tr>
<tr>
<td>4. <strong>Suggested due diligence questions</strong></td>
<td>12</td>
</tr>
<tr>
<td>5. <strong>References and additional sources</strong></td>
<td>16</td>
</tr>
</tbody>
</table>
1. Process description

The processes used for smelting, refining and moulding the majority of metals are similar and illustrated in the diagram below. Some processes are specific to aluminium refining and are labelled as such. Not all processes will be used for each metal.

**Smelting and Refining Overview**

- **Roasting** – removes sulphur from metal sulphide concentrates by adding air and heating/drying to achieve the desired sulphur content for smelting. Partial roasting prepares copper and nickel sulphides for matte2 smelting; complete roasting produces a metal oxide, which can be reduced or leached.
- **Smelting** – separates metals of value from other less desirable metals and impurities. A fluxing agent is used to remove the impurities as a slag.
- **Converting** – blowing air through copper and nickel matte and high grade scrap to remove residual sulphur and iron.
- **Leaching** – using acid or other solvent to dissolve the metal content from an oxidic ore or an oxide produced by roasting, the resulting solution is termed “pregnant”. Sulphidic ores require oxidation before they can be leached.
- **Electrowinning or electrorefining** – refining metals from the pregnant leaching solution. Electric current is passed through the solution in electrolytic cells and the dissolved metal ions are deposited on the cathode. Metal impurities either dissolve or form sludge. Spent electrolyte is returned to the leaching process.
- **Chemical Refining** – the condensation of metal from a vapour or the precipitation of metal from an aqueous solution.
- **Fire Refining** – (mainly for copper) removes further impurities by blowing air through a molten mixture to oxidise the metal and evaporate off sulphur. Other impurities may be removed with a flux. A small amount of slag is produced. Residual oxygen is removed using natural gas, ammonia or wood.
- **Aluminium** – Alumina is electrolysed to form liquid aluminium, which collects at the bottom of the cell and is removed by vacuum tapping. Many cells may be

---

2 Molten solution of metal sulphides
connected in series and can produce a strong magnetic field.

- **Melting** – heating the metal in a furnace; different types of furnaces are used depending on the type of metal.

- **Moulding** - Non-ferrous casting mainly uses Permanent (multi-use) Moulds, made from a metal with a higher melting point than the casting metal. Lost (single-use) Moulds are sometimes used; these are made from sand and clay and are lost in the process.

- **Casting** – different pouring systems are used depending on the metal and the type of mould, e.g. by gravity (lost mould), injection under low or high pressure, or by centrifugal force. The metal is allowed to solidify and the mould is broken away. The casting is then subject to further controlled cooling.

**Finishing** - depending on the casting process, different steps may be required, e.g. shot blasting, grinding, deburring, thermal treating, inspection and testing. Welding to join or repair castings may be required as well as chemical cleaning before coating operations. Recycled metals may be re-entered into the smelting process. These are pre-treated by shredding, sieving, magnetic separation or drying. Further refining as described above may be required after smelting. Recycling of aluminium is very common due to the high energy demand of primary production of the metal.

2. **Key E&S Risks**

Non-ferrous metal processing businesses may need permits or licences which will set out the limits to adhere to in terms of pollution and harm to human health. An environmental permit from a national or local authority may be required where an installation is a large consumer of organic solvents and significant volatile organic compound (VOC) emissions may be released. Water use and discharge and trade effluent permits may also be required, particularly for those facilities where there is potential for effluent to be contaminated with heavy metals.

Larger installations obligated under the Industrial Emissions Directive (IED) (2010/75/EU) will need a permit which requires the application of “best available techniques” relevant to the sector.

Below are the material E&S risks associated with this sector and key measures to manage them. Where gaps are found in the management of key E&S risks, the E&S risk management measures should form part of a corrective E&S action plan agreed with your customer.

**Air emissions**

Emissions can occur from all steps of metal processing and can harm the environment, for example sulphur dioxide, nitrogen oxide and other acidifying compounds cause acid rain. Carbon dioxide and incompletely combusted hydrocarbons such as methane are greenhouse gases that contribute to climate change; production of these is often restricted by regulation (see ‘Financial Implications’).

