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**SIMPLIFIED ENVIRONMENTAL AND SOCIAL IMPACT STUDY  
OF SIMANDOU PROJECT PREPARATORY WORKS**

**CLIENT:** RIO TINTO – SIMFER S.A.  
**PROJET:** PREPARATORY WORKS, SIMANDOU  
GUINEA, WEST AFRICA



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## EXECUTIVE SUMMARY

### **PREPARATORY WORKS OF THE SIMANDOU PROJECT**

Simfer S.A., a wholly-owned subsidiary of Rio Tinto and the International Finance Corporation (IFC), is assessing the feasibility of mining a major iron deposit located in southeastern Guinea in the Simandou mountain range. A Mining Agreement signed in February 2003 by the Government of Guinea and Rio Tinto set an initial term of 25 years with the possibility of renewal for an additional 25 years.

Rio Tinto agreed to conduct a feasibility study for construction of the infrastructure needed to operate an extensive mine, and to assess the potential for building a smelter in Guinea.

Before beginning any feasibility study site work, basic infrastructure will have to be constructed within and around the mining concession. The preparatory works covered by this study consists of expanding the Canga East Camp, construction of a new Ouéleba access road, and construction of an airstrip near the city of Beyla.

This Simplified Environmental and Social Impact Study focuses on the construction and operation of said preparatory works. It is intended to identify and quantify the impacts of Project component construction and operation on the physical and social environment, and to develop the necessary mitigation measures. It is a planning tool designed to optimize preparatory works integration into the environment.

A specific study area was defined for each of the Simandou Project preparatory works components to include all environmental elements likely to be impacted directly or indirectly by the future infrastructure construction and operation activities.

### **BACKGROUND OF THE SIMANDOU PROJECT**

The preparatory works, designed in part to provide the basic infrastructure for intensifying the exploration program, is part of the overall Simandou Project. In addition to operation of an iron ore mine in the Pic de Fon region along the Simandou chain with an estimated capacity of 70 million tonnes per year, the project involves building a "Trans-Guinean" railway for transporting ore extracted from Mount Nimba (Euro-Nimba) and Simandou (Simfer S.A.) projects over a distance of approximately 700 km to a deepwater port in the Matakang region. The port infrastructure, in the prefecture of Forécariah, is intended to handle vessels carrying up to 300,000 tonnes of ore.

The quality of Simandou iron ore is regarded as exceptional, making this deposit one of the richest in the world: average iron levels are around 68%, quartz levels are low and there is virtually no sulphur or phosphorus. Western Guinea's high iron content reserves are generally considered to be the last major reserves of high quality iron ore on the planet.

In accordance with the Guinean Decree codifying environmental impact studies and the related application rules, the overall Simandou Project will be subject to detailed environmental and social evaluation. The overall project is also classified by the IFC as Category A, and must comply with all requirements for this category, including the Policy and Performance Standards on Social and Environmental Sustainability and Policy on Information Disclosure.

Rio Tinto recognizes the importance of implementing a formal process for consulting stakeholders and communities potentially affected by the project, and disclosing information. The company has developed an Operational Guideline for the Simandou project on consulting and informing communities. This Guideline seeks mainly to forge and maintain a lasting relationship with communities that may be affected. The basic principles are mutual respect, active partnership and long-term commitment.

A Guinean National Environmental and Social Impact Assessment Monitoring Committee was set up to orient and validate the Simandou Project feasibility study. The members are representatives of the ministries, organizations and institutions concerned.

The environmental management system implemented for the Simandou Project complies with ISO 14001. Rio Tinto has also developed a series of strategic guidance documents and operational guidelines regarding community development, biodiversity, sustainable development and regional development, to be applied to the Simandou Project.

In addition to the simplified environmental and social impact study of the Simandou Project preparatory works, many other studies have been conducted in the mining concession zone since the exploration program began in 1996. These studies have evaluated the environmental and social sensitivity of the Simandou region with respect to implementation of an iron mine.

Definition of the three components of the overall Simandou Project (mine, railway and port) is currently in the preliminary stage. One objective of the recently launched feasibility study is to define a project that is technically and economically viable. The current definition of the project and initial characterization studies conducted at the mine site have enabled the main potential environmental and social issues associated with the Simandou Project to be identified. These issues are summarized in Table A.

**Table A Overall Simandou Project – Main Environmental and Social Issues**

<b>Component</b>	<b>Environmental Issues</b>	<b>Social Issues</b>
<b>Mine</b>	<ul style="list-style-type: none"> <li>- Possible pluviometric changes in Pic de Fon, affecting groundwater recharge.</li> <li>- Erosion.</li> <li>- Changes in surface water flow patterns.</li> <li>- Impact on biodiversity.</li> </ul>	<ul style="list-style-type: none"> <li>- Change in traditional activities and way of life of local population.</li> <li>- Significant change in landscape.</li> <li>- Community development around the mine.</li> <li>- Management of influx of people drawn by the project.</li> </ul>
<b>Railway</b>	<ul style="list-style-type: none"> <li>- Topographical changes.</li> <li>- Running a train approximately 2 km in length approx. 10 times a day over a very long distance implies major potential impacts in terms of noise, dust, vibration and atmospheric emissions associated with diesel combustion.</li> <li>- Impact on biodiversity.</li> </ul>	<ul style="list-style-type: none"> <li>- In view of the railways; projected length, major potential for compensation and resettlement of populations affected by route configuration.</li> <li>- Significant change in landscape over a very long distance.</li> <li>- Railway configuration at Kabak Island will result in loss of farmland.</li> <li>- Management of influx of people drawn by project.</li> </ul>
<b>Port</b>	<ul style="list-style-type: none"> <li>- Loss of wildlife habitats from backfill activities.</li> <li>- Loss of mangroves (habitats) on Kabak Island.</li> <li>- Changes in circulation of marine current and sediment exchange</li> <li>- Increased noise level.</li> </ul>	<ul style="list-style-type: none"> <li>- Potential impact on traditional village activities in Makatang (artisanal activities and subsistence farming).</li> <li>- Significant change in landscape</li> <li>- Management of influx of people drawn by project.</li> </ul>

The next step is to conduct further baseline environmental and social characterization studies focusing on the project's three aspects (i.e. the mine, railway and port). Specific Terms of Reference will be developed for this phase and submitted for discussion and improvement to the Simandou project's National Environmental and Social Impact Assessment Monitoring Committee. The characterization studies are expected to take about 18 months.

While the environmental and social characterization studies are in progress, the project feasibility study will continue to define more details, including the mining plan, the final railway route and the exact location of the port and harbour infrastructures.

This will provide all the information to enable the environmental and social impact assessment phase of the Simandou Project to be completed and the environmental and social management plan, including specific actions, to be prepared.

### **ENVIRONMENTAL AND SOCIAL LEGAL FRAMEWORK**

The Project will comply with existing Guinean environmental legislation and will conform to Rio Tinto's internal policies and requirements as set forth in the corporate document entitled: "*The Way We Work*". Rio Tinto will also adopt International Finance Corporation requirements with respect to socially responsible and environmentally friendly projects.

The national environmental requirements applicable to the Project are defined in four main documents including the *Code for the Protection and Development of the Environment* together with legal texts of an environmental nature defining regulations applicable to the various activity sectors (*Mining Code, Forestry Code, Water Code, Domanial Land Use Code, Pastoral Code, etc.*).

The social legislative framework in Guinea consists of three important legislative texts, the *Basic Law* of 1992, the *Labour Code* and the *Social Security Code*.

In the case of a Simplified Environmental and Social Impact Study, the authorization process is subject to review by an internal commission of the *Service National des Études et Évaluations Environnementales* (SNEEE) followed by a restitution workshop in the project area.

Lastly, since the Republic of Guinea has no environmental emission or environment quality standards, standards applicable to atmospheric emissions, liquid effluents, and ambient noise levels will refer to World Bank and IFC general and sectorial guidelines and to the World Health Organization's potable water criteria.

### **PUBLIC CONSULTATION**

Various consultation activities were carried out in August 2006 as part of the Simandou Project preparatory works. Public consultations were intended to inform the public concerned (mainly the various levels of government and local communities) about the preparatory works and their anticipated physical and social environmental impacts. They also provided an opportunity to collect people's comments and concerns so that they could be taken into consideration and incorporated into environmental and social impact study preparation.

The consulted public was selected through traditional and administrative structures in villages in which the people were likely to be affected by the preparatory works.

The comments and concerns raised in the course of these consultation activities focused mainly on economic development, access to public services and infrastructure, and agropastoral activities.

The consultations revealed that economic development was the primary expectation expressed by the people who wanted training programs so that they could qualify for the newly-created jobs. They also wanted to participate in the creation of local business to supply products and services (food in particular) to the workers.

The village women wanted the jobs and training programs created by the Project to be open to themselves as well as their husbands and children. They also wanted the Project to boost their commercial activities.

The young were extremely hopeful about the Simandou Project since the great majority of them no longer wanted to work in farming (at least, not under existing conditions).

After the preliminary version of the Environmental and Social Impact Study was submitted, a review workshop was held in Beyla (December 2006) to present the findings of the study.

The main concerns raised were related to expected economic spin-offs from the project, civilian use of the aerodrome, safety measures during dynamiting, the hiring process and the activities planned for community development. Also, the strengthening of infrastructures, training, and proposed mitigation measures for protecting waterways during the construction phase (access road, aerodrome).

## **DESCRIPTION OF THE RECEIVING ENVIRONMENT**

### **□ Physical Environment**

Annual average rainfall in the study area generally varies from 1,500 to 2,500 mm, and humidity is high all year long. The average annual temperature is 24°C with the lowest temperatures recorded from December to February (18 to 20°C) and the highest in March (22 to 26°C).

