11 Resources and Non-Mineral Waste Management

11.1 Introduction

Use of energy and materials and the generation of waste during construction and operation of the Simandou Mine both have the potential to cause environmental and social impacts. The diversity of types and sources of resources used, and of types and disposal routes for wastes generated, means that it is difficult to predict what those impacts are likely to be at this stage. Nevertheless it is appropriate to consider the issues that are likely to arise and to identify the approaches which the Project will take to manage its resource use and waste disposal so as to minimise impacts. This chapter therefore considers the Project’s likely resource use and waste generation and sets out the measures it will take to keep its impacts as low as reasonable practicable.

With respect to the use of resources the chapter considers the main resources consumed during the construction, operation and closure of the mine including:

- energy;
- water;
- materials; and
- products.

With regard to waste streams, mine waste and construction spoil, discharges to water and emissions to air are considered in other chapters of the report (Chapter 5: Geology, Soils and Mineral Waste, Chapter 6: Water Environment and Chapter 8: Air Quality), and this chapter focusses on non-mineral solid wastes generated by the Project, including wastes from the workforce, maintenance activities, processing wastes, and sludges from wastewater treatment and spill clean-up. These will include inert wastes, non-hazardous biodegradable wastes, and some hazardous wastes (1).

Where impacts associated with resource use and waste generation can be specifically identified at this stage in the design of the Project these are addressed in other sections of the SEIA Report. Where these activities are undertaken specifically for the Project, for example in local quarries and waste disposal facilities, the impacts are being addressed in detail in the Site Files being prepared under the Class SEIAs for Simandou Early Works (2). The findings from these will be considered in the Project-wide assessment reported in Volume IV of the SEIA Report. Other impacts from general supply of materials and equipment will arise remotely from the Project and cannot be specifically assessed here, but the chapter does address the way the Project will manage these issues in its procurement decisions.

As this chapter does not directly address the impacts of the Project it is structured differently from the other impacts topics and is organised as follows:

- Section 11.2 describes the study area and the legal context for resources and waste;
- Section 11.3 identifies the types of resources that the Project will use and describes the measures that will be taken to manage resource use so as to minimise their impacts;
- Section 11.4 identifies the types and quantities of wastes expected to be generated by the Project, reviews their potential impacts, and describes the measures the Project will take to manage waste and minimise those impacts; and
- Section 11.5 presents a summary of findings.

(1) Hazardous wastes are defined as wastes listed in Annex I of the Basel Convention which exhibit one or more of the characteristics listed in Annex III of the Basel Convention. Characteristics include (but are not limited to) explosive, flammable, oxidising, poisonous, infectious, corrosive, toxic and ecotoxic. Available at http://basel.int/text/17Jun2010-conv-e.pdf
(2) Rio Tinto (2011); Class SEIA for Temporary Work Camps and Logistical Supply Centres and Class SEIA for the Simandou Quarries Programme, approved by the Minister Delegate for Environment, Water and Forests in December 2011 and May 2012.
11.2 Approach

11.2.1 Overview

As noted above the approach in this chapter differs from the chapters focusing on specific impact topics. This section identifies the study area and legislation and standards relevant to resource use and waste. The rest of the chapter then:

- describes the projected resource use and waste generation at the mine based on the outline design and workforce;
- highlights the key potential for impacts associated with these activities; and
- presents the Project approach to management of these issues.

11.2.2 Study Area

The study area for this topic covers all mine activities and associated resource use and waste streams. It is not specifically defined geographically for the reasons outlined in Section 11.1.

11.2.3 Legal and Other Requirements

This section identifies the key requirements relevant to resource use and waste management derived from legislation, guidance and standards applying to the mine project.

11.2.3.1 National Requirements

The following Guinean legislation is relevant to resource use and waste:

- **Code de l’Environnement** (Code for the Protection and Development of the Environment) Order 0453PRG/SGG/87 - Title 4, Chapter 1 deals specifically with waste;
- Environment Code –Article 31 relates to the disposal of harmful or dangerous substances in inland waters; Article 65 relates to disposal of waste in inland waters, Article 75 mentions substances which due to their toxicity, their radioactivity, or their concentration in biological chains, are a danger or are likely to be a danger to man and his habitat and the natural environment;
- **Code de l’Eau** (Water Code) Act L/94/005/CTRN – covers discharges to water; Article 31 relates to the evacuation and discharge into surface or ground waters of any material that could cause pollution; and Article 32 relates to the disposal of waste into inland waters;
- **Régime juridique des "Installations Classées pour la Protection de l’Environnement"** (Regulatory Regime for Classified Installations in relation to the Protection of the Environment) D/200/PRG/SGG/89 defines waste management facilities as ‘Classified Installations’ and requires such facilities to obtain a classified installation permit from the appropriate authority; a Joint Order under this regime include installations for processing of industrial waste as installations classified for protection of the environment; and
- Public Health Code – Article 45 relates to the disposal of effluent from sanitary works; Article 47 relates to the disposal of effluent from purification plant; Article 55 relates to the production of solid waste; Article 105 relates to the collection of solid waste; Article 106 relates to waste produced from operating industrial plants; Article 108 relates to burying of radioactive and toxic substances and Articles 98 and 102 relate to waste produced by utility activities likely to impact on public health that are part of development projects.