Emissions that may cause harm to workers include metal fumes, volatile organic compounds (VOCs), polycyclic aromatic hydrocarbons. Short term exposure to these can cause nausea, irritation and vomiting, longer term exposure can cause cancer, immune system and organ damage. Dioxins and furans may be formed due to the presence of small amounts of chlorine in secondary raw materials, these can cause cancer and disrupt human development and metabolic processes.

---

Dust and particulates will be released during receiving, conditioning, handling, transporting and storage of ores, concentrates and secondary raw material; during furnace processing and the movement of hot materials; during the collection and transport of abatement system contents e.g. filters; and during melting and casting. Dust and particulates can be inhaled and cause respiratory disease including asthma in employees.

When dry, casting sand, fettlings and kiln linings produce silica dust known as respirable crystalline silica (RCS), this can cause silicosis which leads to dismemberment and death and is made worse by smoking.

Dust, vented fumes, smog caused by particulates, and odours can be a nuisance to neighbouring residential and industrial areas.

In the majority of cases, process gases are cleaned in fabric filters reducing the emissions of dust and metal compounds such as lead. Wet scrubbers, afterburners and wet electrostatic precipitators (ESP) may also be used. Sulphur dioxide captured may be converted to sulphur, sulphuric acid or gypsum.

For large installations, the risk of transboundary pollution must be considered.

The prioritised hierarchy of gas collection is:
1. Process optimisation and minimisation of emissions;
2. Sealed reactors and furnaces;
3. Targeted fume collection.

**Aluminium Process Emissions**

The production of aluminium is highly energy intensive (see ‘Energy Consumption’); both the extraction of alumina from the bauxite ore and the electrolysis of alumina to extract aluminium have high carbon dioxide emissions associated with heating and electricity use. Some air emission issues that are specific to aluminium processing are highlighted below.

- Two perfluorocarbons (PFC) (CF4 and C2F6) contribute about 48% of primary aluminium greenhouse gas emissions and these can be up to 10,000 times more harmful than CO2. Emissions of PFCs are strictly the result of electrolytic reduction; they are formed during the “anode effect” when the electrolyte becomes depleted in alumina and the production of aluminium is inhibited. The effect can be stopped by increasing the feed-in rate of alumina and stirring the electrolyte. A shift from older smelter technologies to newer technologies can improve energy efficiency while reducing PFC emissions, e.g. replacement of the smelter to one using Point Feeder Pre-Bake (PFPB) technology.

- Gaseous fluorides may be emitted during electrolysis. Fumes should be captured and cleaned using alumina and filters or wet scrubbers.

- Anodes are prepared using carbon containing materials including petroleum pitch baked onto a metal core. Tar, polycyclic aromatic hydrocarbons (PAHs), volatile organic compounds (VOCs) and other contaminants such as sulphur can be released during the baking process. If feasible, the VOCs can be burnt within the baking furnace, the other off-gases should be treated by scrubbing or absorption followed by filtering. Hydrocarbons obtained may be returned to the production process.

**How can a business manage this risk?**

- Optimise operational practices to control emissions to air e.g. conveyors rather than manual handling to reduce dust emissions; enclose conveyors and storage areas to reduce dust.
- Dust suppression measures should be adopted such as covered storage, silos, wetting surfaces and use of windbreaks.
- Respiratory hazard control technology, (e.g. respirators) must be used when exposure cannot be avoided, e.g. during maintenance.
• Indoor air quality monitoring should be conducted and dedicated areas with signage marked out where there are elevated levels of emissions and personal protective equipment is required;
• Administrative controls such as limiting exposure time, health surveillance and regular indoor air quality monitoring;
• Use sealed furnaces and reactors/retrofit existing furnaces with maximum sealing;
• Installation or upgrade of abatement technology e.g. enclosure of equipment, cover electrolytic cells, appropriate ventilation with filters, gas balancing systems, baghouses;
• Implement a formal Leak Detection and Repair (LDAR) programme for and where necessary, replace with higher quality items, any equipment which generates significant fugitive emissions;
• Monitor and control anode effects;
• Consider upgrade of smelter technology when feasible to reduce anode effect emissions and decrease energy consumption.

