Energy Use and Conservation

All economic operations consume energy to power processes such as heating and cooling; auxiliary systems such as motors, pumps and fans; generating compressed air; heating, ventilation and air conditioning systems (HVAC); lighting systems or other industry-sector specific processes.

Energy consumption is typically associated with specific production processes and supporting utilities such as:

- **Process heating:** This is vital to many manufacturing processes including heating for fluids, calcining, drying, heat treating, metal heating, melting, melting agglomeration, curing and forming. In many process heating systems, only a portion of the system's energy input provides true process heating while energy losses are caused by excessive parasitic loads, distribution or conversion losses. Energy losses can be reduced by identifying opportunities for improvement in a facility's process heating systems.
- **Process cooling:** This is vital to many manufacturing processes and energy losses occur due to issues such as lack of insulation to reduce heat gains; overcooling; poor refrigeration system design; and refrigerant compressor and chiller efficiency. Energy losses can be reduced by identifying opportunities for improvement in a facility's process cooling systems.
- **Compressed air:** In many industry sectors, this is the most commonly found utility service, yet in many cases, the energy contained in compressed air for use by a facility is often 10 percent or less the energy used in compressing the air.

The production of energy entails the use of renewable or non-renewable resources. Energy from renewable resources includes solar power, wind power, hydropower, biomass and nuclear fission and fusion. Non-renewable resources include crude oil, coal and natural gas, which are collectively called fossil fuels. Fossil fuels are considered non-renewable resources due to the long duration of formation and assimilation to the environment. The combustion of fossil fuels to produce energy generates different types of air pollution, including greenhouse gases (GHGs) that can harm global environmental systems and human health. Emissions of pollutants and GHGs can be reduced by using renewable forms of energy.

Where possible, operations should reduce overall energy use at the facility level by managing the energy consumption associated with specific production processes and supporting utilities, which would result in cost savings.

Air Emissions and Air Quality

Emissions of air pollutants can occur from a wide variety of activities during construction, operation and decommissioning of any economic operation.

Air emissions are typically associated with processes such as combustion, storage of materials or other industry-sector specific processes and can be:

- **Point sources:** These are discrete, stationary, identifiable sources of emissions (such as a specific stack, vent or other discrete point of emission) that release pollutants to the atmosphere. They are typically located in manufacturing or production plants. Point sources are characterized by the release of air pollutants typically associated with the combustion of fossil fuels, such as nitrogen oxides (NOx), sulfur dioxide (SO2), carbon monoxide (CO), and particulate matter (PM), as well as other air pollutants including certain volatile organic compounds (VOCs) and metals that may also be associated with a wide range of industrial activities.
- **Fugitive sources:** These are emissions that are distributed spatially over a wide area and originate in operations where exhausts are not captured and released through a stack. Fugitive emissions have the potential for much greater ground-level impacts than stationary source emissions, since they are discharged and dispersed close to the ground. The two main types of fugitive emissions are volatile organic compounds (VOCs) and particulate matter (PM). Other contaminants (NOx, SO2 and CO) are mainly associated with combustion processes designed to deliver electrical or mechanical power, steam and heat.
- **Mobile sources:** These are emissions associated with vehicle use and include CO, NOx, SO2, PM and VOCs. Emissions can be reduced by implementing a regular vehicle maintenance and repair program, instructing drivers on better driving practices that reduce both the risk of accidents and fuel consumption, replacing older vehicles with newer, more fuel efficient alternatives, converting to cleaner fuels and installing emissions control devices such as catalytic converters.

Responsible investors and/or clients should estimate and monitor air emissions associated with operations through qualitative or quantitative assessments and atmospheric dispersion models to assess potential ground level concentrations and environmental impacts. At a facility level, air emissions should not result in pollutant concentrations that exceed the ambient air quality standards set by national authorities. Pollutant concentrations can also be compared to international best practice and standards to identify any deviations, which would indicate poor performance of an operation. Air emissions of concern typically include:

- **Volatile Organic Compounds (VOCs):** Emissions of VOCs are associated with industrial activities that produce, store and use VOC-containing liquids or gases in particular where the material is under pressure. Typical sources include equipment leaks (from valves, fittings and elbows), open vats and mixing tanks, storage tanks, unit operations in wastewater treatment systems and accidental releases. Emissions can be reduced by modifying

equipment, regularly monitoring equipment to detect and repair leaks, using less volatile substances such as aqueous solvents and collecting vapours through air extractors.

- **Particulate Matter (PM):** Dust or particulate matter (PM) is released during certain operations such as the combustion of fossil fuels, open storage of solid materials, and from exposed soil surfaces, including unpaved roads. Emissions can be reduced through dust control methods such as covers, water suppression, or increased moisture content for open materials storage piles, or controls (such as a baghouse or cyclone).
- **Ozone Depleting Substances (ODS):** Ozone depleting substances (ODSs) include chemicals, which have been scheduled for phase-out under the Montreal Protocol on Substances that Deplete the Ozone Layer. Systems or processes using chlorofluorocarbons (CFCs), halons, 1,1,1-trichloroethane (methyl chloroform), carbon tetrachloride, hydrochlorofluorocarbons (HCFCs), hydrobromofluorocarbons (HBFCs), and methyl bromide should be gradually phased out or not used at all. These chemicals are typically used in a variety of applications including refrigeration, air conditioning, manufacturing foam products, solvent cleaning, aerosol propellants, fire protection systems and as crop fumigants.
- **Greenhouse Gases (GHGs):** Greenhouse Gases (GHGs), as defined under the Kyoto Protocol to the United Nations Framework Convention on Climate Change, include carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF6). GHGs can be generated by a facility's production processes as well as from the production of power (on-site or off-site) for use by the facility. Emissions can be reduced through mechanisms such as carbon financing, energy efficiency, sustainable forms of agriculture and forestry, use of renewable forms of energy, carbon capture and storage technologies, recovery and use of methane in waste management and energy distribution.
- **Sulfur dioxide (SO2):** Sulfur dioxide (SO2) is mainly produced by the combustion of fuels such as oil and coal and as a by-product from some chemical production or wastewater treatment processes. Emissions can be reduced through the use of alternate fuels such as low sulfur coal, light diesel or natural gas, emissions control technologies.
- **Toxics (mercury):** Mercury exists as elemental mercury, inorganic mercury compounds (primarily mercuric chloride), and organic mercury compounds (primarily methyl mercury). All forms of mercury are toxic and each form exhibits different health effects. A major source of exposure to elemental mercury is through inhalation in the work place. Sources of inorganic mercury compounds are generally low as their use has mostly been banned but limited exposure can occur through the use of old cans of latex paint. Sources of methyl mercury include fungicide-treated grains and meat from animals fed with treated grain.