Guinea is also signatory to the following international conventions relevant to resources and waste:
- Basel Convention controlling Transboundary Movements of Hazardous Wastes and their Disposal;
- Bamako Convention on the Ban of the Import into Africa and the Control of Transboundary Movement and Management of Hazardous Wastes within Africa; and
- The Vienna Convention for the Protection of the Ozone Layer and the Montreal Protocol on Substances that Deplete the Ozone Layer.

11.2.3.2 International Requirements

The assessment takes into account the following international standards and guidance relevant to the Project:

- IFC Performance Standard 3 – Resource Efficiency and Pollution Prevention;
- IFC EHS General Guidelines;
- IFC EHS Guidelines for Mining;
- IFC EHS Guidelines for Construction Materials Extraction; and
- IFC EHS Guidelines for Waste Management Facilities.

11.2.3.3 Rio Tinto Environment Performance Standards and Requirements

The following Rio Tinto standards are also considered in the assessment:

- Rio Tinto Environment Standard E7 – Non-Mineral Waste Management;
- Rio Tinto Environment Standard E5 – Hazardous Materials and Contamination Control;
- Rio Tinto Health Standard B4 – Hazardous Substances;
- Rio Tinto – Procurement Principles;
- Rio Tinto – The Way We Work; and
- Rio Tinto – Guinea Buy Local Programme (GBLP).

11.3 Project Resource Use and Management

11.3.1 Predicted Resource Use

11.3.1.1 Primary Resources

The most significant primary resources used by the mine will be fossil fuel and water. The demand for construction aggregates and fill from external sources at the mine is expected to be relatively low compared to other parts of the Project and will be supplied by local quarries and borrow pits, developed in accordance with the Class SEIA for the Simandou Quarries Programme (see Section 11.1). Supply of fill from borrow pits is also discussed in Chapter 5: Geology, Soils and Mineral Waste.

It is estimated that the Simandou Mine will use a total of 90 million litres (ML) of diesel and 26 ML of aviation fuel during 5 years of construction. During 40 years of operation the mine will also require the use of approximately 5 140 ML of diesel and 33 ML of aviation fuel. Diesel will be used in construction and operational plant and vehicles, heavy mobile mining equipment and for power generation.

The mine project will use freshwater abstracted from both surface and groundwaters for a range of purposes during construction such as road making and concrete batching, and during operation for dampening of ore for dust control. During construction water demand is expected to be on average about 0.3 ML per day, with a peak demand of 3 ML per day. During operations water use is expected to be approximately 3.6 ML per day with a peak of 5.6 ML per day.
11.3.1.2 Procured Materials and Products

In addition to primary resources, the mine will consume a wide range of other resources in the form of procured materials and products. These will include the materials used in the construction of mine facilities, major pieces of plant, heavy mining and other equipment and a wide range of consumables.

Estimates of the main materials to be consumed in construction of the mine are presented in Table 11.1.

Table 11.1 Estimated Construction Materials, Types and Amounts

<table>
<thead>
<tr>
<th>Item / Resource</th>
<th>Unit</th>
<th>Total Quantity (approximate)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete slabs on grade</td>
<td>m³</td>
<td>1 000</td>
</tr>
<tr>
<td>Columns</td>
<td>m³</td>
<td>50</td>
</tr>
<tr>
<td>Elevated slabs</td>
<td>m³</td>
<td>100</td>
</tr>
<tr>
<td>Steel</td>
<td>tonnes</td>
<td>2 000</td>
</tr>
<tr>
<td>Metal roof cladding</td>
<td>tonnes</td>
<td>181</td>
</tr>
<tr>
<td>Metal siding</td>
<td>tonnes</td>
<td>222</td>
</tr>
<tr>
<td>Masonry wall</td>
<td>m³</td>
<td>1 620</td>
</tr>
</tbody>
</table>

The currently projected requirements for mobile equipment required for mine operations are presented in Table 11.2.