The predominant winds are the monsoons from the West in the rainy season and the harmattan from the Northeast in the dry season. The latter are responsible for the microclimatic differences on the eastern and western slopes of the Simandou range.

The air quality in the study area is generally good, although at certain times during the dry season, the level of airborne particulates can be more significant, especially during the agricultural slash burning period.

The Simandou range consists of metamorphic rock; it overlooks the valley where the Canga East Camp is sheltered. Valleys carved out by waterways on both sides of the mountain range mark the territory in a southwest-northeast direction.

Seasonal variations in water flows are very significant and result in major water level variations. As a result, the depressions and valley floors are flooded in the rainy season and the streams rarely dry up in the dry season. Depression surface



deposits consist of variable thicknesses of topsoil with traces of iron transported by groundwater.

An analysis of the available water quality data indicates that the water is of good quality but the metal concentrations (iron, aluminum, copper, nickel, lead), typical of iron ore deposits, often exceed World Health Organization (WHO) limits.

#### ❑ **Biological Environment**

The preparatory works are partially located inside the Pic du Fon classified forest. The 25,600 ha forest was classified on November 4, 1953 by virtue of Order No. 8113 SE/F.

The regions is occupied by highland plant formations located above 900 m altitude (montane grassland, montane forest) and lowland plant formations below this altitude (gallery forest, bush and tree savanna, disturbed savanna and grassland savanna mosaic).

Some at-risk species were identified in the preparatory works sector. They include *Eulophia odontoglossa* (CITES), *Vitex doniana* and *Mitragina stipulosa* (*Monographie Nationale*) and *Pterocarpus erinaceus* (Art. 78 of the *Forestry Code*). Some of the species inventoried in the study area are included among the plants likely to be used by local populations (primarily for medicinal purposes).

The preparatory works sector has low fauna potential. The degraded condition of the plant cover, annual brush fires, and area traffic are the main reasons. No traces of chimpanzees or primates were observed in the future work areas.

#### ❑ **Human Environment**

All the preparatory works will be carried out in the N'Zérékoré administrative region in the prefecture of Beyla. The main cities and villages that will be affected are Beyla, Moribadou, Piyaro, Morisangarédou et Kéoulendou. The rural communities, mainly Muslim and of Malinké origin, practice subsistence farming dominated by growing rice (particularly in the lowlands) and manioc, and accompanied by complementary food, fruit, and market crops. They grow most of their food and trade or sell the surplus for other necessities.

Refugee migrations from Sierra Leone and Liberia affected regional ethnic diversity since Beyla Prefecture absorbed a large proportion of the refugees and Guinean nationals. In addition to refugees, the villages of Moribadou and Traoréla accommodate migrant employment seekers.

Apart from agropastoral activities, the region's inhabitants' subsistence depends on the gathering of common use natural products such as firewood, medicinal plants, wild fruit, and honey, as well as building materials.

The region is served by basic health infrastructure (Beyla Hospital and the Moribadou Health Station). Rio Tinto has a private dispensary in the Canga East Camp that provides health services to workers and their families.

Most of the area villages have an elementary school, but the literacy rate is very low, especially among the women.

The villages have no electricity and are linked by rural paths and a well-developed system of trails. Potable water is drawn from village wells and marsh creeks around the villages. In most cases the water sources are not only depletable, but contain coliforms that are one of the main causes of illness in the region.

Some study area sites are of heritage and cultural interest; these include traces of the old colonial airstrip building near Beyla, the old Mamouroudou village site, some natural resources, cemeteries, worship sites, and spring heads.

### **CANGA EAST CAMP**

The Canga East Camp is located on the eastern slope of the Simandou range and currently accommodates about 200 people. The camp expansion will provide capacity for an additional 300 people.

Expansion of the existing Canga East Camp is proposed to minimize the impacts on the host environment and take maximum advantage of the existing camp infrastructure. Expansion of Canga East will take advantage of existing installations and minimize the extent of infrastructure to be built. It will also allow common use of service infrastructure (potable water treatment, waste water treatment, waste handling, etc.) and improve the existing camp. Consequently, no other camp location was analyzed. The new camp will consist of a living area, central facilities, and auxiliary services.

Camp construction will require very little site preparation work since the site is relatively flat. Rio Tinto's objective is to disturb the natural vegetation as little as possible during site clearing and earthworks.

Construction will start in March 2007 and will continue over a period of about six months.

### **Risks, Environmental and Social Impacts and Mitigation Measures**

#### **□ Physical Environment**

Expansion of the Canga East Camp will have both positive and negative impacts on the physical environment. Application of the prescribed mitigation measures and Rio Tinto's adoption of good practices and industry standards will reduce or even eliminate the most significant disturbances.

The result of these practices will be that the risks and residual negative impacts on surface and groundwater, soil, air quality and noise environment will be low to negligible. Installation of the waste water and waste treatment systems that will serve both the existing and expanded camp will have positive impacts of medium significance. The measures taken to reduce suspended material contributions, contain petroleum product tanks, and install waste and waste water treatment system will result in conformance to surface water effluent discharge criteria (World Bank).

Implementing measures to limit earthworks, reduce erosion and soil contamination risks, recover topsoil, and rehabilitate disturbed areas when construction is completed will reduce the residual negative impacts from very low to negligible. Installing a waste treatment system that conforms to recognized international practices, and rehabilitating the existing disposal site will have a positive impact of medium significance despite the increased volume of waste that will be produced.

The overall impact on ambient air quality associated with the installation of new infrastructure in Canga East will be very low. The main sources of atmospheric contaminants in the camp will be the diesel-fuelled electrical generators and domestic waste incinerator. According to the simulations carried out, the electrical generators will meet World Bank and WHO standards except for the WHO's daily standard for SO<sub>2</sub>. This daily standard that appeared very recently (October 2006) is very stringent (20 µg/m<sup>3</sup>) compared to the previous standard of 125 µg/m<sup>3</sup>. To comply with this standard, it would apparently be necessary to limit diesel fuel sulphur content to less than 0.05% compared to the 0.5% that was used in the analysis.

No ambient air quality impact is anticipated in relation to operation of the incinerator since that apparatus is designed to ensure efficient and complete combustion of incinerated materials.

Lastly, the residual impacts on the noise environment after application of the recommended mitigation measures will be of very low significance during camp construction and operation. These measures include limiting construction activities to daylight hours and keeping stationary sources of noise (generators and incinerator) away from the housing units.

#### □ **Biological Environment**

Site preparation and construction of the camp buildings and infrastructure will require clearing of the construction footprint and the consequent loss of approximately 6.6 ha of grassland savanna. Because of the small area involved, and the proposed reforestation measures, a residual impact of low significance on vegetation, and a negligible impact during the camp operation period is anticipated.

During construction, the residual impact on loss of terrestrial and avifauna habitat will be low since grassland savanna has a low habitat potential. Since workers will be prohibited from taking faunal resources, only a very low impact – associated with disturbance of the peace in the areas used by fauna – is anticipated during the camp operating period.

In terms of biodiversity, the camp site does not constitute an essential habitat, but rather a modified habitat. No threatened species are present on the site. Thus, the impact on biodiversity is considered low.

#### □ **Human Environment**

Risks to safety during construction and operation arise mainly from increased traffic through neighbouring villages and storage of hydrocarbons and chemical products. These risks will be mitigated to a low level by implementation of the *Operational Guideline – Hydrocarbon Management*, and implementation of usual measures such as installing appropriate signage, speed limits, personnel training, etc.

The arrival of new workers in the region could contribute to the propagation of HIV-AIDS among the workers and neighbouring population and increase the risks for the safety of young women. The significance of the impact will depend on factors such as the origin, health status, time of residence of the workers, management of migratory flow in the area, control of contacts between workers and other inhabitants, health services provided, and the level of awareness of workers and other

inhabitants. Preventive measures recommended by Rio Tinto's strategic directive regarding HIV/AIDS will be implemented at the construction camp to limit transmission. The anticipated impact on health will thus be low during the construction period, and medium during operation.

The Project must control the hiring of workers from outside the region and the influx of migrants looking for jobs and settling around the camp and neighbouring communities. Such migrants are liable to put more pressure on agricultural lands, natural resources, existing infrastructure and services and cause tension in the villages. Informal dwellings with no sanitation equipment and no access to adequate sources of water could cause the spread of waterborne diseases. An induced migration management program is currently being developed with the local and regional authorities to address the issue. The impact anticipated by induced migration caused by the preparatory works is considered low.

Since the camp site is located on grassland savanna, it has limited agropastoral potential, and the residual impact on land use is deemed to be very low, and negligible after implementation of proposed mitigation measures.

The Simandou Project preparatory works will generate socioeconomic benefits for Beyla Prefecture. The investment for the Canga East Camp is estimated to be US \$1 million. A program of regional and local employment and economic benefit management measures will be implemented to optimize these benefits. Implementation of these measures will promote the awarding of subcontracts to local contractors and the hiring of local manpower. During the operation period, the management of a camp of 500 people will generate a significant demand for goods and services, primarily foodstuffs. Rio Tinto will give the opportunity to vulnerable groups and women to become suppliers, particularly for fresh agricultural products.

Considering the high value the people place on the economic benefits of the Project, of which the preparatory activities are only one component, the recommended improvement measures will result in a high (positive) residual impact during construction and operation, and a very high impact in conformance with the expectations of the local communities that support the Project.

Given the fact that the new Canga East infrastructure will be harmonized with the existing facilities in terms of shape, colour and materials, a very low residual impact is anticipated with respect to alteration of the visual framework.