Ground and groundwater contamination

Contamination of land and surface and ground waters (on or off site) can occur through sudden and accidental incidents such as major spillages, via gradual leakage of contaminants in to ground and waters, via deposition from air emissions. In addition, scrap metal may include contaminants, e.g. cadmium, lead, zinc, oil, PAH and plastics. Contamination may be historical from past operations or from current activities or both.

A large percentage of drinking water comes from groundwater resources (aquifers Contaminants can perculate down to these aquifers, contaminating drinking water supplies. Pollutants can also contaminate drinking water supplies if they come into contact with water pipes. The damage caused by the release depends on the amount of material released, the local geology (i.e. how easily the leak can pass through the underlying soil and rock) and the proximity of the facility to sensitive environmental receptors such as watercourses, groundwater wells, building structures and underground services. It is good practice to consider the water environment in its wider context, rather than just groundwater.\(^4\)

How can a business manage this risk?

• Install devices to prevent spills and overfills, e.g. alarms to warn of overfilling and automatic shut-off devices;
• Above ground tanks should be bunded. (A bund wall is a constructed retaining wall designed to hold at least 110% of the capacity of the storage tank);
• Consider use of corrosion protection in tanks and piping such as double skinning or membranes;
• Pave stockyards to prevent ground infiltration by pollutants;
• Consider installation and use of groundwater monitoring points on site to check for contamination.

Energy consumption

Smelting, refining and casting operations are energy intensive, particularly in terms of the fuel used to provide heat and generate electricity for electrolysis and to power utilities and equipment. Some forms of energy production are damaging to the environment, such as the production of carbon dioxide from fossil fuel combustion. There is also a risk that energy supply may become depleted in the future and no longer be sufficient for operations.

Some large energy consumers in the metal processing sector may come under emissions trading schemes (ETS), such as the EU ETS which requires members to monitor and report

---

their CO2 emissions, and ensure that enough allowances (either allocated or purchased) are in place to cover their emissions.

**How can a business manage this risk?**

- Improve thermal efficiency to minimise heat loss;
- Recover heat and energy from processes for use elsewhere on the site or to supply heat and power off site. For example, the use of heat generated by smelting and refining processes to melt secondary material. Combined heat and power (CHP) or trigeneration plants can offer higher efficiencies for energy generation and heating and cooling needs;
- Consider fuel used onsite (e.g. coal, heavy fuel oil, and diesel) and whether there are opportunities to switch to cleaner fuels such as gas.

### Wastewater

Wastewaters arising from various process stages are likely to contain soluble and insoluble metal compounds, oil and organic material. Rainwater runoff may become contaminated through contact with material stockpiles or airborne contaminants. The volume of water falling on contaminated areas should be minimised by installing roofs, and where necessary should be captured and treated before discharge.

Water consumption may be high in casting depending on the type of furnace used, the type of flue-gas cleaning and the casting method. Water is used for cooling and quenching operations and wet dedusting systems. In most foundries, the water is recirculated, but a high percentage evaporates.

**How can a business manage this risk?**

- Ensure untreated wastewater does not discharge to watercourses;
- Segregate process water, rainwater and indirect cooling water streams to reduce the need for waste water treatment equipment or sewers;
- Minimise the consumption of water in the process, including water used on product purification and equipment cleaning;
- Recycle wastewater where possible back to the processes or to secondary uses such as for cleaning.

### Hazardous materials

Hazardous chemicals (acids, alkalis) are used in smelting and refining. Significant hazardous properties relating to individual chemicals include flammability, combustion potential, toxicity, corrosive potential and oxidising potential. Chemicals with such properties should be labelled with the appropriate internationally recognised diamond shaped hazard symbol. Some chemicals may only possess a hazard potential if they have the opportunity to react with other compounds.

Inadequate control or accidental release of hazardous chemicals on site and in transit may result in explosions, air pollution and significant environmental impacts in relation to soil, groundwater and surface water contamination. Releases of hazardous substances to the air could impact the workers, the local community and the environment.

**How can a business manage this risk?**

- Chemicals should be stored in a dedicated enclosed facility with a roof and a paved/concrete floor;
- Chemicals with different hazard symbols should not be stored together - clear guidance on the compatibility of different chemicals can be obtained from the Materials Safety Data Sheet (MSDS) which should be readily available from the manufacturer and on site.
Solid wastes

A range of hazardous and non-hazardous residues and wastes are produced including slag, spent refractory linings, waste from abatement systems, cathode waste, smelter dust, and sludge from wastewater treatment and leaching, purification and electrolysis activities.