Table 11.2 Projected Mobile Equipment Fleet

<table>
<thead>
<tr>
<th>Item</th>
<th>Pit Development</th>
<th>Pre-stripping</th>
<th>Production</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large Excavators</td>
<td>0</td>
<td>3</td>
<td>7</td>
</tr>
<tr>
<td>Large Haul Trucks</td>
<td>0</td>
<td>22</td>
<td>56</td>
</tr>
<tr>
<td>Medium Excavators and FEL</td>
<td>6</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Medium Haul Trucks</td>
<td>14</td>
<td>15</td>
<td>6</td>
</tr>
<tr>
<td>Blasthole Drill Rigs</td>
<td>0</td>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>Water Trucks</td>
<td>0</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Large Dozers</td>
<td>4</td>
<td>6</td>
<td>8</td>
</tr>
<tr>
<td>Grader/Medium Dozers</td>
<td>4</td>
<td>6</td>
<td>9</td>
</tr>
</tbody>
</table>

11.3.2 Impacts Associated with Resource Use

Environmental impacts will occur in the extraction of raw materials, processing, manufacturing, transportation, use and ultimate disposal of materials and products used during the construction, operation and closure of the mine. The main areas of impact will include:

- depletion of non-renewable resources such as fossil fuels and construction aggregates;
- contribution to climate change from emissions of carbon dioxide and other greenhouse gases;
- depletion of water resources with impacts on the availability of water for other uses such as potable supply, agricultural irrigation and general ecosystem provision; and
- air, noise, water and soil pollution from extraction, processing and transport.

Emissions of greenhouse gases directly from the Project are discussed in Chapter 10: Greenhouse Gas Assessment and impacts of water use on other users are assessed in Chapter 6: Water Environment. Other environmental impacts will occur at the locations where energy and materials used in the Project are extracted, processed, converted into products, and transported to the Project and these locations will vary from within Guinea to worldwide. As noted in Section 11.1, where those activities are specific and local to the Project they are being assessed and mitigation measures identified through the Class SEIAs and Site
Files prepared for Simandou Early Works. Impacts in other locations will be managed through the Simandou procurement process as described in Section 11.3.3.

11.3.3 Mitigation of Impacts from Resource Use

In accordance with IFC Performance Standard 3 the Project will seek to implement all technically and financially feasible and cost effective measures for improving efficiency in its consumption of energy, water, and other inputs, integrating the principles of cleaner production into the design of processes with the objective of conserving resources. The environmental impacts of purchased resources, materials and products will be mitigated through the Project’s approach to procurement. This will comply with Rio Tinto’s Procurement Principles which outline the responsibilities of Rio Tinto and its businesses and Rio Tinto’s expectations of its suppliers. They highlight the commitment to a sustainable supply chain and, where appropriate, to working with local suppliers of goods and services.

In accordance with these principles the Project will develop a Procurement Plan. This will address the lifecycle of goods and services and will establish contractual requirements for the environmental credentials of products through their manufacture, supply, use and disposal, taking into account local and Project-specific conditions. Suppliers and their products will be evaluated for risks to health and safety and the environment and suppliers may be required to provide information on the life cycle stages and impacts relevant to their products.

The Project will also apply the ‘Guinea Buy Local Programme’ which has been established to promote use of Guinean supplies, businesses and labour. The programme is expected to cover elements such as construction of buildings and roads, purchasing of road furniture and signage, and provision of services such as local transport, food and cleaning. The programme includes training of local businesses and workers in sustainable provision of these services and is designed to develop local business infrastructure, create jobs and develop the local economy.

Specific measures that will be taken to minimise resource use will include:

- measures to minimise fuel use as detailed in Chapter 10: Greenhouse Gas Assessment;
- measures to reduce use of raw water by:
  - removing or reducing the need to use water by changing designs and processes;
  - monitoring water use;
  - using recycled water if quality permits;
  - using dewatering water and rainwater if quality permits; and
  - using other sources of poorer quality water in preference to higher quality supplies.
- consideration of microclimatic factors (eg prevailing winds, solar aspect, elevation, shade) in design of Project buildings to maximise opportunities for energy efficiency.

11.4 Non-Mineral Waste Generation and Management

11.4.1 Waste Generation

A wide range of non-mineral wastes will be generated during construction, operation and closure of the mine as identified in Table 11.3.
Table 11.3  Expected Non-Mineral Wastes Generated by the Mine Project