## **AIRSTRIP**

The Beyla region has no air transportation infrastructure. Rio Tinto wants to construct an airstrip in the Simandou region to facilitate the transport of personnel and equipment.

Because of its undulating topography, Beyla prefecture offers few potential sites for a 1,600 meter airstrip. Two locations were analyzed: one on National Road N-1 between Piyaro and Kéoulendou, west of Beyla, and another location, south of Beyla, at the junction of Road N-1 and the road to Moribadou. After investigating, the site south of Beyla was rejected because its topography was not conducive to construction of an airstrip. The selected site for the airstrip is therefore the one located on Road N-1 between Piyaro and Kéoulendou.

The projected developments include a 1,600 meter long, 30 meter wide, laterite landing strip and aircraft manoeuvring and parking areas. No aircraft refuelling facility is planned for the site.

Airstrip construction will also involve the rerouting of an estimated 2 km section of Route N-1.

Runway construction will not require much site preparation work since the ground is relatively flat. Since most excavation materials will be re-used to fill the site, no borrow pits will be needed. A storage area will be provided for construction debris which will be placed in two piles: topsoil and non-reusable excavation materials.

Construction is scheduled to begin in March 2007 and end in August 2007.

### **Risks, Environmental and Social Impacts and Mitigation Measures**

#### **□ Physical Environment**

The anticipated impacts on water and soil resources, during construction of the airstrip and relocation of the section of Route N-1, are associated with suspended particulate contributions to rivers and streams, the risk of contamination in the event of accidental hydrocarbon spills, surface drainage alteration, and the erosion of denuded soil. Application of measures such as doing the work during the dry season, intercepting runoff water before it reaches the rivers and streams, refuelling of vehicles a minimum of 50 m away from rivers and streams, and preservation of topsoil for rehabilitation of disturbed areas will reduce the impact to a level that is very low to negligible.

During the airstrip operating period, the anticipated impacts are the risk of water and soil contamination by waste water, waste, and the presence of hydrocarbons on the site. Managing waste and wastewater using the treatment systems installed in Canga East, implementation of *Operational Guideline – Hydrocarbon Management*, and installation of devices for hydrocarbon recovery in the event of a leak will mitigate these risks to low to very low levels.

The impact associated with dust being raised during airstrip and road construction will be very low or even negligible since water will be used as a dust blanket. During airstrip operation, atmospheric emissions will be on the order of those from a diesel truck, given the low power of the generators. As a result, the impact on ambient air quality will be very low.

The increase in noise level during construction will be very low given the distance from the villages and the measure designed to limit work to daylight hours. During airstrip operation, the noise level emitted by a DASH-8 will conform to International Civil Aviation Convention limits and the impact will be low.

#### **□ Biological Environment**

The clearing required for the airstrip and national road relocation will result in the loss of about 56 ha of grassland savanna. Given the low value assigned to this type of vegetation, the impact will be low.

Some bushy specimens of *Vitex doniana*, endangered species on the Guinean *Monographie Nationale*, have been inventoried in the airstrip location. Since this species has been inventoried in abundance throughout the territory of Guinea, in fairly variegated stations, and since the specimens in questions are subject to annual destruction by brush fires, the significance of the impact is low.

The impact associated with the loss of fauna habitat and disturbance of the peace in the sector will also be of low significance given the low habitat potential and infrequent faunal use of the sites. Note that installing a fence around the airstrip will eliminate the risk of collisions.

## □ Human Environment

The risks to safety during construction are associated with the crossing of the work area by the local population and their herds to access their fields. The work area will be fenced off and new trails will be marked off to guarantee user safety. The risk is therefore considered low.

During the operation period, vehicles transporting passengers between the airstrip and Canga East Camp will bring more traffic to villages along the road and with it, an increased risk of accidents. Since a maximum of one flight per day is planned, recommending a more direct route between the airport and camp is not yet justified. However, risks and complaints will be monitored by Community Liaison Officers in the villages along the route.

Construction of the airstrip will result in an increase in the number of workers. This will be accompanied by an increased risk of accidents and contagious diseases (STD's, AIDS, etc.) and risks for young women. To mitigate these risks and lessen their impact, the Project will implement a series of measures including: a worker awareness/prevention program on health risks, and implementation of Rio Tinto's HIV/AIDS strategy. Since these measures will be included in the Project, the residual impact on health will be low during construction.

During the operating period, low altitude aircraft overflights above villages could produce stress in the villagers. It is recommended that the airstrip only be used during the daylight hours from 7:00 am to 8:00 pm. The significance of the residual impact is considered low. Night lighting, used only in case of medical emergencies, is also liable to result in disturbance to the neighbouring population. Orienting the lighting toward the ground will mitigate this impact.

Just as in the case of the Canga East Camp, the potential influx of migrants looking for job opportunities must be controlled through an induced migration management program (currently under development).

As a result of optimized alignment of the landing strip and the new configuration of Route N-1, no parcels of productive farmland will be affected.

The area occupied by the airstrip and new road N-1 segment will result in the loss of about 56 ha of grassland savanna potentially used for pasturage. Given the surplus of pasture land in the region and the community compensation program, the residual impact on land use will be low.

Capital investments for the airstrip, associated infrastructure, and relocation of the national road will be approximately US \$1.5 million. This investment will contribute to

job creation and result in economic benefits provided the proposed recommendations for maximizing regional and local economic benefits are implemented.

The existence of new transportation infrastructure – an airstrip in the Beyla region – will have some, although difficult to quantify, impact on the region's economic development potential and opportunities. The new infrastructure will facilitate the exchange of goods and people with the rest of the country in an area that is currently only accessible by road. In this context, the residual impact is deemed to be of medium significance.

The airstrip location is only visible from nearby villages and hamlets. The low building profiles will only contribute to alteration of the visual landscape in a minor way. Harmonizing infrastructure with the landscape will make the visual impact very low.

### **ACCESS ROAD**

At present, the only way to get to the Ouéléba drilling sites from Canga East Camp is via a two-hour trip. To continue their drilling campaign, Rio Tinto wants to build a more direct access road between the Canga East Camp and the Ouéléba drilling sites. The access road will be used to transport the workers and heavy equipment assigned to the drilling campaign.

Four Ouéléba access road variants were analyzed and compared; two of them start west of the Canga East Camp (Canga East-1 & Canga East-2 variants) and the other two, east of the camp near the village of Moribadou (Moribadou-1 & Moribadou-2 variants). The alternative routes were analyzed based on techno-economic criteria as well as the territorial, environmental, social, and visual integration of the route.

The comparative analysis of the alternative routes indicated that the Moribadou-1 variant was the most advantageous Ouéléba access road construction route. Project-related consultation activities in Moribadou village also confirmed that this variant was the best solution for the local community.

The access road will be 6.2 km long and 15 m wide, and it will be usable all year long.

The work required to build the road consists of clearing and grubbing of the right-of-way, removal of topsoil, blasting, earthworks (excavation, backfill and compacting), and installation of river and stream crossing structures.

Access road construction will take from March to September 2007.

### **Risks, Environmental and Social Impacts and Mitigation Measures**

#### **□ Physical Environment**

The road route traverses nine rivers and streams. Since measures will be taken during construction to avoid downstream sediment re-suspension, including working in the dry season and diverting runoff water into areas of vegetation to avoid the risk of water contamination, a residual impact of very low significance is anticipated. Considering that the river and stream crossing structures will be selected and sized based on the volume of surface water runoff, no significant hydrological condition modifications are expected.

Removal of vegetation in steeply sloped areas is liable to concentrate and accelerate the flow of runoff during the rainy season, resulting in soil erosion and transport of sediment into the rivers and streams. The risk of soil contamination by hydrocarbons is also a possibility. Rehabilitation of disturbed areas and those likely to be subject to erosion and implementation of *Operational Guideline – Hydrocarbon Management* will mitigate this impact to a very low residual level.

The impacts on air quality associated with dust raised by earthworks and traffic during road construction and operation will be very low or even negligible since water will be sprayed to reduce dust emissions.

The projected noise levels during Ouéléba access road construction and operations will be very low because construction will be limited to daylight hours and traffic speed will be limited.

#### □ **Biological Environment**

Deforestation and clearing of the access road right-of-way and material dumping areas will result in the loss of approximately 10 ha of disturbed tree and bush savanna, 5 ha of grassland savanna, and 0.2 ha of montane grassland. Since clearing will be limited to the minimum areas required, and because of the small areas involved and the possibility that the local population can recover the timber, the residual impact associated with the loss of plant formations is deemed to be low for the savannas and medium for the montane grassland since the latter plant formation has a high value due to its rarity.

Habitats affected by the passage of the road are considered modified habitats. In addition, the farmers annual setting of brush fires reaching the peak of the Simandou chain affects the development of the different vegetative species.

Fauna habitats on the eastern slope of the Simandou range are assigned a medium environmental value because of their degraded condition. The loss of these habitats for terrestrial and avifauna will result in a low significance impact, while operation of the road will increase the risks of collisions with fauna and will increase hunting pressure on the faunal resource. However, this impact is deemed to be of very low significance because of the mitigation measures that will be deployed.

#### □ **Human Environment**

The heavy traffic that will be generated on the access road during construction and operation is liable to have an impact in terms of the risks of accidents to users (pedestrians and livestock). However, mitigation measures such as the installation of protective barriers, vehicle speed limits, and the use of appropriate signage in pedestrian crossing areas will reduce such risks to a low level during the construction period and a medium level during operation.