How can a business manage this risk?

- Develop and implement a waste management plan covering all aspects of waste treatment on site. Wherever possible, priority should be given to reduction of wastes generated, and recovery and re-use of raw materials;
- Consider opportunities for commercial sale of recovered product. Slag may be processed into an inert granular material that can be sold for industrial use, e.g. in cement manufacturing and insulation products. Sand waste from moulding can be recovered and reused internally or externally e.g. for construction material. Collected dust may be sufficiently high in metal content to be classified as hazardous waste or to make metal recovery feasible; it should be recirculated to the furnace to the extent possible. Sludge from wastewater treatment may contain heavy metals, oil and grease; some may be internally recycled but the majority is landfilled;
- Explore manufacturer willingness/capability to “take-back” damaged products;
- Spent cathodes from the aluminium refining process contain soluble fluoride, cyanide, copper and zinc and produce an alkaline leachate if made wet. These should be treated and reused (e.g. in furnaces, cryolite production, in the cement industry, or as a fuel source) or disposed of as hazardous waste.

Occupational Health and Safety

Ionising Radiation
Gamma ray testing can be used to determine metal quality and integrity. Incoming scrap metal to make recycled products may be radioactive. Radiation can cause sickness and long term health implications such as cancer.

Burns and heat stress
High temperatures and direct infra-red radiation (IR) can cause fatigue and dehydration for those working in the vicinity. Direct IR can also cause damage to sight. Burns and scalds may occur through contact with hot surfaces, metal or water especially during maintenance activities.

Noise and vibration
Sources of noise and vibration include: transport and handling of materials; furnaces; venting of steam; location and sound insulation of fans and filtration systems; casting installations; sand reclamation processes; fettling (removal of imperfections, excess metal or sand after casting by welding, grinding or chiselling); internal transport. Noise may reach levels that are hazardous to health, leading to symptoms associated with permanent deafness. Noise, particularly during unsocial hours, may cause annoyance or disruption to local communities.

Hand-arm vibration syndrome from the prolonged use of vibrating tools and machinery causes effects on the body’s blood circulation known as ‘vibration white finger’ (VWF). Other damage may be caused to the nerves and muscles of the fingers and hands causing numbness and tingling, reduced grip strength and sensitivity. Pain and stiffness in the hands, and joints of the wrists, elbows and shoulders are other possible symptoms.

Machinery
Moving parts of machinery can result in entanglement and entrapment. Particular attention should be paid to conveyors and to handling, cutting and grinding activities.
Collision
This can take the form of people being hit by vehicles, or moving or falling loads. Collisions between vehicles can also occur. Heavy loads may be lifted and moved at elevated heights using hydraulic platforms and cranes present a serious safety hazard. Grinding and cutting activities may eject pieces of scrap metal, causing injury.

Confined spaces
Smelting, refining and foundry facilities have equipment that requires entry into dangerous confined spaces. Some examples of workers at risk are maintenance workers performing repairs on a furnace or servicing a fuel tank or trailer, silo or bunker, and workers creating sand moulds where stored sand may collapse. Entry into confined spaces must be strictly controlled and avoided wherever possible.

Working hours
Long hours or night shifts can lead to fatigue, decrease wellbeing and ability to concentrate.

Manual handling and repetitive work
Lifting and carrying heavy or awkwardly shaped objects, such as bags, can result in manual handling injuries.

Slips, trips and falls
These are primarily caused by uneven surfaces, inappropriate footwear, poor lighting, weather conditions, trailing cables and pipe work, especially during unblocking, maintenance and cleaning activities.

Asbestos
Asbestos (a carcinogen) has been used on a large scale for many years as a fire proofing and insulation material. The organisation should identify the presence of asbestos, confirm its condition and encapsulate or remove it.

Removal of these materials should be undertaken by licensed contractors where available and in all circumstances should be carried out in controlled conditions to ensure that there is no release of substances or materials to the environment. Particular attention should be given to buildings constructed before the 1980s.

Fire and explosion
Processes requiring high temperatures, use of furnaces, handling liquid metal, or the use of flammable chemicals all increase fire and explosion risk.