<table>
<thead>
<tr>
<th>Type of Waste</th>
<th>Classification</th>
<th>Typical Sources</th>
<th>Phase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soil, plant material and timber</td>
<td>Non-hazardous</td>
<td>Site clearance, on-going maintenance and closure</td>
<td>Construction, Operation and Closure</td>
</tr>
<tr>
<td>Concrete and other inert construction wastes</td>
<td>Inert</td>
<td>Construction activities, general civil engineering works, demolition and closure</td>
<td>Construction, Operation and Closure</td>
</tr>
<tr>
<td>Haul truck and vehicle tyres</td>
<td>Non-hazardous</td>
<td>HME and other workshops</td>
<td>Construction, Operation and Closure</td>
</tr>
<tr>
<td>Waste lubricating and hydraulic oils</td>
<td>Hazardous</td>
<td>Vehicle and equipment workshops</td>
<td>Construction, Operation and Closure</td>
</tr>
<tr>
<td>Oil / Fuel Filters</td>
<td>Hazardous</td>
<td>HME and other workshops</td>
<td>Construction, Operation and Closure</td>
</tr>
<tr>
<td>Used Vehicle Batteries</td>
<td>Hazardous</td>
<td>HME and other workshops</td>
<td>Construction, Operation and Closure</td>
</tr>
<tr>
<td>Tyres</td>
<td>Non-hazardous</td>
<td>HME and other workshops</td>
<td>Construction, Operation and Closure</td>
</tr>
<tr>
<td>Coolant</td>
<td>Hazardous</td>
<td>HME and other workshops</td>
<td>Construction, Operation and Closure</td>
</tr>
<tr>
<td>Oily water</td>
<td>Hazardous</td>
<td>Bulk fuel facility, workshops</td>
<td>Construction, Operation and Closure</td>
</tr>
<tr>
<td>Empty Oil / Grease Drums</td>
<td>Hazardous</td>
<td>HME and other workshops, bulk fuel storage</td>
<td>Construction, Operation and Closure</td>
</tr>
<tr>
<td>Hydrocarbon contaminated rags / absorbent pads</td>
<td>Hazardous</td>
<td>Bulk fuel facility, HME and other workshops</td>
<td>Construction, Operation and Closure</td>
</tr>
<tr>
<td>Hydrocarbon Contaminated Soil / Sediment</td>
<td>Hazardous</td>
<td>Spillage of fuel/oils</td>
<td>Construction, Operation and Closure</td>
</tr>
<tr>
<td>Sludges containing hydrocarbons</td>
<td>Hazardous</td>
<td>Bulk Fuel facility oily water interceptors and bunds</td>
<td>Construction, Operation and Closure</td>
</tr>
<tr>
<td>Hydrocarbon / other hazardous liquid contaminated equipment and containment</td>
<td>Hazardous</td>
<td>Bunds, storage tanks, distribution infrastructure</td>
<td>Construction, Operation and Closure</td>
</tr>
<tr>
<td>Worn out conveyor belt</td>
<td>Non-hazardous</td>
<td>Maintenance and closure of conveyors</td>
<td>Operation and Closure</td>
</tr>
<tr>
<td>Worn out and redundant equipment and vehicles</td>
<td>Non-hazardous</td>
<td>HME and other workshops Decommissioning</td>
<td>Operation and Closure</td>
</tr>
<tr>
<td>Scrap Metal (ferrous and non-ferrous including electrical cable)</td>
<td>Non-hazardous</td>
<td>HME and other workshops Dismantling and demolition</td>
<td>Construction, Operation and Closure</td>
</tr>
<tr>
<td>PVC Pipe / hose</td>
<td>Non-hazardous</td>
<td>HME and other workshops Dismantling and demolition</td>
<td>Construction, Operation and Closure</td>
</tr>
<tr>
<td>Paint Containers / Paint Residues</td>
<td>Hazardous</td>
<td>HME and other workshops</td>
<td>Construction, Operation and Closure</td>
</tr>
<tr>
<td>Laboratory Chemicals</td>
<td>Hazardous</td>
<td>Laboratory</td>
<td>Construction, Operation and Closure</td>
</tr>
<tr>
<td>Food scraps</td>
<td>Non-hazardous</td>
<td>Kitchens, accommodation and site bins</td>
<td>Construction, Operation and Closure</td>
</tr>
<tr>
<td>General Waste (packaging, used goods etc)</td>
<td>Non-hazardous</td>
<td>Kitchens, accommodation and site bins</td>
<td>Construction, Operation and Closure</td>
</tr>
<tr>
<td>Waste kitchen oil</td>
<td>Non-hazardous</td>
<td>Kitchens</td>
<td>Construction, Operation and Closure</td>
</tr>
<tr>
<td>Paper</td>
<td>Non-hazardous</td>
<td>Offices, accommodation</td>
<td>Construction, Operation and Closure</td>
</tr>
<tr>
<td>Glass</td>
<td>Non-hazardous</td>
<td>Accommodation</td>
<td>Construction, Operation and Closure</td>
</tr>
<tr>
<td>Cardboard</td>
<td>Non-hazardous</td>
<td>Accommodation and packaging</td>
<td>Construction, Operation and Closure</td>
</tr>
<tr>
<td>Type of Waste</td>
<td>Classification</td>
<td>Typical Sources</td>
<td>Phase</td>
</tr>
<tr>
<td>---------------------------------------------</td>
<td>----------------</td>
<td>--------------------------------------------------------------------------------</td>
<td>--------------------------------------------</td>
</tr>
<tr>
<td>Water bottles</td>
<td>Non-hazardous</td>
<td>Accommodation and work areas</td>
<td>Construction, Operation and Closure</td>
</tr>
<tr>
<td>Aluminium cans</td>
<td>Non-hazardous</td>
<td>Accommodation and work areas</td>
<td>Construction, Operation and Closure</td>
</tr>
<tr>
<td>Steel (tin) cans</td>
<td>Non-hazardous</td>
<td>Accommodation and work areas</td>
<td>Construction, Operation and Closure</td>
</tr>
<tr>
<td>Timber</td>
<td>Non-hazardous</td>
<td>HME and other workshops, workshop, site clearance, packing crates, demolition and closure activities</td>
<td>Construction, Operation and Closure</td>
</tr>
<tr>
<td>Sewage and other sludge from wastewater treatment</td>
<td>Hazardous</td>
<td>Wastewater treatment plant</td>
<td>Construction, Operation and Closure</td>
</tr>
<tr>
<td>Air conditioners</td>
<td>Hazardous [1]</td>
<td>Accommodation and offices</td>
<td>Construction, Operation and Closure</td>
</tr>
<tr>
<td>Printer Toner Cartridges</td>
<td>Hazardous</td>
<td>Offices</td>
<td>Construction, Operation and Closure</td>
</tr>
<tr>
<td>Fluorescent Tubes</td>
<td>Hazardous</td>
<td>All buildings</td>
<td>Construction, Operation and Closure</td>
</tr>
<tr>
<td>Aerosol spray cans</td>
<td>Hazardous</td>
<td>Accommodation</td>
<td>Construction and Operation</td>
</tr>
<tr>
<td>Medical / Clinical Waste</td>
<td>Hazardous</td>
<td>Medical centre</td>
<td>Construction, Operation and Closure</td>
</tr>
</tbody>
</table>