The project involves dynamiting operations, which may pose a risk of flying debris for the local population and workers, particularly vulnerable groups. To ensure this hazard is properly managed, Rio Tinto will implement its *Operational Guideline – Explosives* and conduct a special communication program for vulnerable groups.

As is the case for the other two Project components, the activities associated with construction and use of the access road are liable to generate increased pressure on agricultural lands, natural resources, and public service infrastructure, primarily with



regard to the potential flow of migrants seeking job opportunities. This specific problem will be addressed in the Management Plan for New Arrivals (currently under development).

The primary impact anticipated on land use is associated with repercussions on the farming activities of some of the farmers from Moribadou village. Clearing and grubbing will remove about 0.6 ha of farmland (belonging to a dozen farmers) mainly used for rice cultivation. The road route will be optimized prior to construction to minimize the area and number of farmers affected. Since a compensation program will be put in place to provide for replacement farming areas, the residual impact is estimated to be medium.

The loss of grassland and tree and bush savanna (approximately 15 ha) will result in a reduction of the resources used by village communities for hunting-gathering (collecting of medicinal plants and foodstuffs, cutting of timber and firewood, hunting, etc.) and areas used as pastureland. Since the route will be optimized to spare the species used by the local population, and because of the possibility of the local population recovering the timber and implementation of a community compensation program, the residual impact is deemed to be of medium significance.

The old Mamouroudou village site is located on the edge of the access road. The site may contain artifacts of heritage interest associated with the operation of an old smelter. An additional study is currently being conducted to determine whether the old Mamouroudou village site has any heritage value requiring protective actions. Should artifacts be discovered, the road route will be optimized to spare them. Based on the available fragmentary information, the impact is considered undetermined.

The people expect the socioeconomic benefits associated with access road construction activities (investment of US \$1.5 million) and maintenance to be maximized for the benefit of the village population. The (positive) residual impact is deemed to be high during both the construction and operating periods.

Given the low degree of visibility the road will have from concentrated observer sites, including Moribadou village, a low impact is anticipated in terms of alteration of the local visual landscape.

### **ENVIRONMENTAL AND SOCIAL MANAGEMENT PROGRAM**

The Project's Environmental and Social Management Program (ESMP) aims to provide a structured framework allowing management of the risks and environmental and social impacts associated with the implementation of the preparatory works.

The proposed measures and actions in the ESMP will be implemented as part of Rio Tinto Policies, Strategies, Operational Guidelines and Work Procedures, and will comply with IFC Performance Standards and applicable Guinean laws and regulations.

The ESMP is designed as a dynamic process to be implemented and updated during the entire lifespan of the Simandou Project. Accordingly, Rio Tinto has set up an Environmental and Social Management Unit (ESMU) to manage development and implementation of the Simandou Project.

The proposed action plan comprises mitigation and improvement measures related to impacts and risks associated with the project, and a series of plans covering specific topics: Compensation, Biodiversity, Community Development, Management of New Arrivals, Cultural Heritage Management, Labour and Working Conditions, Occupational Health and Safety, Community Grievance Management, Incident and Emergency Measures Management, and Public Consultation and Information Disclosure Strategy (Table B).

**Table B Action Plan Components**

Specific Plan	Details
Compensation Plan	A plan that identifies measures for compensating individuals whose property or land may be affected by the project, who may be deprived of a source of income or means of subsistence.
Biodiversity Action Plan	This plan sets out an action framework for minimizing impacts on biodiversity, for restoring disturbed areas, compensating for habitat loss, increasing effective protection of essential habitats in the Simandou region and securing the commitment of local communities to biodiversity protection.
Community Development Plan	This development plan is designed to create opportunities for local populations to benefit from the project and fulfil their aspirations for sustainable economic and social development, in particular by reinforcing communities, centralizing, and improving access to basic health services and education.
New Arrivals Management Plan (currently being developed)	The guiding principles behind this plan are to establish a structured, concerted framework jointly with local authorities for the project's development cycle regarding induced migration, tracking of demographic data for the Simandou zone and strengthening community organizations; the idea being to organize and mobilize local populations more effectively in favour of planned development that promotes the conservation of resources.
Cultural Heritage Management Plan	The plan's goal is to prevent, minimize or compensate for potential damage to sites or elements of cultural value. For this to be achieved, sites of cultural interest have to be pinpointed and mapped, and a procedure established for determining appropriate measures for mitigation and compensation where required.
Labour and Working Conditions Management Plan	This plan establishes a human resources policy specifying the overall framework for labour relations between Rio Tinto and its workers, and a hiring policy setting out hiring priorities and procedures.
Occupational Health and Safety Management Plan	Rio Tinto has developed a number of strategies and operations standards for preventing and managing health and safety risks.
Community Grievance Management Plan	This plan implements the <i>Operational Guideline – Community Grievance System</i> , which formalizes the procedure for receiving and processing claims from the community.
Incident and Emergency Measures Management Plan	This plan implements the Emergency Measures Plan, which specifies the management structure in an emergency situation, defines roles and responsibilities regarding communications and explains the process for setting in motion the Emergency Measures Plan.
Public Consultation and Disclosure Strategy	This implements the <i>Operational Guideline – Consulting and Informing Communities</i> , which sets out a structured process for forging and maintaining lasting relationships with affected communities and securing their support for the project. Among the means in place are community forums (held every 6 months), the Beyla information desk, information posts in villages, a community liaison officer in all main villages, and a project website (under construction).

An environmental and social surveillance and monitoring program will also be put in place. Environmental and social monitoring will cover the following elements: surface water, drinking water, nuisances, management of residual and hazardous materials, economic spin-offs, induced migration, community projects, health and safety, and vegetation (reforestation).

## **CONCLUSION**

The activities associated with construction and implementation of the three preparatory works components – the Canga East Camp, Airstrip, and Access road – will not have any high negative residual impact on the natural and human environment in the study area. The fact that the Project component insertion environments are in relatively isolated areas with few sensitive elements, and the fact that ESMP mitigation measures will be implemented+, will contribute substantially to minimizing the impacts on the environment.

In addition, the analysis of alternatives for the camp site, airstrip, and Ouéléba access road locations resulted in options having the least impact, in conformance with Rio Tinto's commitment to minimize adverse impacts on the biophysical and social environment.



**ACRONYMS AND ABBREVIATIONS**

AIDS	Acquired Immunodeficiency Syndrome
BCSPP	Coordination Office for Strategies, Planning and Prospective (Bureau de Coordination des Stratégies, de la Planification et de la Prospective)
CED	Educational Center for Development (Centre d'éducation au Développement)
CEGENS	Mount Nimba and Simandou Environmental Management Center
CI	Conservation International
CIA	Internal Commission for Approbation (Commission Interne d'Approbation)
CIS	Communication and Information Systems
CITES	Convention on International Trade in Endangered Species of Wild Flora and Fauna
CMDP	Center for Mining Development and Promotion
CRD	Rural Development District (Commune Rurale de Développement)
DNCQV	National Directorate for Quality Life Control (Direction Nationale de Contrôle de la Qualité de vie)
DNEF	National Directorate of Waters and Forests (Direction Nationale des Eaux et Forêts)
DNPLPN	National Directorate of Prevention and Control of Pollution and Nuisances (Direction Nationale de la Prévention et de la Lutte contre les Pollutions et Nuisances)
DNPN	National Directorate of Nature Protection (Direction Nationale de la Protection de la Nature)
EIA	Environmental Impact Assessment
EPIC	Industrial and Commercial Public Institution (Établissement Public à Caractère Industriel et Commercial)
EPNL	Effective Perceived Noise Level
ESIS	Environmental and Social Impact Study
ESMP	Environmental and Social Management Program
ESMU	Environmental and Social Management Unit
FAO	Food and Agriculture Organization of the United Nations
FCZ	Forestry Center of N'Zérékoré
GDP	Gross Domestic Product
GHG	Greenhouse Gases
GPS	Global Positioning System
HIV	Human Immunodeficiency Virus
HSEC	Health, Safety, Environment and Community
IBA	Important Bird Area

ICAO	International Civil Aviation Organization
IFC	International Finance Corporation
ILO	International Labour Organisation
IRAG	Agronomic Research Institute of Guinea
ISO	International Organization for Standardization
IUCN	International Union for Conservation of Nature
JMO	Joint Ministerial Order
L <sub>Aeq,T</sub>	Equivalent Continuous Noise Level
MAEF	Ministry of Agriculture, Waters and Forests
ME	Ministry of the Environment
MI	Ministry of the Interior
MMG	Ministry of Mines and Geology
MPN	Most Probable Number
MSDS	Material Safety Data Sheet
NGO	Non-Governmental Organization
PAN/LCD	National Action Program Against Desertification (Plan d'Action National/Lutte Contre la Désertification)
PCDS	Public Consultation and Disclosure Strategy
PD	Prefectural Director
PISM	Investment Project in Mining Sector (Projet d'Investissement dans le Secteur Minier)
PNAE	National Action Plan for the Environment (Plan National d'Action pour l'Environnement)
PPAH	Pollution Prevention and Abatement Handbook
RAP	Rapid Assessment Program
RBG	Royal Botanical Gardens
SCHL	Canada Mortgage and Housing Corporation (Société Canadienne d'Hypothèque et de Logement)
SEIA	Social and Environmental Impact Assessment (Service National des Études et Évaluations Environnementales)
SNEEE	National Service of Environmental Studies and Assessments (Service National des Études et Évaluations Environnementales)
STD	Sexually Transmitted Disease
USEPA	United States Environmental Protection Agency
WB	World Bank
WHO	World Health Organization
WMC	Water Management Consultants

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# CHAPTER 1

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## Introduction



## **1. INTRODUCTION**

### **1.1 PROJECT OVERVIEW**

Simfer S.A., a wholly-owned subsidiary of Rio Tinto and the International Finance Corporation (IFC)<sup>1</sup>, is evaluating the feasibility of mining a large iron ore deposit located in southeastern Republic of Guinea (Guinea), in the Simandou mountain range region. A mining agreement between the Guinean government and Rio Tinto signed in February 2003 defines the legal framework applicable to the Simandou Project. The agreement covers an initial term of 25 years with an option to extend this for a further 25 years.