Where possible, operations should avoid, minimize and control adverse impacts to human health, safety and the environment from emissions to air. The generation and release of air emissions can be managed through a combination of energy use efficiency, process modification, selection of fuels or other materials and application of emissions control techniques..

Wastewater and Water Quality

All business operations generate wastewater, which is treated on site and/or discharged either to the municipal sewage system for treatment or directly to the environment (surface water) without prior treatment.

Wastewater includes process wastewater, wastewater from utility operations, stormwater and sanitary wastewater. Wastewater will vary in quality and quantity by industry sector and typically includes:

- **Process wastewater:** Pollutants may include acids, bases, and many others. These include soluble organic chemicals, suspended solids, nutrients (phosphorus and nitrogen), heavy metals (such as cadmium, chromium, copper, lead, mercury, nickel and zinc), cyanide, toxic organic chemicals, oily materials and volatile materials. The costs of treating process wastewater can be significant.
- **Wastewater from utilities operations:** Utility operations such as cooling towers and demineralization systems may result in high rates of water consumption, as well as the potential release of high temperature water containing high dissolved solids, residues of biocides and residues of other cooling system anti-fouling agents.
- **Stormwater:** Stormwater includes any surface runoff and flows from process and materials staging areas resulting from precipitation or drainage. Typically stormwater runoff contains suspended sediments, metals, petroleum hydrocarbons, Polycyclic Aromatic Hydrocarbons (PAHs) and coliform. Rapid runoff, even of uncontaminated stormwater, also degrades the quality of the receiving water by eroding stream beds and river banks.
- **Sanitary wastewater:** This may include effluents from domestic sewage, food service and laundry facilities serving site employees and can also include other sources such as from laboratories, medical infirmaries, equipment maintenance shops and water softening.

The quality, quantity, sources and discharge points of liquid effluents by type (process, utilities operations, stormwater and sanitary) should be monitored. At a facility level, discharges of wastewater should not result in contaminant concentrations in excess of the effluent discharge quality standards of national regulations. Discharge quality can also be compared to international best practice and standards to identify any deviations, which would indicate poor performance of an operation. The generation and discharge of wastewater should be managed to reduce the volume of water requiring specialized treatment by improving water use efficiency, modifying production processes (including the use of hazardous materials that contaminate water), and treating wastewater on-site prior to discharge in order to reduce the load of contaminants.

Where possible, all operations should avoid, minimize and control adverse impacts to human health, safety and the environment from wastewater generation through wastewater management, water conservation and reuse.

Water Use and Conservation

All economic operations use water in various production processes, which vary by industry sector. Typically, water use at the facility level is associated with processes such as described here.

- **Process water:** Processes that typically use large quantities of water include washing machines, rinsing, water jets or sprays to keep conveyors clean or to cool product, and the use of tanks, which are refilled to control losses. Opportunities for reducing water use exist through water reuse, improved equipment maintenance and better process design.
- **Building facility operations:** Consumption of building and sanitary water is typically less than that of industrial processes. Areas for reducing water use include repairing leakages and installing water-saving devices.
- **Cooling systems:** Once-through cooling systems with cooling towers use large quantities of water and can be replaced by closed circuit cooling systems. Fresh water use can also be reduced by replacing it with treated water.
- **Heating systems:** Closed heating systems based on the circulation of low or medium pressure hot water may consume large quantities of water if they leak and are poorly maintained. In some cases, large quantities of water may be used by steam systems but water use can be reduced through steam recovery systems and improved systems operations.

Where possible, all economic operations should reduce overall water use at the facility level by managing the water consumption associated with specific production processes to avoid excess costs.

Hazardous Materials Use

An economic operation may require the use of materials that are hazardous. Hazardous materials are materials that represent a risk to human health, property, or the environment due to their physical or chemical characteristics.

These can be classified according to the hazard as explosives; compressed gases, including toxic or flammable gases; flammable liquids; flammable solids; oxidizing substances; toxic materials; radioactive material; and corrosive substances.

Economic operations may involve the production, handling, storage and use of large quantities of hazardous materials. This can result in uncontrolled releases of hazardous materials or accidents if the necessary measures to prevent accidents such as fire and explosions or leaks and spills are not in place or the workplace does not have procedures to respond to emergencies. Those responsible need to ensure that prevention and control measures are in place to ensure the protection of the workforce and surrounding communities from hazardous materials used at a facility. Typically, prevention and control measures of hazardous materials include:

- **Non-hazardous substitutes.** Avoiding or minimizing the use of hazardous materials in processes by using nonhazardous alternatives. For example, there are non-hazardous materials that can be used as substitutes for asbestos in building materials, PCBs in electrical equipment, persistent organic pollutants (POPs) in pesticides formulations, and ozone depleting substances in refrigeration systems.
- **Release prevention and control planning.** When handling hazardous materials, a client/investee needs to develop procedures and practices for quick and efficient responses to accidents. Where there is risk of a spill of hazardous materials, facilities should prepare a spill control, prevention, and countermeasure plan, which would include training and drills of key staff on release prevention, inspection programs, and secondary containment structures.
- **Hazard communication and training programs.** Workers should be able to recognize and respond to workplace chemical hazards and have a clear understanding of hazard identification and safe operating and materials handling procedures. This also requires the need for suitable personal protection equipment (PPE includes footwear, masks, protective clothing and goggles), emergency eyewash and shower stations, ventilation systems and sanitary facilities.
- **Hazardous materials transfer.** Uncontrolled releases of hazardous materials may result from small cumulative events or from significant equipment failure associated with events such as manual or mechanical transfer between storage systems or process equipment. Hazardous material releases from processes can be prevented through the use of dedicated

fittings, pipes, and hoses, regular inspection and maintenance of fittings, pipes, and hoses, and the use of secondary containment.