Notes:
[1] Depending on type of refrigerant – will comply with Montreal Protocol
[2] Depending on composition

Wastes generated during the preparation of the mine site and construction of the ancillary infrastructure will comprise a variety of materials including:

- surplus spoil: spoil will be used on-site or alternative off-site uses found as far as possible and material will only be disposed of to land where other uses cannot be found; soil disposal will be managed as discussed in Chapter 5: Geology, Soils and Mineral Waste;

- cleared vegetation: readily biodegradable foliage will be left in situ to compost and act as soil conditioner whilst wood from felled trees will be collected and made available for local use where feasible;

- packaging: a substantial quantity of packaging waste will be generated from delivered equipment and other goods;

- hazardous wastes: small quantities of hazardous wastes will include used lubricating oils (from vehicles and machinery), paints, vehicle batteries, fluorescent light bulbs, contaminated containers (eg old paint tins) and clinical waste from first aid and medical facilities (syringes, used dressings, expired drugs etc);

- domestic waste: the construction workforce of up to 2 500 people will generate of the order of 2 000 tonnes per annum of household type waste (food, paper, used bottles, cans etc) from kitchens, offices and the accommodation camp [1];

- wastewater treatment and other sludges: there will be small quantities of sludge arising from sewage treatment and oily and other contaminated sludges from oily-water interceptors, cleaning of tank bunds and clean up of spills, and

- other waste streams will include excess concrete, tyres, electrical cable and scrap metal.

(1) Construction workers typically generate between 0.6 and 0.9 tonnes of waste per person.
There will be a similar range of hazardous and non-hazardous wastes generated during mine operations. Particularly significant waste streams will include waste tyres from heavy mobile equipment and worn-out conveyor belt. It is estimated that up to 2,000 tonnes of waste tyres will be produced. As the majority of workers will live in their own homes waste arisings from this source will be managed through the local waste management system operating in Beyla and other towns and villages. There will also be a general increase in the quantity of waste arisings in the area around the mine as a consequence of Project-induced in-migration, with an increase in population around the mine estimated to be between 60 and 110,000 (see Chapter 18: In-Migration). This increase in population could lead to up to a trebling in total waste arisings in the local study area around the mine (the four neighbouring sub-prefectures have a current population of around 50-60,000).