Security
Metal processing facilities could be targets for criminal or terrorist attack and therefore appropriate security measures must be implemented to minimise this hazard.

How can a business manage these risks?

Ionising Radiation
- Gamma ray testing should be conducted in a controlled restricted area.
- All incoming scrap should be tested for radioactivity before use.

Burns and heat stress
- Shield hot surfaces where close contact is expected and implement safety buffer zones;
- Reduce exposure times for people working in extreme heat and provide suitable personal protective equipment;
- Install cooling ventilation to reduce heat stress;

Noise and vibration
- Conduct a noise survey and mark out dedicated areas with signage where there are elevated noise levels and personal protective equipment is required;
- Enclose noisy machines to isolate people from the noise where practicable;
- Reduce vibration exposure times and provide personal protective equipment where people may be exposed to vibration;
- Limit scrap handling and transport during unsocial hours to reduce noise.

Machinery
- Provision of personal protective equipment (PPE) that is fit for the task to prevent injury and maintain hygiene standards. Staff should be trained in the correct selection, use and maintenance of PPE;
- Redesign manual processes and rotate work tasks to reduce heavy lifting/repetitive activities,
• Introduce accident, fire and explosion precautions and emergency response procedures;
• Provide the local fire department with a list/volume of products stored on the premises;
• Emergency storage lagoons may be needed to prevent contaminated firewater reaching watercourses.
**Security**
• Undertake a security vulnerability assessment and consider need for upgrades to existing security measures.

3. **Financial implications**

Outlined below are key financial implications for businesses of ineffective management of E&S risks related to this sector.

• Significant capital investment in site infrastructure may be required to comply with planning constraints, permit / consent conditions and new environmental, health and safety requirements, especially if local communities raise concerns regarding the site operations;
• Fines, penalties and third party claims may be incurred for non-compliance with environment, health and safety regulations;
• Fire/explosions can result in widespread contamination and destruction, impacting surrounding land, rivers and communities. Compensation costs can be high and widespread remediation and rebuilding may be necessary;
• Soil and groundwater contamination from accidental chemical releases can be costly to remediate, especially if contamination affects neighbouring property, water supplies or public health;
• Injuries to employees may lead to increased payroll costs, lost production time and employee compensation claims;
• Many countries are signatories to the Kyoto Protocol and have adopted targets for the reduction of CO2 emissions. Where Governments have set up carbon emission reduction programmes industrial processes have been required to reduce their CO2 emissions through the setting of targets. This can result in a need for substantial investment in new/clean technologies to achieve the emission targets. These targets may be reflected in environmental permits;

• Reputational risk through poor environment, health and safety performance may impact sales or cause the local community to no longer tolerate the company’s operations (loss of a ‘social license to operate’).

4. Suggested due diligence questions

When assessing E&S risks, it is important to engage the customer on how these risks are managed. Below are suggested questions to discuss with management, as relevant to the business.

General
• What processes are undertaken and are any hazardous chemicals used? How hazardous are the materials and have associated risks been documented and addressed in appropriate systems?
• If on a site visit, note signs of poor housekeeping, inadequate/untidy storage areas and poor drum labelling. Look for evidence of any recent spills or releases of raw materials/product.

Management plans
Confirm that the business has put in place at minimum, the following items in its E&S risk management systems:

• Operational policies and procedures for managing environmental, health, safety, labour and community matters. These systems should cover both employees and contractors.

• Accountability and responsibility for environmental, health and safety, and labour matters. Is there evidence of management review/demonstrated involvement in environment, health, safety and hygiene management? This should include senior management oversight.

• Improvement objectives, targets, project plans and monitoring programmes.

• Training for personnel, including ensuring that personnel are trained in the risk associated with their job and the correct use of personal protective equipment;

• Regular inspections, checks and audits with records to demonstrate achievement of the required level of performance against legal requirements;

• Energy conservation schemes and development of programmes to reduce greenhouse gas emissions.

• Emergency plans for environment, health and safety accidents or hygiene non-compliance incidents.

• Waste management plan (waste minimisation, re-use, recycling, monitoring).

• Stakeholder engagement plans / programmes.

• Financial investment plans directly or indirectly related to management of environment, health and safety and labour issues.