The project is located in a remote region of Guinea characterized by limited infrastructure, and a lack of roads in particular.

Rio Tinto has committed to undertaking a feasibility study for the construction of infrastructure required to operate a large-scale mine as well as assessing the potential for an iron smelter in Guinea.

### **1.2 PREPARATORY WORKS**

As part of the feasibility study, basic infrastructure works must be built on and around the mining concession (Simandou). Before feasibility study field work can begin, basic infrastructure works must be built near the mining concession (Simandou). These preparatory works consist of expanding the existing Canga East Camp currently used for exploratory work, building a new access road to Ouéléba, and constructing an airstrip near the city of Beyla.

The preparatory works that will support the basic infrastructure required for the planned increased exploration activities in the mining concession, is a part of the Simandou project. In addition to the mine, the project involves building the Trans-Guinean railway and a deepwater port at Matakang. The feasibility study (now in its initial stages), will further clarify the mine layout, the location of mine infrastructure, the railway route and the final location of the port and port infrastructure. At this stage of the project, the impact zone of the project's three components and the project development zone have not yet been defined. In view of the development possibilities of a landing strip at Beyla (particularly regional), the Trans-Guinean railway and a new deepwater port, it is expected that the development zone associated with the Simandou project will be much larger than the project impact zone.

### **1.3 STUDY OBJECTIVES**

This environmental and social study focuses on the construction and operation of the above-mentioned preparatory works ("the Project").

The purpose of the study is to identify and quantify the impacts of the Project's components on the natural and social environment, and to design the necessary mitigation measures. It is a planning tool intended to optimize the integration of the preparatory works into the environment.

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<sup>1</sup> Rio Tinto – Simfer S.A. with 95% ownership; IFC with 5%.

## **1.4 CONTENTS OF SIMPLIFIED ENVIRONMENTAL AND SOCIAL IMPACT STUDY**

The Preparatory works Environmental and Social Impact Study (ESIS) is structured along the lines of the Project components. The following are provided for each one: a technical description of the component, a description of the environment into which it is integrated, an assessment of its environmental and social impacts, and the proposed mitigation measures. Some elements of the description of the components' integration environment are similar, so in order to avoid redundancy, a complete description of the element in question is given in the chapter on the component that is most affected by its environment, and then this section is simply referred to in the other chapters. For example, the climate description is given in the airstrip chapter, since certain weather conditions (wind speed and direction) must be taken into account in designing the airstrip. Surface water and groundwater quality are addressed in the camp chapter.

The Environment and Social Management Program (ESMP) is designed for the Project's components as a whole.

The environmental and social assessment consists of seven chapters (in addition to this introduction):

- Chapter 2 describes the environmental and social legal framework applicable to the Project;
- Chapter 3 introduces the impact study approach and methodology;
- Chapter 4 discusses the expansion of the Canga East Camp;
- Chapter 5 discusses the new airstrip planned for near Beyla;
- Chapter 6 addresses the construction of the Ouéléba access road;
- Chapter 7 describes the Environmental and Social Management Program that will be implemented as part of the preparatory works;
- Chapter 8 concludes the environmental and social impact study.

## **1.5 PROPONENT**

Rio Tinto is a world leader in the discovery, extraction and processing of mineral resources. The company's operations provide the essential minerals and metals that help meet global needs and continue to enhance living standards around the world.

Rio Tinto began its exploration activities in Guinea in 1996.

Rio Tinto encourages local initiatives and has adopted a management philosophy based on decentralization of authority that delegates responsibility to its various work locations.

## **1.6 BASIC STUDIES CONDUCTED AS PART OF THE SIMANDOU PROJECT**

Since the start of the first exploration campaigns, Rio Tinto has conducted several basic studies in the Simandou range area to assess the environmental and social sensitivity of the Simandou region. The basic studies undertaken to date were designed to obtain knowledge that would provide a better understanding of the biodiversity of the Simandou range and the local communities that depend on mining of its resources. The social studies conducted to date were designed to understand the social organization and

demographic, socioeconomic, health, and education conditions of the villages that could be affected by the Project.

The main studies currently produced as part of the Simandou Project include:

□ **Preliminary Environmental Characterization Study - Simandou Iron Ore Project Exploration Programme (Hatch & Associates Inc., 1998)**

A preliminary environmental characterization study was carried out as part of the Rio Tinto exploration program. This report:

- Provided an initial review of the applicable legal framework (Guinean government, Rio Tinto, World Bank, etc.);
- Provided an initial environmental and social portrait of the study area based on information collection and on-site validation;
- Identified the main social and environmental concerns and health and safety challenges;
- Identified an environmental code of practices that would reduce negative impacts;
- Prepared a scope of work to be performed as part of the in-depth environmental and social impact study in the event Simandou Project development should go ahead.

□ **Temporary Access Route Social/Environmental Analysis - Simandou Iron Ore Project Exploration Programme (Hatch & Associates Inc., 1998)**

To carry out an exploration campaign in the Ouéléba, Dabatini, Pic de Fon, Summit 1302, and Canga 2 sites located in the Simandou range, a road will have to be built so that drilling equipment can access the sites. The impact study evaluated two alternative routes for accessing the Simandou deposits. The analyses indicated that the choosing the East variant (rehabilitation of the existing path between Beyla and Moribadou and construction of a new road from Moribadou to Pic de Fon) would reduce the impacts on the primary forests of the Pic de Fon classified forest, most of which are located mainly on the western slope of the Simandou range. Construction of this road will have no significant negative impact, but it will improve the local population's access to local markets.

□ **A Rapid Biological Assessment of the Forêt Classée du Pic de Fon, Simandou Range, South-Eastern Republic of Guinea (McCullough, 2004)**

Since the Pic de Fon was designated as a priority area for biodiversity assessment by Conservation International (CI) and there are few data on the Simandou range, a protocol of agreement to initiate activities within and around the Pic de Fon classified forest was negotiated in November 2002 between Rio Tinto and CI. A Rapid Assessment Program (RAP) was conducted by a multidisciplinary team of 13 international and regional scientists to evaluate the region's biodiversity, potential threats, and opportunities for conservation of the classified forest.

A wide diversity of habitats and taxons was observed during the study. Among the habitats inventoried, the montane grasslands and montane forests presented conservation interest because of their very limited extent in Guinea. The RAP team inventoried a total of over 800 plant and animal species. Some of these species are

new to science (5 invertebrates and 3 amphibians) and others are new for Guinea (11 invertebrates, 3 amphibians, 7 birds, 3 bats, 1 shrew). The classified forest is home to several species of national importance for conservation (IUCN and CITES).

The 24 villages surrounding the Pic de Fon classified forest depend on its resources for their survival. The main existing threats to biodiversity are hunting, creeping farming, brush fires, forestry and mine exploitation, etc. The RAP concluded with recommended biodiversity conservation actions.

❑ **Rio Tinto Simandou Communities Programme – Land Tenure Issues in the Republic of Guinea (Synergy, 2005)**

This report provided a comprehensive picture of the challenges with regard to land tenure in the Republic of Guinea. A description of the customary landholding system showed the importance of ethnic group membership-based traditions in land acquisition methods. The legal and regulatory framework of the Guinean *Code Foncier et Domanial* which, since 1992, has been encouraging and facilitating private acquisition methods is described. The report also covers the various ownership rights restrictions imposed by the *Code Foncier* and addresses gaps in the system such as land access gender inequality and poor administration organizational capabilities.

Next, current trends in land occupancy are identified, highlighting potential conflicts in such matters. The new national strategy adopted in 2001 is then described in detail. The strategy is designed to improve land ownership security based on strengthening of social cohesion, development of economic activities, promotion of decentralized resource management, and fair land distribution. Lastly, the report presents two examples of expropriations and agreements in principle in Guinea, and then concludes with the various mechanisms used to secure ownership rights.

❑ **Report on the Preliminary Study of Land Use and Management in the Simandou Zone (RTI International, 2006)**

This report is part of the development of a community program to ensure the acceptance and social approval of the Rio Tinto Project in Guinea; the purpose of the report is to define the land use and management system in the Simandou area through a participatory and integrated process. More specifically, it describes the existing situation with regard to access to the land and land appropriation (customary, legal, and local) in the villages and communities potentially affected by the project in order to present proposals for strengthening and improving the organization of local land management capabilities.

The report first provides a comprehensive diagnosis of the communities affected by the Project, describing their socioeconomic, demographic, and geographic characteristics. The report then describes local land management spatial organization modes, characteristics, and challenges, as well as conflict resolution methods. This exercise fully defined the local problem with regard to land ownership and presented solutions to the problems encountered.

□ **Rio Tinto Simandou Communities Programme - Social Characterization Study – Beyla Town (Synergy, 2006)**

Since the Simandou Project is located mainly in Beyla Prefecture, a social characterization study was conducted for the City of Beyla (covering the five Beyla neighbourhoods, but not including its districts and rural sectors). This study was designed to provide Rio Tinto with in-depth knowledge of the socioeconomic realities and challenges for Beyla town.