- **Overfill protection.** The overfilling of vessels and tanks is among the most common cause of spills resulting in soil and water contamination, and can easily be prevented.
- **Reaction, fire, and explosion prevention.** Reactive, flammable, and explosive materials should be managed to avoid uncontrolled reactions or conditions resulting in fire or explosion. Incompatible materials (acids, bases, flammables, oxidizers, reactive chemicals) should be stored in separate areas, and with containment facilities separating material storage areas.
- **Secondary containment.** The use of secondary containment is a critical aspect for controlling accidental releases of liquid hazardous materials during storage and transfer. Appropriate secondary containment structures consist of berms, dikes, or walls, made of impervious, chemically resistant material, capable of containing the larger of 110 percent of the largest tank or 25% percent of the combined tank volumes in areas with above-ground storage tanks (ASTs) with a total storage volume equal or greater than 1,000 liters.
- **Underground Storage Tanks (USTs).** Although there are many environmental and safety advantages of underground storage of hazardous materials, including reduced risk of fire or explosion, and lower vapor losses into the atmosphere, leaks of hazardous materials can go undetected for long periods of time with potential for soil and groundwater contamination. The risk of leaks can be reduced by installing impermeable liners or structures such as concrete vaults under and around tanks, reconciling tank contents by measuring the volume and comparing it against the expected volume, regular testing of the integrity of the tank, and monitoring down-gradient groundwater quality for potential contamination.
- **Pesticide use.** When pest management activities include the use of pesticides, pesticides that are low in human toxicity and have minimal effects on non-target species and the environment should be used. Selected pesticides should be packaged in safe containers, clearly labelled for safe and proper use, and manufactured by a licensed entity. Pesticide should be handled, stored, applied, and disposed of in accordance with best international practice (Food and Agriculture Organization's International Code of Conduct on the Distribution and Use of Pesticides). Pesticides that are categorized as extremely hazardous, highly hazardous, and moderately hazardous by the World Health Organization Recommended Classification of Pesticides should not be used.

Where possible, economic operations should reduce the use and/or potential spills and releases of hazardous materials at the facility.

Wastes

Economic operations may generate, store, or handle any quantity of hazardous or non-hazardous waste across a range of industry sectors.

Waste can be solid, liquid, or contain gaseous material that is discarded by disposal, recycling, burning or incineration. It can be a by-product of a manufacturing process or an obsolete commercial product that can no longer be used for its intended purpose and requires disposal. Inappropriate waste disposal practices can lead to contamination of ground water or potential fines.

Solid (non-hazardous) waste generally includes domestic trash, inert construction/demolition materials, metal scrap and empty containers (except those previously used to contain hazardous materials, which should be managed as a hazardous waste), and residual waste from industrial operations.

Hazardous waste shares the properties of a hazardous material (such as ignitability, corrosivity, reactivity, or toxicity), or other physical, chemical, or biological characteristics that may pose a potential risk to human health or the environment if improperly managed. When a hazardous material is no longer usable for its original purpose and is intended for disposal, but still has hazardous properties, it is considered a hazardous waste. Typically, hazardous wastes include solvents, fuels, asbestos in building materials, PCB oils in electrical equipment, most pesticides, and ozone depleting substances in refrigeration systems. Wastes may also be defined as “hazardous” by local regulations or international conventions, based on the origin of the waste and its inclusion on hazardous waste lists or based on its characteristics. Hazardous wastes should always be segregated from nonhazardous wastes.

Facilities that generate and store wastes need to consider issues linked to waste minimization, generation, transport, and disposal. Typically, approaches to waste management include:

- **Waste management planning.** Facilities that generate waste should characterize their waste according to composition, source, types of wastes produced, generation rates, or according to local regulatory requirements. This information can be used to identify opportunities for pollution prevention, such as source reduction, reuse, and recycling.
- **Waste prevention.** Processes can be designed and operated to prevent, or minimize, the quantities of wastes generated and hazards associated with the wastes generated. This can be accomplished by substituting raw materials or inputs with less hazardous or toxic materials, or with those where processing generates lower waste volumes, and improving manufacturing processes to convert materials more efficiently.
- **Recycling and reuse.** The total amount of waste can be significantly reduced through the implementation of recycling and reuse plans. This entails identifying and recycling products that can be reintroduced into the manufacturing process or industry activity at a site or in industrial

processing operations located at other facilities. It also includes identifying materials that can be reused, saving both costs and disposal needs.

- **Treatment and disposal.** If waste materials are still generated after the implementation of feasible waste prevention, reduction, reuse, recovery and recycling measures, waste materials should be treated and disposed of while considering all measures to avoid potential impacts to human health and the environment. Typical treatment and disposal methods include on-site or off-site biological, chemical, or physical treatment of the waste material to render it non-hazardous prior to final disposal; and treatment or disposal at permitted facilities specially designed to receive the waste.
- **Hazardous waste storage.** Hazardous waste should be stored so as to prevent or control accidental releases to air, soil, and water resources. This requires the need for storage in closed containers away from direct sunlight, wind and rain; secondary containments; and the provision of adequate ventilation where volatile wastes are stored.
- **Hazardous waste transportation.** On-site and off-site transportation of waste should be conducted using appropriate protocols to prevent or minimize spills, releases, and exposures to employees and the public. All waste containers designated for off-site shipment should be secured and labelled with the contents and associated hazards, and be properly loaded on the transport vehicles before leaving the site.
- **Hazardous treatment and disposal.** In the absence of qualified commercial or government-owned waste vendors, facilities generating waste should have the technical capability to manage the hazardous waste or install on-site waste treatment or recycling processes in a manner that reduces immediate and future impacts to the environment. This may also require the need for applicable permits, certifications, and approvals.
- **Small quantities of hazardous waste.** Hazardous waste materials are frequently generated in small quantities by many projects through a variety of activities such as equipment and building maintenance activities. Waste storage collection and storage areas should be visually inspected on a regular basis for evidence of accidental releases and to verify that wastes are properly labelled and stored. These types of wastes include spent solvents and oily rags, empty paint cans, chemical containers; used lubricating oil; used batteries (such as nickel-cadmium or lead acid); and lighting equipment, such as lamps or lamp ballasts.