• Closure and Remediation Plan, where relevant;

Air emissions management (including noise)
• What levels of air emissions are permitted? Have they previously exceeded their permitted levels of emissions?

• Have they installed abatement technology to reduce atmospheric emissions?
• Has employee exposure to potentially harmful off-gases been assessed and controlled?

• If operations include aluminium processing, are there measures in place to control PFC emissions?

• Are ore/powdered material/sand moved around the site by conveyor or by vehicle?

• Is there local exhaust ventilation? Is it maintained?

• Are there any dust control measures? Are they used and effective? Is there any build-up of dust on machinery or other surfaces?

• If on a site visit, note the noise and dust levels and any odours at the site. Is there any evidence of noise/dust/odour abatement measures deployed or that might be required (e.g. hearing protection)?

**Water abstraction & management**

• What amounts and quality of water are required? Where is the water obtained from?

• Are measures in place to recycle water? Will there be any planned changes which may affect the demand for water? Will existing resources be able to meet demand?

**Wastewater management**

• What liquid effluents are produced? What discharge control measures are employed?

• Is effluent and wastewater treated before discharge? If on a site visit, check the condition of the treatment plant and location of discharge points for effluent and wastewater from the facility. What does the quality of these discharges look like? Note the colour and appearance of adjacent watercourses.

• Does the wastewater treatment plant discharge to ground, a local watercourse or the municipal wastewater treatment works? Higher environmental risks will be associated with facilities discharging to water courses without adequate treatment.

• Is the wastewater quality tested and if so, for what? What are the waters tested for? Where are the samples taken from, and how often? Do the discharges have to meet set standards?

• Check regulatory compliance - are all necessary licences/permits/discharge consents in place?

• Efficiency of wastewater treatment (facility/municipal) is critical - investigate type, effectiveness and monitoring of final effluent and sludge disposal. What are the regulatory compliance discharge consents, enforcement and costs?

• Are there any other discharges of effluent off the site?

• Will the presence of the installation lead to change in the type or volume of waste-water produced? Will the existing waste water infrastructure be able to treat expected future volumes?

**Solid waste management**

• Note nature of solid waste disposal;

• If on a site visit, check that solid waste storage equipment is in a good condition, that waste storage areas are clear of debris and that skips are covered to prevent waste escaping, for example, check that waste containers have lids or are stored in an area with a roof;

• If on a site visit, check for flora/vegetation zones near storage sites that are not growing very well as this will indicate the possibility of pollution;

• How is hazardous waste removed? How are appropriate contractors selected and monitored to ensure that the waste is being taken to an appropriate waste disposal facility?

**Transport of materials to or from the site**

• How are chemicals transported (e.g. road, water or rail), and what are their potential impacts?
• If on a site visit, check the age and condition of equipment and vehicles. Look for signs of wear and tear, degradation, leaks and breaks;
• Where are the areas for loading/unloading of material located? Are they located near any water bodies or other possibly sensitive features? Is there any containment to prevent run-off of contaminated water?
• Does road haulage cause excessive traffic through any neighbouring residential areas?

Storage
• If on a site visit, what fuels and materials are stored in bulk on site? What is the condition of storage facilities for raw materials, finished products and fuel?
• What is the potential for spillages and leakages to enter soil or stormwater drainage systems? Are surface tanks and usage areas hard surfaced and bunded? If on a site visit look to see whether these are in good condition. Is the volume of the bunded area adequate to contain the stored materials? Are they regularly cleaned and inspected and tested for leakages? Are alarms installed to detect leaks from storage areas?

Health & safety
• Do staff wear Personal Protective Equipment?
• If on a site visit, check signage around the site:
  – Does it convey the health and safety risks?
  – Are fire exits and/or evacuation routes clearly marked?
  – Are there demarcated routes for pedestrians and vehicles?
• Is first aid equipment available? Is there a trained and competent first aid resource on site?
• If on a site visit, check the age and condition of equipment, look for signs of wear and tear, degradation, leaks and breaks. Check for automatic safeguards on machinery to prevent accidental injury;
• Is there worker health monitoring programme? What does it check for?
• Have workers been historically exposed to materials that could potentially lead to occupation health diseases?