Investigations carried out with Beyla citizens, administrative personnel and individuals responsible for specific sectors, and community organizations characterized the population of each of these neighbourhoods, their resources and means of existence (agriculture, commerce, and employment), and defined the quality of life, existing services and infrastructure, and organization of local development in Beyla.





### Environmental and Social Legal Framework



## 2. ENVIRONMENTAL AND SOCIAL LEGAL FRAMEWORK

### 2.1 INTRODUCTION

This chapter describes the environmental and social legal framework applicable to preparatory works for the overall Simandou. Preparatory works consists of construction of a new Ouéléba access road, establishment of an airstrip near Beyla, and expansion of the Canga East Camp.

This chapter focuses on the environmental and social Guinean guidelines and national requirements that apply to the Project (preparatory works), and also describes international environmental requirements respected by Guinea and that are applicable to the Project. Similarly, the main social legislation is also presented.

Rio Tinto has committed to the International Finance Corporation's (IFC)<sup>1</sup> requirements for socially responsible and environmentally-friendly projects. A brief section of this chapter will therefore address IFC policies applicable to the project. Rio Tinto's main policies and directives regarding health, safety, the environment and community relations will also be introduced.

As the Simandou project feasibility study gets under way, a number of the project components and infrastructure elements need to be defined. The social and environmental legal framework for the overall project will be identified at the stage of supplementary social and environmental characterization studies. In keeping with its commitments, Rio Tinto will ensure that the standards adopted for the project will meet the best practices recognized in the industry as well as the best practices of the Guinean government, the International Finance Corporation (IFC) and Rio Tinto's own internal guidelines.

### 2.2 LAWS AND REGULATIONS APPLICABLE TO GUINEA

#### 2.2.1 Legal Environmental Framework

##### □ Legal Texts of General Interest

In Guinea, requirements for the protection of the environment are defined in four main documents:

1. The Code for the Protection and Development of the Environment (*Code sur la protection et la mise en valeur de l'environnement*), Order 045/PRG/SGG/87, May 28, 1987; the "Environment Code").
2. Presidential Decree No. 199/PRG/SGG/89 defining the requirement for Environmental Impact Assessments (*Décret codifiant les études d'impact sur l'environnement*, November 8, 1989; the "EIA Codifying Decree").
3. Presidential Decree No. 200/PRG/SGG/89 defining the authorization process for facilities classified for protection of the environment (*Décret définissant le processus d'autorisation des installations classées pour la protection de l'environnement*, November 8, 1989, the "EIA Process Decree").

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<sup>1</sup> A branch of the World Bank dedicated to private sector project funding.

4. Order No. 990/MME/SGG/90 regulating the content, methodology and procedure of the Environmental Impact Assessment (March 31, 1990).

#### *The Law for the Protection and Development of the Environment*

The *Law for the Protection and Development of the Environment* describes the overall framework applicable to environmental issues. The law provides general guidance to ensure that the environment (i.e. soil, surface and coastal water, atmosphere), the natural and human environment (i.e. human settlements, fauna, flora) are protected, and that environmental nuisances are minimized (i.e. solid wastes, hazardous substances, noise, odours). The law also specifies that all projects that could potentially harm or jeopardize the environment (as classified by the decree No. 200/PRG/SGG/89) are subject to the environmental assessment process. As a result, the *Law for the Protection and Development of the Environment* applies to the proposed Project.

#### *The Decree Codifying Environmental Impact Assessments*

The EIA Codifying Decree (No. 199/PRG/SGG/89) states that an EIA is mandatory for all projects identified in a list annexed to the decree. The types of projects in the list include airstrips, roads, thermal power plants, and “classified facilities” (industrial facilities).

The application document entitled “Terms of Reference & Assessment Guide for Environmental Impact Studies” specifies the type of environmental assessment (simplified or in-depth) to be prepared by the different types of projects. According to said document, the construction of an airstrip less than 2,500 m long and the construction of a road and associated infrastructure with a right-of-way less than 20 m wide and more than 1 km in length are subject to a simplified EIA. The camp expansion is not subject to the EIA procedure, but the environmental and social study will cover all related preparatory works (camp, airstrip, and access road).

In addition, information received from the Department of the Environment on November 23, 2006 (Ref. Appendix H) confirmed that the works in question is classified under categories C, work requiring only one simplified EIA in accordance with the “Environmental Impact Assessment Guide” produced by the Ministry of the Environment.

The approval process for a simplified EIA includes submission of the report to the Ministry of Environment, examination by an internal commission, and approval by a verbal process. Once the EIA has been considered to be in conformance with administrative and technical procedures, a dissemination workshop for the EIA must be organized in the project area by the firm carrying out the EIA studies. The technical aspect of the workshop will be ensured by the CEGENS responsible for environmental issues in the Simandou region, assisting by the Department for Environmental Evaluations and Social Studies.

For the purposes of conducting, reviewing, validating and monitoring the application of the results of environmental studies and assessments, on September 28, 2006, the Ministry of the Environment issued Order No. 05074/ME/CAB/SGG, establishing a National Environmental Study and Assessment Service (SNEEE), which in turn set up an Internal Review Board (CIA) to rule on the admissibility and compliance of the

content of environmental impact assessment reports on the basis of defined reference criteria. At the end of this procedure, the Internal Review Board issues a report on its findings. Thereafter, a dissemination workshop for the EIA must be organized in the project area by the firm carrying out the EIA studies. The technical aspect of the workshop will be ensured by the CEGENS responsible for environmental issues in the Simandou region, assisted by the SNEEE. This procedure, which is both internal and external, essentially involves considering and recording the concerns, suggestions and recommendations of all stakeholders with a view to improving the final version of the report.

#### *Decree Setting Out the Approval Process for Facilities Classified for Environmental Protection Reasons*

Decree No. 200/PRG/SGG/89 sets out the various procedures and requirements that a project proponent must satisfy in order to obtain approval for the building and commissioning of a classified facility (Class 1).

Preparatory works is not considered to be a classified facility and is therefore not subject to the provisions of the decree.

#### *Order Describing Environmental Impact Assessment Content, Methodology and Procedure*

Order 990 (March 31<sup>st</sup>, 1990) regulates environmental impact assessment (EIA) content, methodology and procedure. The EIA must include 5 sections:

1. Summary Project Description (justification, location, investment costs, date of decision regarding investment, project schedule).
2. Baseline environmental analysis and description including the following parameters: geology, pedology; hydrogeology, hydrology; natural environment, fauna and flora; landscapes and sites; noise, odours, air quality, traffic and infrastructure, socio-economic activities.
3. Assessment of the project's predictable impacts on the site and its natural and human environment as a function of the above-mentioned environmental elements.
4. Description of project alternatives and reasons for which, from an environmental standpoint, the proposed alternative was selected.
5. Measures to be undertaken by the proponent or contractor to eliminate, reduce, and if possible, compensate for the damaging consequences of the project on the environment; and estimation of related costs.

#### □ **Sectoral Legal Texts**

The main sectoral project-related legal texts of an environmental nature are listed below in Table 2.1.

**Table 2.1 Sectoral Environmental Legal Texts**

Legislation	Legislation No.	Signature
Mining Code	Act L/95/036/CTRN	June 30, 1995
Forestry Code	Act L/99/013/AN	June 22, 1999
Water Code	Act L/94/005/CTRN	Feb. 14, 1994
Domanial Land Use Code & Policy	Order O/92/019/PGR/SGG/92	March 30, 1992
Wildlife Protection Code & Hunting Regulations	Act L/97/038/AN	Dec. 9, 1997
Order Respecting Exploitation of Domestic & Wild Animals	Order No. 006/PGR/SGG/90	Jan. 15, 1990
Pastoral Code	Act L/95/51/CTRN	Aug. 29, 1995
Livestock Raising & Animal Product Code	Act L/95/046/CTRN	Aug. 29, 1995
Order Regulating Transhumance & Conflict Management Between Farmers & Herders	Joint Order No. A2005/4960/MATD/MAE/SGG	2005
Forestry Code & Mining Code Harmonization	Joint Ministerial Order No. 624	Feb. 9, 2000
Explosives Code	Act L/96/008	July 22, 1996

#### □ Guinean Clearances and Permits

For projects covered under the legal framework of the Mining Code (Law L/95/036/CTRN), as is the case for the proposed project, the process for obtaining most of the necessary permits, clearances, and authorizations is described in the Code itself. Most of these processes have been streamlined and centralized under the Ministry of Mines and Geology or the Center for Mining Development and Promotion (CMDP) within the Ministry of Mines. In other specific cases, such as the import and use of explosives, the procedure for obtaining the necessary permits is established by a Joint Ministerial Order (JMO).

JMOs harmonize the Mining Code with various other codes (such as the Water Code, Forest Code, Urban Code, Land Rights or Domanial Code) that regulate other aspects of the Project. They also streamline the process of applying for and obtaining permits by identifying the Ministry of Mines as the only body with the authority to grant such permits, or by clearly stating that a JMO is required. However, in the case of a simplified EIA, the permit-issuing process is biased in favour of direct permit issuance by the prefecture responsible – Beyla Prefecture in this case – whenever prefecture directors or section heads are involved.

Under the Mining Code, certain rights are granted to the owner of a mining concession, which permits them to undertake work throughout the project. The mining agreement signed by Rio Tinto includes the mining and beneficiation of the iron ore deposits depending on the construction of infrastructure outside the boundaries of the mining concession (Article 17 of the Base Convention). However, concession beneficiaries are required to obtain certain permits and/or authorizations from various Guinean government agencies. Activities and works requiring special authorization are identified in Table 2.2 below.