Where possible, all economic operations should implement sound waste management practices at the facility.

Land Contamination

Land can become contaminated due to releases of hazardous materials, wastes, or oil, including naturally occurring substances.

Releases of these materials may be the result of historic or current site activities, including accidents during their handling and storage, or due to poor management or disposal. Land is considered contaminated when it contains hazardous materials concentrations, including oil, above baseline and/or naturally occurring levels.

Contaminated lands may involve topsoils or subsurface soils that, through leaching and transport, may affect groundwater, surface water, and adjacent sites. Where subsurface contaminant sources include volatile substances, soil vapour may also create potential for contamination through infiltration of indoor air spaces of buildings.

Land contamination is a concern when hazardous materials, waste, or oil are present in any environment at potentially hazardous concentrations and the potential for contact with humans, wildlife, plants, and other living organisms exists. This may occur when a contaminant migrates from its point of release (e.g., leaching into potable groundwater) and humans or other living organisms are exposed to it (e.g., through ingestion or skin absorption). This has potential risks to human health(e.g., risk of cancer) and ecology and represents a liability to the polluter/business owners (e.g., cost of remediation, damage of business reputation and/or business-community relations) or affected parties (e.g., workers at the site and nearby property owners).

Land contamination should be avoided by preventing or controlling the release of hazardous materials, hazardous wastes, or oil to the environment. When contamination of land is suspected or confirmed during any project phase, the cause of the uncontrolled release should be identified and corrected to avoid further releases and associated adverse impacts. Contaminated lands should be managed to avoid the risk to human health and ecological receptors. This requires cleanup to reduce the level of contamination at the site while preventing human exposure.

In cases of land contamination representing an immediate risk to human health and the environment, appropriate risk reduction should be implemented as soon as practicable to remove the imminent hazard. Risk mitigation strategies should be developed based on site-specific conditions and target contaminant source reduction, taking into consideration technical and financial feasibility. To protect human health, access to a contaminated site should be limited or prevented, for example through signage, fencing, or site security. This may also require capping contaminated soil with clean soil to prevent human contact, introducing certain plants into contaminated soils or paving them over as an temporary measure to prevent direct contact.

Therefore necessary measures should be undertaken to prevent releases of hazardous materials, waste, or oil to the ground..

Biodiversity and Natural Resources

Land use and conversion to support an economic operation not only results in increased erosion of the topsoil but can also impact biodiversity due to habitat loss and fragmentation.

Land use and conversion to support a client's/investee's operations not only results in increased erosion of the topsoil, which leads to sedimentation of streams and rivers and degrades water quality, but can also impact biodiversity due to habitat loss and fragmentation. A reduction in biodiversity diminishes the capacity of ecosystems to provide a stable and sustainable supply of essential goods and services such as clean air and water and also reduces genetic variability, which could potentially decrease the amount of natural resources available for future use.

Protecting and conserving biodiversity – the variety of life in all its forms, including genetic, species and ecosystem diversity – and its ability to change and evolve, is fundamental to sustainable development. The components of biodiversity, as defined in the Convention on Biological Diversity, include ecosystems and habitats, species and communities, and genes and genomes, all of which have social, economic, cultural and scientific importance. Clients/Investees need to avoid or mitigate threats to biodiversity arising from their operations as well as sustainably manage renewable natural resources as most national environmental legislations protect biodiversity and regulate the use of natural resources. Any violation of legislations can result in fines and/or penalties.

The destruction of habitat (natural and modified) is recognized as the major threat to the maintenance of biodiversity. Natural habitats consist of land and water areas where the biological communities are formed largely by native plant and animal species, and where human activity has not essentially modified the area's primary ecological functions. Modified habitats are typically altered natural habitats, often with the introduction of alien species of plants and animals, such as agricultural areas. Both types of habitat can support important biodiversity at all levels, including endemic or threatened species.

Within both natural and modified habitats, there may be critical habitats that are required for the survival of critically endangered or endangered species or for endemic or restricted-range species and migratory species. The intentional or accidental introduction of alien, or non-native, species of flora and fauna into areas where they are not normally found can be a significant threat to biodiversity, since some alien species can become invasive, spreading rapidly and out-competing native species.

Typically, measures to protect biodiversity include:

- **Modified habitats.** The client/investee needs to minimize any conversion or degradation of habitat and identify opportunities to enhance habitat and protect biodiversity as part of operations.
- **Natural habitats.** The client/investee needs to ensure that habitat is not converted or degraded unless there are no other alternatives and the overall benefits of keeping operations in that locations outweigh impacts to the environment and biodiversity. In cases of any conversion or degradation, the client/investee needs to ensure that appropriate mitigation measures are implemented.
- **Legally protected areas.** In cases where a client's/investee's operations are located within a legally protected area under national regulations, the client's/investee's operations need to comply with the requirements established in the protected area management plans and consult with protected area managers, local communities, and other key stakeholders.
- **Invasive alien species.** The client/investee cannot introduce any new alien species unless this is appropriately managed within an existing regulatory framework or action plan to determine the potential for invasive behaviour. The client/investee should prevent accidental or unintended introductions of any alien species with a high or known risk of invasive behaviour.