Incident management
• Is site safety equipment clearly signed and readily available, e.g. fire extinguisher(s), eye wash, safety shower, first aid equipment, emergency escape routes, emergency stop, decontamination equipment, and absorbent materials?
• Have there been any recent incidents on site such as fatalities, fires/explosions, spills?
• Assess emergency responses to fires, major spills and explosions (in some countries it may be a legal requirement to have an emergency response plan). Does the organisation have an emergency response plan which includes an engagement plan to disseminate information to local communities at risk?
• Does the organisation have insurance to cover any significant damage to the environment/community/operations (this may be covered by public liability insurance or the organisation may be party to an industry insurance scheme). Review the terms of the cover and identify any exclusions relevant to environmental and health and safety matters. Identify the number and type of claims against insurance in the past.

Inspections & regulation
• Check the conditions and duration of validity for all permits. Will any planned changes at the facility require revisions to the permits or require new consents?
• What systems are in place to check and maintain assets and infrastructure?
• Have the premises been inspected recently by the regulatory authorities for health and safety, labour conditions, hygiene and environment? What were their findings?

• Has the organisation been subject to environment, health and safety or quality audits by customers/insurers? What was the outcome of these audits?

• Does the organisation have insurance in place to cover the recall of contaminated/ faulty products? Have there been any recent product recall incidents? If yes, what did these relate to?

• Review historical and projected trends for environmental fees and fines. It is also suggested that contact is made with local regulatory agencies to determine compliance and whether complaints have been made by the public.

Social, labour and community
• Check that labour standards, contracting and remuneration are in line with national law and are consistent with the average for the sector;

• Check that hours worked, including overtime, are recorded. Staff should receive written details of hours worked and payment received;

• Check that wages and working hours are consistent with the average for the sector and national standards;

• Has the company received inspections from the local labour inspectorate in the previous three years? Have these resulted in any penalties, fines, major recommendations or corrective action plans?

• Does the organisation have a grievance mechanism, which allows employees to raise workplace concerns?

• Are employees free to form, or join, a worker’s organisation of their choosing?

Take note of/ask questions relating to any activities that manage risk as listed in the earlier sections of this document.

Investment
• Where are the organisations main markets? Are they manufacturing or exporting to the EU? Will new product standards such as REACH regulation be relevant? Could the organisations markets and hence revenue be impacted by REACH? Is investment required?

• Review budgets for capital expenditure and operational expenditure to cover EHS matters. Does the business plan have line items for Environment, Health and Safety improvements as well as asset management and maintenance?

• If investment or refinancing will lead to restructuring of the organisation what will be the potential impacts on health and safety at the operation and wider community? Have these been considered and assessed by the company?

• If the company plans to invest in new technology, what will be the impacts and benefits for human resources?
5. References and additional sources

Castings Technology International 2004, Land Contamination at Foundry Sites,  

European Aluminium Association (EAA), http://www.alueurope.eu/

Best Available Techniques in the Smitheries and Foundries Industry, May 2005,  
http://eippcb.jrc.es/pub/english.cgi/0/733169

European Commission 2001, Integrated Pollution Prevention and Control; Reference Document on  
Best Available Techniques in the Non Ferrous Metals Industries, December 2001,  

European Bank for Reconstruction and Development (EBRD). Environmental and Social Policy May  


International Finance Corporation (IFC) Environmental, Health and Safety Guidelines. See guidelines  
on Foundries and Base Metal Smelting and Refining  
http://www.ifc.org/wps/wcm/connect/Topics_Ext_Content/IFC_External_Corporate_Site/IFC+Sustainability/Sustainability+Framework/Environmental,+Health,+and+Safety+Guidelines/

International Labour Organisation (ILO) 2003, Code of Practice on Safety and Health in the Non-ferrous Metals Industries  

ILO Declaration on Fundamental Principles and Rights at Work Information:  

International Organisation for Standardisation (ISO) www.iso.org  
Geneva: ISO. (confirmed in 2008, and to be revised in 2014:  

NACE Rev. 2 Statistical classification of economic activities in the European Community  


United Kingdom Environment Agency 2009, Non-Ferrous Metals and the Production of Carbon and  

United Kingdom Health and Safety Executive, Health and Safety in the Molten Metals Industry,  
http://www.hse.gov.uk/moltenmetals/index.htm

http://www.unece.org/trans/danger/publi/ghs/ghs_rev05/05files_e.html