Mine closure will generate a range of wastes from removal of redundant equipment and vehicles from the site, dismantling and demolition of plant and buildings, removal of underground structures such as foundations down to at least 1 m below ground level, clearance of any contaminated ground, and regrading of the site for rehabilitation and future use. The intention will be to reuse or recycle the majority of the items and materials that will arise during closure with the exception of hazardous wastes which will need to be disposed of at appropriate facilities.

11.4.2 Impacts of Waste Disposal

Waste from the Project will require disposal via a variety of different methods depending on the nature of the waste and the availability of suitable facilities. Wastes will be re-used or recycled where practicable but where disposal is necessary, the majority will be disposed of by landfill in suitably designed and engineered facilities. Where this is not feasible some wastes may be incinerated.

The impacts of development and operation of these facilities will include:

- impacts on land-based resources including community use, habitats, fauna and flora and cultural heritage features located within land occupied by waste disposal sites;
- pollution of soils and surface and groundwaters from deposit of waste on land;
- impacts on the amenity of neighbouring areas as a result of litter, dust, odours, noise and visual intrusion from waste handling and disposal;
- potential for health impacts from vermin and disease carriers attracted to waste sites;
- risks of accidental release of toxic, flammable. Explosive, infectious or other harmful substances from hazardous waste;
- air pollution cause by emissions for incineration of waste (combustion products including smoke, dust, greenhouse gases, acid gases and potentially toxic emissions such as dioxins); and
- fuel consumption, air and noise emissions and traffic congestion caused by road transport of waste to disposal facilities.

11.4.3 Mitigation of Impacts from Waste Management

11.4.3.1 The Project Waste Management Strategy

To manage the impacts of waste management the Project is developing a Waste Management Strategy building on the approach it has adopted to date during the exploration phase. The Waste Management Strategy will cover all phases of the Project and will be designed to comply with Rio Tinto’s Environmental Standard E7: Non-Mineral Waste Management which requires disposal of all waste to be carried out only in engineered and approved facilities and in accordance with established operational procedures and applicable local laws and regulations. The Strategy will be developed into a more detailed Non-Mineral Waste Management Plan (see Section 11.4.2.2) which will set out the proposals for management of all...
wastes including a number of general waste management measures detailed in Section 11.4.2.3. This will be developed prior to start of construction and will be updated for future phases of the Project. The Project will also develop additional waste management facilities and / or contract with specialist waste management contractors to meet future Project needs. All Project facilities will meet the requirements set out in Section 11.4.2.4.

As part of the Project In-Migration Plan (see Chapter 18: In-Migration) the Project will also work with and assist the local authorities in planning for the provision of local waste management facilities to meet the needs of the expanded local population.

All transfer and transport of wastes from the point of origin to the appropriate waste management facility will be controlled and monitored by a Project waste tracking system (see Section 11.4.2.5).

The overarching approach to waste management will follow the Waste Hierarchy, a good practice model for the regulation and management of wastes that promotes the following methods for managing waste in order of preference:

- remove – do not generate waste;
- reduce – generate less waste by better management;
- reuse – reuse waste in its original form;
- recycle – recycle / reprocess the waste;
- recover – extract material or recover energy from waste;
- treat – mitigate any hazards arising from the waste; and
- dispose – relocate waste to another location.

The Project objective is to ensure that as much waste as possible is managed at the higher levels in the waste hierarchy (removal through to recovery), avoiding the need for treatment and disposal wherever practicable.

11.4.3.2 The Non-Mineral Waste Management Plan

The detailed implementation of the Non-Mineral Waste Management Strategy will be developed in a Non-Mineral Waste Management Plan (NMWMP). This document will define specific waste management arrangements and act as a central point of reference for how wastes will be managed by the Project.

The NMWMP will include:

- legal and corporate requirements with respect to how Project wastes are managed;
- clear objectives and targets with respect to waste management;
- a list of the types / quantities of waste to be produced;
- an analysis of potential opportunities to reduce, reuse or recycle each type of waste in accordance with the Waste Hierarchy;
- a description of roles, responsibilities and resources to ensure that the objectives and targets are achieved;
- procedures governing the handling, treatment and disposal of all wastes; and
- verification procedures for appropriate assessment of contractors and third-party facilities (1) used for waste transport, management and disposal.

(1) Third party providers may be contracted to develop new capacity and provide services. As stated, at present there is not sufficient or adequate existing capacity and the Project will require new facilities and capacity to be developed.
All contractors utilised to meet Project waste management needs, including waste transport and recycling, will be evaluated by the Project prior to contract award. As well as ensuring that the organisation, equipment and/or facility has all the necessary permits and authorisations, the Project will check that it meets acceptable health, safety and environmental standards. This will apply to all waste streams but is of particular importance for the more hazardous wastes such as lead-acid batteries, oils, fluorescent tubes and clinical waste.