If operations involve the use of natural resources such as forests and aquatic species, these need to be managed in a sustainable manner, to meet the reasonably foreseeable needs of future generation. The sustainable management of natural resources involves the following:

- **Natural and plantation forests.** The client/investor should not cause any conversion or degradation of critical habitat and give preference to land that has already been converted. The exploitation of natural forests and plantations needs to be independently certified against internationally accepted principles and criteria for sustainable forest management.
- **Freshwater and marine systems.** The client/investor needs to demonstrate that the production and harvesting of fish populations or other aquatic species is conducted in a sustainable manner. If available, this includes certification by an internationally accepted system of standards.

Labour and Working Conditions

The pursuit of economic growth through employment creation and income generation should be balanced with protection for basic rights of workers.

For any business, the workforce is a valuable asset, and a sound worker-management relationship is a key ingredient to the long-term sustainability of the enterprise. Failure to establish and foster a sound worker-management relationship can undermine worker commitment and retention, result in labor strikes, and can jeopardize a client's/investee's operations. Conversely, through a constructive worker-management relationship, and by treating the workers fairly and providing them with safe and healthy working conditions, clients/investees may create tangible benefits, such as enhancement of the efficiency and productivity of their operations.

A commitment to establish a sound worker-management relationship encompasses the following aspects:

- **Human resources policy.** An economic operator should adopt a policy appropriate to its size and workforce, which sets out its approach to managing employees. The policy provides information regarding their rights under national labour and employment law, including their rights related to wages and benefits.
- **Working conditions and terms of employment.** An economic operator should document and communicate to all employees and workers (including contract workers) their working conditions and terms of employment. These include their entitlement to wages and benefits, hours of work, overtime arrangements and overtime compensation, and leave for illness, maternity, vacation or holiday, that at a minimum comply with national law. This includes respecting a collective bargaining agreement with a workers' organization if there is such an agreement.
- **Workers' organizations.** Employees should be granted the right to associate freely and to bargain collectively, by forming and joining workers' organizations or through alternative means. An economic operator should not discourage workers from forming or joining workers' organizations and should not discriminate or retaliate against workers who participate in such organizations and bargain collectively.
- **Non-discrimination and equal opportunity.** An economic operator should not make employment decisions on the basis of personal characteristics unrelated to inherent job requirements but rather on the principle of equal opportunity and fair treatment.
- **Retrenchment.** If an economic operator anticipates the elimination of a significant number of jobs or a layoff of a significant number of employees, it should develop a plan for managing the adverse impacts on employees.

- **Grievance mechanism.** An economic operator should provide all employees with a mechanism to raise reasonable workplace concerns, confidentially or anonymously if needed, so that concerns can be addressed promptly at the management-level without any retribution.
- **Child labour and forced labour.** An economic operator cannot employ children in a manner that is economically exploitative, or is likely to be harmful to the child or to interfere with the child's education. An economic operator cannot employ forced labour, which consists of any work or service not voluntarily performed by an individual but executed under threat of force or penalty.
- **Supply chain.** An economic operator should pay attention to unfair labour practices of its suppliers, especially in instances where low labour cost is a factor in the competitiveness of supplies, and ensure that this is not due to harmful labour practices.

Respecting international standards with regard to labour and working conditions benefits an enterprise by encouraging positive worker-management relationships that lead to more productive and stable operations, including a reduced likelihood of strikes, and provides a reputational advantage that comes from enhanced public recognition that good international standards are being followed.

Occupational Health and Safety

Providing workers with a safe and healthy work environment, free from physical, chemical, biological, and radiological hazards inherent in a particular industry sector, is essential for ensuring the long-term sustainability of an economic operation.

An economic operator is required to implement all reasonable precautions to prevent accidents, injury, and illness of workers in the course of performing their duties. This includes following industry-specific worker's safety standards and implementing preventive and protective measures to:

- **Eliminate hazards** by removing an activity from the work process (such as substitution with less hazardous chemicals or use of different manufacturing processes);
- **Control the hazard** at its source through use of engineering controls (such as local exhaust ventilation, isolation rooms, machine guards, and acoustic insulation);
- **Minimize the hazard** through design of safe work systems and procedural control measures (such as job rotation, training safe work procedures, lock-out and tag-out, workplace monitoring, and limiting exposure or work duration); and
- **Provide appropriate personal protective equipment (PPE)** in conjunction with training, use and maintenance of the PPE. PPE provides additional protection to workers exposed to workplace hazards in conjunction with other facility controls and safety systems.

An economic operator's efforts to protect the health and safety of workers in the design and operation of facilities encompass the following aspects:

- **Integrity of workplace structures.** Facilities should be structurally safe and floors/surfaces should be free of accumulated material.
- **Severe weather and facility shutdown.** Facilities should be designed and constructed to withstand the expected elements for the region and have an area designated for safe refuge of workers.
- **Workspace and exit.** The workspace provided for each worker should be adequate for safe execution of all activities and passages to emergency exits should be unobstructed at all times.
- **Fire precautions.** The workplace should be designed to prevent the start of fires and the facility should be equipped with fire detectors, alarm systems, and fire-fighting equipment.
- **Lavatories and showers.** Adequate lavatory facilities (toilets and washing areas, including hot and cold running water, soap, and hand drying devices) should be provided for the number of people expected to work in the facility and segregated by gender, if necessary.
- **Potable water supply.** Adequate supplies of potable drinking water (meeting drinking water quality standards) should be provided and supplied to areas

of food preparation or for the purpose of personal hygiene (washing or bathing).

- **Clean eating area.** A clean eating area needs to be designated within the facility, where workers are not exposed to hazardous or noxious substances.
- **Lighting.** Workplaces should receive natural light and be supplemented with sufficient artificial illumination to promote workers' safety and health, and enable safe equipment operation.
- **Safe access.** Passageways around the facility should be segregated for pedestrians and vehicles; hand, knee and foot railings should be installed on stairs, fixed ladders, and platforms; floor openings should be covered; covers to protect against falling items should be installed; and measures to prevent unauthorized access to dangerous areas should be in place.
- **First aid.** Appropriately equipped first-aid stations should be easily accessible throughout the place of work, including Eye-wash stations and/or emergency showers.
- **Air supply.** Sufficient fresh air should be supplied for indoor and confined work spaces, through appropriate air distribution systems, including heating, ventilation and air conditioning (HVAC).
- **Work environment temperature.** During hours of operation, the temperature in work, rest rooms and other welfare facilities should be maintained at an appropriate level.