**Table 2.2 List of Required Permits & Authorizations**

Permit / Authorization	Legislation	Authority Responsible for Issuing Permit or Authorization	Comments
<b>Opening &amp; operating of a quarry or borrow pit, excavation &amp; earthworks</b>	Mining Code Act L/95/036/CTRN (Art. 107)	Ministry of Mines & Geology Beyla Mines & Quarries Section Head	Borrow pit locations & amounts required: needed for permit request
<b>Importing &amp; transport of explosives</b>	Explosives Code Act L/96/008 (Art. 26)	Ministry of Territorial Administration & Security (Department of the Interior)	Authorization to transport, use, import & store explosives (> 5 kg) for non-military use
<b>Using explosives</b>	Explosives Code Act L/96/008 (Art. 27)	Ministry of Mines & Geology National Mines Division	-
<b>Tree felling permit</b>	Forestry Code Act L/99/013/AN (Art. 78 et 80) <sup>2</sup> Joint Order No. 571/MAEF/MEF/SGG (February 9 2005) Order No. 98/8346/MFNE/SGG	Ministry of Agriculture, Livestock, Waters & Forests Beyla Prefecture Water & Forests Manager	If work is done in the domanial forest
<b>Camp construction permit</b>	Domanial Land Code Order No. O/92/019/PGR/SGG /92 (Art. 89)	Ministry of Urbanism & Habitat Beyla Prefecture Habitat Manager	Construction permit to be obtained locally (Beyla prefecture)
<b>Transport infrastructure development permit (road)</b>	Mining Code Act L/95/036/CTRN (Art. 73)	Ministry of Mines & Geology (after consultation with the Ministry of Public Works)	Road construction permit (Beyla prefecture)
<b>Airstrip</b>	International Civil Aviation Organization regulations	Ministry of Transport National Civil Aviation Division West African Civil Aviation	Mandatory visits by Department of Transport: 1 <sup>st</sup> visit: release for start of work 2 <sup>nd</sup> visit: start of construction 3 <sup>rd</sup> visit: release for start of operation

## 2.2.2 Social Legislation

The social legislative framework in Guinea consists essentially of three main legislative texts: the Order of January 28, 1988, respecting the *Labour Code of the Republic of Guinea*; the Act of February 14, 1994, instituting the *Social Security Code*; and the *Basic Law of 1992*.

<sup>2</sup> Refer to the list of the species of flora (Appendix F) requiring a license from the forest service under the terms of Article 78 of the Forestry Code.

### ❑ **Labour Code (Order No. 003/PRG/SGG/88)**

The Republic of Guinea has been a member of the International Labour Organization since 1959. The *Guinean Labour Code*, regarded as being one of the most modern in West Africa, provides an exhaustive legal framework for employment contracts, working conditions, the representation of social partners and the protection of workers' health.

### ❑ **Social Security Code (Act L/94/006/CTRN)**

The *Social Security Code* applies to all workers under the Labour Code, including government employees. It deals primarily with the national social security fund, the prevention of occupational hazards, pension and annuity provisions, and health care and social initiatives.

### ❑ **Basic Law of 1992**

The *Basic Law* proclaims, in its preamble, the equality and solidarity of all nationals, without distinction of race, ethnic group, sex, origin, religion or opinion. It also enshrines compulsory elementary school education and equal access of all, without discrimination to educational services.

Furthermore, in accordance with Article 17 of the Universal Declaration of Human Rights adopted and proclaimed by the United Nations General Assembly (December 1948) the *Basic Law* of the Republic of Guinea established (Article 13) that everyone has the right to own property. This article has thus re-established the right of ownership of private property in Guinea, breaking with the 1958–1984 period, when land was nationalized.

### ❑ **Other Legislation**

Several other pieces of legislation have social ramifications in Guinea. Mainly, the *Declaration of rural land-use policy* (Decree 0/200/037/PRG), which seeks to promote economic and social development by securing rural land rights and developing sustainable agriculture, and the *Urban Planning Code*, which establishes the rules governing land occupancy and use and provides local and regional authorities with a reference framework for land-use planning guidelines, which must take into account, among other things, demographic forecasts, interregional relationships, distribution of basic infrastructure and facilities, distribution of economic activities, and environmental protection.

Lastly, some pieces of Guinean legislation ensure protection for vulnerable groups: the *Bill to promote and protect disabled persons* is one example, as is the *Reproductive Health Act* (Act 2000/010/AN of July 10, 2000), which specifically addresses women's concerns.



## **2.3 ENVIRONMENTAL AND SOCIAL REGULATIONS AND GUIDELINES OF PROJECT PROPONENTS**

### **2.3.1 Rio Tinto Policies and Procedures**

Rio Tinto recognizes that effective management designed to protect the health and safety of its employees and reduce any adverse impact that its operations might have on the environment and local communities is essential to its long-term success. To achieve these objectives, Rio Tinto has developed a Health, Safety, Environment and Community (HSEC) Policy, the main points of which are:

- Ensure that safety is always a core value and top priority; the company seeks to achieve a zero accident and occupational illness goal.
- Act in compliance with applicable health, safety, environment and community (HSEC) regulations and Rio Tinto standards while supporting voluntary undertakings.
- Constantly seek improvement in setting and reviewing objectives while assessing and publishing performance results for HSEC issues and using the best work methods.
- Prevent, minimize, mitigate or remedy the adverse effects of Rio Tinto's operations on the environment and communities.
- Foster and promote better understanding of HSEC issues related to these operations.
- Make constructive contributions to sustainable development.

The Simandou Project will adopt the corporate policies of Rio Tinto Iron Ore.

To structure their various operations and activities (including projects and mineral exploration), Rio Tinto adopted nine policies regarding communities, employment, environment, human rights, land access, occupational health, political engagement, safety and sustainable development (Ref. Appendix I). The detailed standards underlying these policies dictate the performance requirements to which Rio Tinto and their subsidiaries must adhere. These standards are supplemented by a series of Operational Guidelines, such as those regarding commercial integrity and governance, which regulate the various operations and company policies.

In their statement "The Way We Work", Rio Tinto established their commitments regarding corporate policies and governance. These commitments aim to ensure that values and good practices of the company are reflected in the day-to-day activities of all employees. These values and good practices relate mainly to responsibility, equity, integrity and transparency.

### **2.3.2 IFC Policies and Procedures**

The present study must conform with requirements of the International Finance Corporation (IFC). Over the last few decades, the IFC has developed guidelines, policies, performance standards and directives to ensure that environmental and social issues are integrated into the planning and implementation stages so that projects are environmentally sound and sustainable.

The IFC recently revised their policies regarding social and environmental sustainability by producing a series of documents describing the policies that must be adopted by all new projects seeking to establish a partnership with the IFC<sup>3</sup>. The new performance standards of the IFC also constitute the base of the Equator Principles.

The IFC's new procedure for assessing the social and environmental aspects of a project is governed by:

- A Policy on Social and Environmental Sustainability (IFC, 2006a), which defines the roles and responsibilities of the IFC when supporting projects in partnership with clients;
- A Policy on Disclosure of Information (IFC, 2006b), unique to the IFC, which defines the disclosure policies for diffusion of information by the institution;
- Environmental and Social Review Procedures (IFC, 2006c), used as an IFC guideline for applying Social and Environmental Sustainability policies and for assessing the conformity of projects completed by the private sector;
- Performance Standards on Social and Environmental Sustainability (IFC, 2006d), defining the roles and responsibilities of the IFC's private-sector partners as well as necessary requirements for obtaining and maintaining the IFC's support. These performance standards are used as guidelines for the implementation of this project (Ref. Appendix I);
- Guidance Notes and reference documents (IFC, 2006e), which encourage the project proponents (and employees of the IFC) to conform to social and environmental sustainability performance standards and to the IFC's requirements; and
- Environmental, Health and Safety Guidelines<sup>4</sup> compiled into a group of reference documents which aim to support project managers in industrial pollution management while specifying the IFC's expectations in this field<sup>5</sup>. These documents comprise directives applicable to certain industrial activities, as well as general directives for industries.

### 2.3.3 Biodiversity Policies

#### □ Guinean Biodiversity Policy

The Republic of Guinea signed the Convention on Biological Diversity at the United Nations Conference on the Environment and Development held in Rio de Janeiro in June 1992. It was subsequently ratified on May 7, 1993. Guinea thus became the second African country to sign and the sixteenth of all the contracting parties to the Convention.

<sup>3</sup> The IFC's new policies regarding social and environmental sustainability and the accompanying documents replace all former policies. They have been in effect since April 30, 2006, and can be consulted at the IFC's website. <http://www.ifc.org/ifcext/enviro.nsf/Content/EnvSocStandards>.

<sup>4</sup> Note that these guidelines are currently under revision by the IFC. The project, however, will ensure integration of these guidelines upon their finalization.

<sup>5</sup> The IFC standards regarding pollution are those published in the "Pollution Prevention and Abatement Handbook (PPAH)" (World Bank Group, 1988), and a series of 73 directives published jointly by the IFC and the World Bank between 1991 and 2003. Refer to: <http://www.ifc.org/ifcext/enviro.nsf/Content/EnvironmentalGuidelines>.

The Ministry of the Environment's National Branch for the Protection of Nature (DNPN) is responsible for applying the Convention, which is the focal point of the country's biodiversity policy. So far, there is no clearly identified agency in charge of coordinating the implementation of the biodiversity strategy and action plans. Guinea is, however, planning to establish a National Office for the coordination and implementation of its biological diversity strategy and action plans.