Throughout all phases of the Project, opportunities for waste reduction, re-use or recycling will be identified, developed and implemented where possible. Where waste disposal cannot be avoided, appropriate facilities will be provided to allow for collection, segregation of any hazardous materials, storage and disposal in appropriately designed facilities.

11.4.3.3 General Waste Management

Specific measures that will be taken to minimise the impacts of waste will include the following:

- waste generation during construction will be minimised by not over-ordering materials, reusing and recycling materials wherever possible and adopting good housekeeping to minimise waste;

- soils, plant materials and timber from trees felled during site clearance will be used on the mine site for rehabilitation purposes where possible, made available to local communities for use or sold;

- readily biodegradable foliage will be left in-situ to compost and act as a soil conditioner whilst wood from felled trees will be collected and made available for local use where feasible;

- to maximise the potential for reuse and recycling and ensuring safe handling and disposal, different waste streams will be identified, segregated, stored and disposed of separately;

- a dedicated area will be created for the storage of segregated wastes prior to their transfer to recycling, incineration or landfill facilities;

- waste collection points will be positioned in easily accessible locations around accommodation and work areas and will be clearly marked to ensure segregation of different types of waste at the source; and

- waste will be removed from work areas at regular intervals and will not be allowed to accumulate onsite in undesignated areas.

Operations will generate a similar range of wastes to construction as well as additional wastes specific to operations (note mineral wastes are addressed in Chapter 5: Geology, Soils and Mineral Waste).

11.4.3.4 Waste Management Facilities

Waste forecasts are being developed as part of preparation of the NMWMP but current estimates suggest that overall, four long term secure storage/landfill facilities will be required for the Simandou Project. The locations of these facilities are yet to be determined but it is anticipated that two will be sited close to the port and the mine and two close to proposed camps along the rail alignment. These facilities may include capacity for both hazardous and non-hazardous waste management and storage. Suitable disposal routes for hazardous waste streams will be developed as required in line with the Waste Management Strategy and NMWMP.

The main waste facility at the mine is likely to be located near the accommodation camp and will be located, designed and operated to minimise transport distances and comply with international environmental, health and safety standards. A detailed assessment of this facility will be provided as a Site File prepared under the Class SEIA for Temporary Workforce Accommodation and Logistical Supply Centres.

The existing waste management facility which is located 3 km from the Canga East camp will also be expanded to manage waste arisings during construction. It currently consists of:
- a landfill cell;
- five waste segregation and storage bays;
- an incinerator facility;
- a four bay hazardous waste storage facility;
- a six bay contaminated soil bioremediation facility; and
- an office.

This will be extended and upgraded as detailed in Table 11.4.

**Table 11.4 Proposed Upgrade to the Existing Waste Management Facility**

<table>
<thead>
<tr>
<th>Key Component</th>
<th>Description / Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction waste area</td>
<td>To store concrete rubble and other inert construction waste for recycling.</td>
</tr>
<tr>
<td>Segregation and recycling facility</td>
<td>Components may include:</td>
</tr>
<tr>
<td></td>
<td>■ shredder – for tyres, empty drums, plastic, wood, paper and other materials;</td>
</tr>
<tr>
<td></td>
<td>■ baler – to compact and form bales to reduce the volume;</td>
</tr>
<tr>
<td></td>
<td>■ oil filter crusher – to puncture and crush oil filters to reducing volume;</td>
</tr>
<tr>
<td></td>
<td>■ aerosol can recycler;</td>
</tr>
<tr>
<td></td>
<td>■ crushers for fluorescent tubes (hazardous) and glass (non-hazardous) crusher;</td>
</tr>
<tr>
<td></td>
<td>■ composter.</td>
</tr>
<tr>
<td>Expanded bioremediation facility</td>
<td>To treat appropriate hydrocarbon contaminated materials such as soils that may arise as operational activities increase.</td>
</tr>
<tr>
<td>Landfill cells</td>
<td>Additional cells for disposal of non-hazardous municipal waste.</td>
</tr>
</tbody>
</table>

Wastes that have currently been stored on-site awaiting disposal, including general waste, recyclable metals and plastics, tyres and hazardous materials such as oil filters, will be taken into account in developing the NMWMP and will be appropriately treated and disposed of.

The upgraded waste management facility site and any other landfills developed by the Project will be sited designed and operated in accordance with the IFC EHS Guidelines for Waste Management Facilities (2007) including the following:

- landfill sites will be located to minimise impacts by:
  - avoiding proximity to residential developments, airports, hospitals, schools and other sensitive receptors;
  - avoiding groundwater and surface water resources;
  - taking advantage of favourable geology and hydrogeology; and
  - avoiding areas subject to natural hazards such as landslides, flooding.