Physical hazards in the workplace represent potential risks of accidents, injury or illness due to repetitive exposure to mechanical action or work activity. This may result in a wide range of injuries, from minor and medical aid only, to disabling, catastrophic, and/or fatal. Multiple exposures over prolonged periods can result in disabling injuries of comparable significance and consequence. Physical hazards in a client's/investee's operations stem from the following:

- **Rotating and moving equipment.** Injury or death can occur from being trapped, entangled, or struck by machinery parts due to unexpected starting of equipment or unexpected movement during operations.
- **Noise.** No employee should be exposed to a noise level greater than 85 dB(A) for a duration of more than 8 hours per day without hearing protection.
- **Vibration.** Exposure to hand-arm vibration from equipment such as hand and power tools, or whole-body vibrations from surfaces on which the worker stands or sits, should be controlled through choice of equipment, installation of vibration dampening pads or devices, and limiting the duration of exposure.
- **Electrical.** Exposed or faulty electrical devices, such as circuit breakers, panels, cables, cords and hand tools, can pose a serious risk to workers. Overhead wires can be struck by metal devices, such as poles or ladders, and by vehicles with metal booms. Vehicles or grounded metal objects brought into close proximity with overhead wires can result in arcing between the wires and the object, without actual contact.
- **Eye hazards.** Solid particles from a wide variety of industrial operations, or a liquid chemical spray, may strike a worker in the eye causing an eye injury or permanent blindness.
- **Welding/hot work.** Welding creates an extremely bright and intense light that may seriously injury a worker's eyesight. In extreme cases, blindness may result. Additionally, welding may produce noxious fumes to which prolonged exposure can cause serious chronic diseases.

- **Industrial vehicle driving and site traffic.** Poorly trained or inexperienced industrial vehicle drivers have increased risk of accident with other vehicles, pedestrians, and equipment. Industrial vehicles and delivery vehicles, as well as private vehicles on-site, also represent potential collision scenarios.
- **Working environment temperature.** Exposure to hot or cold working conditions in indoor or outdoor environments can result temperature stress-related injury or death. Use of Personal Protective Equipment (PPE) to protect against other occupational hazards can accentuate and aggravate heat-related illnesses. Extreme temperatures in permanent work environments should be avoided through implementation of cooling and ventilation.
- **Ergonomics,** repetitive motion, manual handling. Injuries due to ergonomic factors, such as repetitive motion, overexertion, and manual handling, take prolonged and repeated exposures to develop, and typically require periods of weeks to months for recovery.
- **Working at heights.** Fall prevention and protection measures should be implemented whenever a worker is exposed to the hazard of falling more than two meters.
- **Illumination.** Work area light intensity should be adequate for the general purpose of the location and type of activity, and should be supplemented with dedicated work station illumination, as needed.

Chemical hazards in the workplace represent potential risks for illness or injury due to single acute exposure or chronic repetitive exposure to toxic, corrosive, sensitizing or oxidative substances. They also represent a risk of uncontrolled reaction, including the risk of fire and explosion, if incompatible chemicals are inadvertently mixed. Chemical hazards in an economic operation stem from the following:

- **Air quality.** Poor air quality due to the release of contaminants into the work place can result in possible respiratory irritation, discomfort, or illness to workers.
- **Fire and explosions.** Fires and or explosions resulting from ignition of flammable materials or gases can lead to loss of property as well as possible injury or fatalities to project workers.
- **Corrosive, oxidizing, and reactive chemicals.** Corrosive, oxidizing, and reactive chemicals present similar hazards as flammable materials. An additional hazard of these chemicals is that inadvertent mixing or intermixing may cause serious adverse reactions, which can lead to the release of flammable or toxic materials and gases, and may lead directly to fires and explosions. These types of substances have the additional hazard of causing significant personal injury upon direct contact, regardless of any mixing issues.
- **Asbestos containing materials.** The use of asbestos containing materials should be avoided in new buildings or as a new material in remodeling or renovation activities. If asbestos containing materials are present, particularly friable asbestos representing the potential to release fibers, the repair or removal and disposal should be performed according to internationally recognized procedures to prevent worker exposure.

Biological agents represent potential for illness or injury due to single acute exposure or chronic repetitive exposure. The use of any harmful biological agents should be avoided and replaced with an agent that, under normal conditions of use, is not dangerous or less dangerous to workers. If use of harmful agents cannot be avoided, precautions should be

taken to keep the risk of exposure as low as possible and maintained below internationally established and recognized exposure limits.

Radiation exposure can lead to potential discomfort, injury or serious illness to workers. Workplaces involving occupational and/or natural exposure to ionizing radiation should be operated in accordance with recognized international safety standards and guidelines. Exposure to non-ionizing radiation (including static magnetic fields, sub-radio frequency magnetic fields, static electric fields, radio frequency and microwave radiation, light and near-infrared radiation, and ultraviolet radiation) should be controlled according to international standards.

Additional precautions are required for workers in special hazard environments such as a confined space or an isolated workspace. A confined space is a wholly or partially enclosed space, which is not designed or intended for human occupancy and in which a hazardous atmosphere could develop as a result of the contents, location or construction of the confined space or due to work done in or around the confined space. Serious injury or fatality can result from inadequate preparation to enter a confined space or in attempting a rescue from a confined space. A worker in an isolated space is out of verbal communication and line of sight with a supervisor, other workers, or other persons capable of providing aid and assistance, for continuous periods (exceeding one hour). This puts a worker at increased risk should an accident or injury occur.

An economic operator should establish procedures and systems for monitoring and recording occupational accidents and diseases as well as dangerous occurrences and incidents, to verify the effectiveness of prevention and control strategies in their operations and monitor employee productivity against lost time injury. If an economic operator does not adequately protect the health and safety of workers in the course of operations, leading to severe injuries, illnesses, and even fatalities, this represents a significant reputational risk and financial liability to the same economic operator.

Community Health, Safety and Security

An economic operation can increase the potential for community exposure to risks and impacts arising from accidents, structural failures, and releases of hazardous materials

An economic operation often bring benefits to communities including employment, services, and opportunities for economic development. However, these operations can also increase the potential for community exposure to risks and impacts arising from accidents, structural failures, and releases of hazardous materials. Communities may also be affected by impacts on their natural resources, exposure to diseases, and the use of security personnel.

While acknowledging the public authorities' role in promoting the health, safety and security of the public, it is also the client's/investee's responsibility to avoid or minimize these risks and impacts that may arise from operations. This includes implementing the following actions:

- **Consultation and grievance channels.** Where appropriate, the client/investee should conduct consultations and establish a line of communication with the impacted community in order to understand and monitor potential impacts. An appropriate consultation and grievance mechanism can help manage and minimize potential risks, avoid reputational issues and reduce the risk of conflicts with the community.
- **Infrastructure and equipment safety.** The client/investee needs to ensure that operations are conducted to prevent potential injury to the surrounding community, especially if aspects of the operations are accessible to the community. If the client's/investee's operations involve operation of moving equipment on public roads, the client/investee needs to ensure that the necessary safety measures are in place to prevent the occurrence of any incidents and accidents.
- **Hazardous materials safety.** The client/investee needs to prevent or minimize the potential for community exposure to hazardous materials that may be released during operations. If there is a potential for life-threatening hazards, the client/investee needs to modify operations or substitute or eliminate substances causing the hazard. The client/investee also needs to control the safety of deliveries of raw materials and of transportation and disposal of wastes.
- **Environmental and natural resource issues.** The client/investee needs to avoid or minimize the exacerbation of impacts caused by natural hazards, such as landslides or floods that could arise from land use changes due to operations. This also includes avoiding or minimizing adverse impacts due to operations on soil, water, and other natural resources used by the affected communities.

- **Community exposure to disease.** The client/investee needs to prevent or minimize the potential for community exposure to water-borne or vector-borne disease, and other communicable diseases that could result from operations. This also includes preventing or minimizing the transmission of communicable diseases that may be associated with the influx of temporary or permanent labour associated with the economic operation.
- **Increase in traffic.** Traffic, especially movement of heavy vehicles increases especially during construction phase. This can lead to possible accidents/incidents which need to be minimized. There is a need for traffic management plan and training of staff to manage and minimize accidents/incidents.
- **Emergency preparedness and response.** The economic operator needs to inform surrounding communities of potential hazards associated with operations and collaborate with the community and local government agencies in preparing to respond effectively to emergency situations.
- **Use of security personnel.** An economic operator may retain security personnel to safeguard its operations, which may pose risks to the surrounding community if not managed properly. This includes ensuring that security personnel have not been implicated in past abuses, have been adequately trained in the use of force (including firearms, if necessary) as well as in the conduct toward workers and the local community. The economic operator will also provide a mechanism to allow the surrounding community to express concerns about security personnel and will investigate any allegations of unlawful or abusive acts of security personnel to take the necessary action to prevent recurrence.

If the impacts of an economic operation on the surrounding community are not appropriately managed, this can create conflict and objections to the investor's presence in the community.

Land Acquisition and Resettlement

Involuntary resettlement refers both to physical displacement and to economic displacement due to land acquisition associated with an economic operation.

Involuntary resettlement refers both to physical displacement (relocation or loss of shelter) and to economic displacement (access to resources for income generation or means of livelihood) due to land acquisition (including rights-of-way) associated with a client's/investee's operations. Resettlement is considered involuntary when affected individuals or communities do not have the right to refuse displacement. This occurs in cases of: i) lawful expropriation or restrictions on land use based on eminent domain; and ii) negotiated settlements in which the buyer can resort to expropriation or impose legal restrictions on land use if negotiations with the seller fail.

Displaced persons may be classified as persons who:

i. have formal legal rights to the land they occupy;

ii. do not have formal legal rights to land, but have a claim to land that is recognized or recognizable under the national laws; or

iii. have no recognizable legal right or claim to the land they occupy.

Unless properly managed, involuntary resettlement may result in long-term hardship and impoverishment for affected persons and communities, as well as environmental damage and social stress in areas to which they have been displaced. For these reasons, involuntary resettlement should be avoided or at least minimized. However, where it is unavoidable, appropriate measures to mitigate adverse impacts on displaced persons and host communities should be carefully planned and implemented with appropriate disclosure of information, consultation, and the informed participation of affected persons. This includes implementing the following actions:

- **Compensation and benefits for displaced persons.** When displacement cannot be avoided, the economic operator will offer displaced persons and communities compensation for loss of assets at full replacement cost and other assistance to help them improve or at least restore their standards of living or livelihoods.
- **Grievance mechanism.** The economic operator needs to ensure that a grievance mechanism is in place to receive and address specific concerns about compensation and relocation that are raised by displaced persons or members of host communities.
- **Social impact assessment, resettlement planning and implementation.** Where involuntary resettlement is

unavoidable, the economic operator will conduct a census to identify the persons who will be displaced by the project, understand the likely impacts on the affected persons and community, develop entitlement framework and determine who will be eligible for compensation.

- **Physical displacement.** If people living on the site of an economic operation must move to another location, the economic operator will: i) offer displaced persons choices among feasible resettlement options, including adequate replacement housing or cash compensation; and ii) provide relocation assistance suited to the needs of each group of displaced persons, with particular attention paid to the needs of the poor and the vulnerable. New resettlement sites built for displaced persons will offer improved living conditions.
- **Economic displacement.** If land acquisition for the economic operation causes loss of income or livelihood, the economic operator will promptly compensate these persons, for example by compensating affected business owners for the cost of re-establishing commercial activities elsewhere, for lost net income during the period of transition, and for the costs of the transfer and reinstallation of their business operations.
- **Government-managed resettlement.** Where land acquisition and resettlement are the responsibility of the government, an economic operator needs to collaborate with the responsible government agency to the extent permitted by the agency to achieve outcomes that are consistent with best international practice.