- facilities will be designed to minimise the generation and impacts of leachate by:
  - siting to avoid groundwater ingress;
  - controlling surface water ingress through use of perimeter drains;
  - enforcing strict control over the types of waste deposited;
  - minimising the area of waste exposed to rainfall;
  - using low permeability landfill lining systems (eg compacted clay or liners) appropriate to the type of waste being deposited;
  - phased, high quality restoration of the completed site incorporating a low permeability cap;
  - collecting leachate via appropriately designed drainage system if deemed necessary;
  - treating leachate to reduce all pollutants to acceptable levels prior to discharge off site; and
- where appropriate monitoring groundwater and leachate to ensure lining and collection systems are effective.

- landfill lining systems will be selected that are chemically compatible with the particular wastes to be deposited and which provide a level of containment appropriate for the wastes taking into account the surrounding geology and hydrogeology;

- liners will be subjected to quality control procedures to ensure integrity of the materials;

- where necessary facilities will be designed to minimise the nuisance caused by litter and vermin by:
  - installing perimeter fences, planting, landscaping and litter screens;
  - minimising the area of exposed waste;
  - using cover soils; and
  - using scaring techniques and/or natural predators to deter birds.

- if hazardous wastes are to be landfilled, these will be deposited within designated cells to separate incompatible materials and appropriate precautions will be taken in the design of the cells and the disposal of the wastes to avoid risks to health and safety;

- appropriate health and safety standards will be employed including:
  - enforcing strict rules regarding access to the site and to deposited waste including control over scavenging on site;
  - using fencing to keep out unauthorised persons; and
  - training all staff, providing and requiring them to wear, appropriate PPE.

Where other suitable options for waste management are not available incineration may be used to reduce environmental hazards associated with combustible waste and to reduce its volume. This will be carried out in modern packaged incinerator plant designed and operated to comply with emissions standards for hazardous and non-hazardous waste incinerators set out in IFC EHS Guidelines for Waste management facilities. Residues will be managed in line with potential risks to downstream receivers and Project standards and may be stabilised for example through creation of ashcrete blocks.

11.4.3.5 Monitoring, Transport and Transfer of Waste

The Project will implement a waste tracking system to record key data including:

- the type and volume of waste stream;
- off-site transport;
- final treatment and disposal; and
- records will kept of all wastes deposited at landfill sites including the types and quantities and, in the case of hazardous wastes, the locations of the cells that have been utilised.

Based on the information recorded in the waste tracker internal and external reporting will be undertaken where appropriate.

Wastes will require transportation between the point of origin and the appropriate Project waste management facility. All transfers of Project waste will be undertaken in line with the requirements of the Waste Management Strategy and documented using the tracking system. Each individual load of waste will have a record that will detail the source, type and quantity of waste as well as the date of transport, the carrier being used to transport the waste, and the final destination. The waste tracking system will provide confirmation that each load of waste has reached the intended storage, recycling, re-use, treatment or disposal facility.
Any organisations contracted to transport, manage or dispose of waste on behalf of the Project, and any facility used for the processing, storage or disposal of waste, will only be used after the Project has confirmed that it has all necessary permits and authorisations to undertake the services.

11.5 Summary of Findings

This chapter identifies the requirements of legislation, standards and guidance which apply to resource use and waste management and sets out the nature and, where available, estimated quantities of resources and wastes associated with the Simandou Mine, and how they will be managed to mitigate their social and environmental impacts.

In the construction phase a range of primary resources such as fuel, water and aggregate and products such as equipment will be used to develop the mine facilities. During operation and closure the Project will require on-going supply of replacement equipment and consumable resources. In all phases, the Project will have an on-going demand for water, particularly for dust control, but the largest resource used will be energy in the form of fuel (principally diesel). The Project will manage the use of resources though implementation of and compliance with the requirements of a range of guidance and management measures which will be incorporated in a Procurement Plan for the Project designed in accordance with Rio Tinto’s Procurement Principles.

The Project will also generate diverse non-mineral wastes including both hazardous and non-hazardous wastes. During construction the Project will generate large quantities of cleared vegetation in addition to typical construction and workforce related wastes. During operations the workforce and hence the associated waste streams will be lower but the operational activities will generate a range of new wastes such as those associated with heavy vehicle and infrastructure maintenance from heavy mine equipment. During mine closure wastes will include redundant equipment and materials from dismantling and demolition of plant and buildings.

Non-mineral waste management will be undertaken in line with an overarching Simandou Waste Management Strategy and a more detailed Non-Mineral Waste Management Plan. All new waste management facilities developed either by the Project or third party contractors will be designed, constructed and operated in line with strict standards including compliance with IFC EHS Guidelines for waste management facilities.