If an economic operation involves land acquisition and resettlement, this should be carefully managed to prevent the likelihood of hardship and impoverishment for affected persons and communities. Given that a displaced community will not be entirely satisfied with its new situation unless there is noticeable improvement in standards of living or livelihoods, this will remain a reputational risk for the economic operator.

Indigenous Peoples

Indigenous Peoples (IPs) are recognized as social groups with identities that are distinct from dominant groups in national societies and are often among vulnerable segments of the population.

Indigenous Peoples may be referred to in different countries by such terms as "Indigenous ethnic minorities", "aboriginals", "hill tribes", "minority nationalities", "scheduled tribes", "first nations", or "tribal groups".

IPs typically self-identify as members of a distinct indigenous cultural group and are recognized as such by others; have a collective attachment to geographically distinct habitats or ancestral territories, making use of natural resources in these habitats and territories; have customary cultural, economic, social, or political institutions that are separate from those of the dominant society or culture; and communicate in an indigenous language, often different from the official language of the country or region.

Indigenous Peoples are often closely tied to their traditional or customary lands and the natural resources on these lands. While these lands may not be under their legal ownership as defined under national law, the use of these lands by communities of IPs for their livelihoods or for cultural purposes is often recognized under customary law. However, the economic, social and legal status of Indigenous Peoples often limits their capacity to defend their interests and rights to lands and natural and cultural resources. Indigenous Peoples are particularly vulnerable if their lands and resources are transformed, encroached upon by outsiders, or significantly degraded. Their languages, cultures, religions, spiritual beliefs, and institutions may also be under threat. These characteristics expose Indigenous Peoples to different types of risks and severity of impacts, including loss of identity, culture, and natural resource-based livelihoods, as well as exposure to impoverishment and disease.

An economic operator should ensure that during the course of operations, the identity, culture and natural resource-based livelihoods of Indigenous Peoples are respected and exposure to impoverishment and disease is prevented. This includes implementing the following actions:

- **Avoid or minimize adverse impacts.** When a client/investee cannot completely avoid impacts on Indigenous Peoples, the client/investee needs to mitigate or compensate for these impacts in a culturally appropriate manner and with the informed participation of affected Indigenous Peoples.
- **Consultation.** The client/investee needs to establish an ongoing relationship with the affected communities of Indigenous Peoples, which should be culturally appropriate. If there are adverse impacts, the consultation process needs to ensure the free, prior, and informed consultation of the Indigenous Peoples and facilitate their informed

participation with respect to proposed mitigation measures and sharing development benefits.

- **Sharing development benefits.** The client/investee needs to identify opportunities for development benefits for affected Indigenous Peoples. This should aim at improving their standard of living and livelihoods in a culturally appropriate manner, including the long-term sustainability of the natural resource on which they depend.
- **Impacts on traditional or customary lands.** If a client's/investee's operations are located within traditional or customary lands or involve the commercial use of natural resources located on these lands, this will generate adverse impacts on the livelihoods or cultural identity of the community of Indigenous Peoples. The client/investee needs to inform affected communities of their rights under national laws, including the recognition of customary rights; make efforts to avoid or at least minimize the size of the impacted land; and offer land-based compensation as well as culturally appropriate development opportunities to affected communities.
- **Relocation of Indigenous Peoples.** The client/investee should avoid the relocation of Indigenous Peoples from their traditional lands. If relocation is unavoidable, the client/investee needs to enter into a good faith negotiation with the affected communities and ensure that any relocation complies with best international standards.

If economic operations are initiated and conducted without the involvement of Indigenous Peoples, this can lead to misunderstanding and conflict. Given worldwide concern for the well-being of Indigenous Peoples, there are significant reputational risks for an economic operator if Indigenous Peoples issues are not managed appropriately.

Cultural Heritage

Cultural heritage encompasses properties and sites of archaeological, historical, cultural, artistic and religious significance as well as unique environmental features and cultural knowledge, and practices of communities protected for future generations.

Cultural heritage encompasses properties and sites of archaeological, historical, cultural, artistic and religious significance as well as unique environmental features and cultural knowledge, innovations and practices of communities embodying traditional lifestyles, which are protected for current and future generations. Consistent with the requirements of the Convention Concerning the Protection of the World Cultural and Natural Heritage, an economic operator is required to avoid significant damage to cultural heritage due to business activities.

Impacts on cultural heritage typical involve the following:

- **Chance finds.** During the construction of a client's/investee's facility(s), there may be physical impacts on previously unknown or undocumented resources that were fully or partially buried prior to the start of construction.
- **Community input.** Where a project may affect cultural heritage, the client/investee will consult with affected communities who use, or have used, the cultural heritage for longstanding cultural purposes to identify cultural heritage of importance. An economic operator should incorporate the views of the affected communities on cultural heritage into the decision-making process.
- **Removal of cultural heritage.** Most cultural heritage is best protected by preserving it in its place, since removal is likely to result in irreparable damage or destruction of the cultural heritage. Cultural heritage should only be removed if the client/investee can demonstrate that the overall benefits of operations at a particular site outweigh the anticipated loss of cultural heritage.
- **Legally protected cultural heritage areas.** When a client's/investee's proposed operations are located within a legally protected area or a legally defined buffer zone, the client/investee is required to take additional measures to promote and enhance the conservation of the area.
- **Use of cultural heritage.** If a client/investee makes commercial use of a community's cultural heritage, such as embodiment of traditional lifestyles, the client/investee is required to enter into a good faith negotiation with the affected local communities and to provide fair and equitable sharing of benefits from the commercialization of their cultural heritage.

If economic operations are initiated and conducted without consideration for cultural heritage, there are significant legal and reputational risks. A systematic approach to incorporating concern for cultural heritage issues throughout an economic operation, including additional investments in the enhancement of cultural heritage, can bring significant reputational advantage to an economic operator at both the local and international level.