This Office would be responsible for overseeing the implementation of the Convention on Biological Diversity in Guinea (*Centre d'échange d'informations de la Guinée*, 2007). Given that there are no regional focal points, the national focal point, in Conakry, is also in charge of implementing the Convention in the regions. Geographically, Guinea can be broken down into four natural regions (Lower Guinea, Middle Guinea, Upper Guinea, Forested Guinea), each of which has a very different ecosystem, and therefore, very different biodiversity. As a result, it is difficult (if not impossible), for the national focal point to manage major biodiversity issues in a region. In forested Guinea, the Environmental Management Centre of Mount Nimba and the Simandou Chain (CEGENS) plays this role, although it has not been designated a regional focal point.

By signing and ratifying the Convention, Guinea has undertaken, among other things, to adopt general measures to promote conservation and sustainable use of biological diversity, identify and use in a sustainable way the components of this biodiversity, and to conduct *in situ* conservation. These measures are being carried out through various biological diversity sustainable use policies and through various agencies that are responsible for implementing these policies. The main biological diversity sustainable use policies being implemented in Guinea are (*Centre d'échange d'informations de la Guinée*, 2007):

- National Action Plan for the Environment (PNAE);
- National Forest Action Plan;
- Mangrove Forest Development Master Plan;
- Energy Sector Study Program;
- National Sustainable Human Development Program;
- Action Plan for the Promotion of Women;
- Framework Program to Promote Civil Society Decentralization and Capacity Building;
- Framework Program to Support Basic Initiatives.

However, the various legislation governing sustainable use of biological diversity in Guinea are encountering implementation problems because insufficient attention was given to coordination and harmonization when many of the existing laws and regulations were drawn up. These shortcomings are particularly acute in the case of the following pieces of legislation: between the *Environment Code* and the *Forestry Code*; the *Forestry Code* and the *Order respecting the tax system and the funding of Rural Development Communes* and the *Land and Domain Code* (*Centre d'échange d'informations de la Guinée*, 2007).

## □ **Rio Tinto Biodiversity Policy**

Rio Tinto's biodiversity policy has two main objectives:

- To reduce the footprint of its mining operations as much as possible so that habitat and species conservation are affected as little as possible;
- To help local communities maintain and enhance their traditional cultural values, particularly those relating to biodiversity.

Rio Tinto recognizes the importance of conservation and responsible management of biodiversity and wants its operations to have an overall positive impact on this diversity. The principles espoused to meet these objectives are:

- To prevent and minimize, through mitigation measures, the risks for and impacts on biodiversity throughout the duration of the operations;
- To ensure respectful stewardship of the area in which the operations are being conducted;
- To identify and help conserve areas of interesting ecological diversity;
- To involve local communities and other organizations in managing biodiversity.

## □ **IFC Biodiversity Policy**

The International Finance Corporation has a mandate to ensure that its projects meet strict social and environmental standards. The standards governing biodiversity are set out in *Performance Standard 6 – Biodiversity Conservation and Sustainable Natural Resource Management*. IFC pursues two objectives:

- Protect and conserve biodiversity.
- Promote sustainable natural resource management and use through the adoption of approaches that incorporate conservation needs and development priorities.

On the basis of risk and impact assessment and the vulnerability of the biodiversity and natural resources in question, Performance Standard 6 is applied to all habitats, whether they have been disturbed in the past or not and whether they are legally protected or not.

To meet the first objective of *Performance Standard 6*, Rio Tinto will have to focus on the assessment of negative, adverse impacts on biodiversity, and the main threats posed by habitat destruction and the possible introduction of non-native invasive species. It will also have to take all types of habitat into consideration (both natural and modified habitats). In addition, it will have to distinguish essential habitats that encompass areas having a high density of biodiversity.

As for the second objective, Rio Tinto will have to manage renewable resources in a sustainable fashion. These resources will primarily concern natural and planted forests and freshwater and marine systems.

## 2.4 INTERNATIONAL DISCHARGE STANDARDS

The Republic of Guinea currently has no specific standards regarding discharges to the environment (i.e. solid waste, liquid effluent, or atmospheric emissions), or on the quality of the environment (e.g. ambient air quality, water quality objectives, or ambient noise). It appears from discussions with government representatives that there has been some progress in developing such standards, but that no standards are currently in place.

Regarding the preparatory works, since no Guinean standards apply, Rio Tinto will adopt internationally recognized standards (WB, WHO, etc.). Where Rio Tinto's own standards are stricter than those set by international organizations, the company's standards will be applied.

### 2.4.1 Atmospheric Emissions


There are no atmospheric emission standards in Guinea. The World Bank's Pollution Prevention and Abatement Handbook (PPAH) publishes guidelines for over 40 different areas of activity, including atmospheric emissions, liquid effluent, and ambient noise. These guidelines and those of the WHO will be used as reference standards. Table 2.3 shows the air quality criteria used.

**Table 2.3 Ambient Air Quality Criteria**

Pollutant	Period	Air Quality Criteria ( $\mu\text{g}/\text{m}^3$ )	
		World Bank <sup>(1)</sup>	WHO <sup>(2)</sup>
NO <sub>2</sub>	1 hour	--	200
	24 hours	150	--
	Annually	--	40
CO	1 hour	--	30,000
	8 hours	--	10,000
SO <sub>2</sub>	1 hour	--	500 (10 min)
	24 hours	125	20
	Annually	50	--
PM <sub>10</sub>	24 hours	70	50
	Annually	50	20
PM <sub>2.5</sub>	24 hours	--	25
	Annually	--	10

(1) Pollution Prevention and Abatement Handbook (PPAH), General Environmental Guidelines, WORLD BANK GROUP, 1998.

(2) Air quality guidelines for Europe; second edition, WHO regional publications. European series; No. 91, 2000. WHO Air quality guidelines for particulate matter, ozone, nitrogen dioxide and sulphur dioxide, Global update 2005, Summary of risk assessment, October 2006.

 Criteria used for preparatory works.

## 2.4.2 Limits for Liquid Effluent Quality

Table 2.4 presents limits for wastewater discharge to surface water set by the World Bank, in addition to surface water standards of *Rio Tinto's Operational Guideline – Sampling and Analysis of Water Quality*.

**Table 2.4 General Limits for Discharge Quality to Surface Waters**

Contaminant/Parameter	World Bank Standards <sup>(1)</sup>	Rio Tinto Standards <sup>(2)</sup>
	(all parameters in mg/L except for pH, bacteria and temperature)	
▪ pH	6 – 9	6 – 9
▪ BOD <sub>5</sub>	50	-
▪ COD	250	-
▪ Total suspended solids	50	<b>25</b>
▪ Oil and grease	10	-
▪ Heavy Metals, total	10	-
▪ Metals, specific:		
- Arsenic	0,1	<b>0,05</b>
- Cadmium	0,1	-
- Chrome (hexavalent)	0,1	-
- Chrome (total)	0,5	<b>0,05</b>
- Iron	3,5	<b>0,3</b>
- Lead	0,1	<b>0,05</b>
- Mercury	0,01	-
- Nickel	0,5	<b>0,3</b>
- Selenium	0,1	-
- Copper	0,5	0,5
- Zinc	2,0	<b>1,0</b>
▪ Ammonia	2,0	-
▪ Chlorine, total residual	0,2	-
▪ Cyanide, free	0,1	-
▪ Cyanide, total	1,0	-
▪ Fluoride	20	<b>1,0</b>
▪ Phenols	0,5	-
▪ Phosphorous	2,0	-
▪ Sulphide	1,0	-
▪ Coliforms	Less than 400 MPN/100 ml <sup>(3)</sup>	-
▪ Temperature increase	< or equal to 3°C	-

(1) Source: PPAH, General Environmental Guidelines, World Bank Group, 1998.

(2) Source : Operational Guideline – Sampling and Analysis of Water Quality. Rio Tinto, 2005.

(3) MPN: Most Probable Number.

Criteria used for preparatory works.

### 2.4.3 Solid Waste Management

The General Environmental Guidelines of The World Bank (PPAH, 1998) state that projects should manage solid wastes through the following practices:

- Recycle or reclaim materials where possible, or
- If recycling or reclamation are not practical, waste must be disposed of in an environmentally acceptable manner and in compliance with local laws and regulations.

### 2.4.4 Ambient Noise Guidelines

Noise abatement measures should either achieve the limits for noise levels set by the World Bank:

- Noise levels given in Table 2.5; or
- A maximum increase in background levels of 3 dBA (PPAH, 1998) with measurements taken at noise receptors located outside the project property boundary.

**Table 2.5 Ambient Noise Guidelines**

Receptor	Maximum Allowable Equivalent Level (Leq in dBA, hourly measurement)	
	Day [07:00 AM – 10:00 PM]	Night [10:00 PM – 07:00 AM]
Residential, institutional, educational	55	45
Industrial, commercial	70	70

Source: PPAH, General Environmental Guidelines, World Bank Group, 1998.

## 2.5 INTERNATIONAL CONVENTIONS

Guinea is party to several international environmental conventions. The signing of a convention is a first step; ratification (including accession) is the step whereby a country takes specific legal steps to implement the convention. Table 2.6 provides a brief description of the relevance of the signed and ratified conventions to the Project.

**Table 2.6 International Environmental Conventions to Which Guinea is Party**

International Convention — Location and Year of Adoption, Purpose of Convention	Action by Guinea
<p><b><i>Convention Relative to the Preservation of Fauna and Flora in Their Natural State, London, 1933</i></b></p> <ul style="list-style-type: none"> <li>• This convention aims to protect particular species of flora and fauna through nature reserves within which the hunting, killing or capturing of fauna, and the collection or destruction of flora shall be limited or prohibited, (ii) by the institution of regulations concerning the hunting, killing and capturing of fauna outside such areas, (iii) by the regulation of the traffic in trophies, and (iv) by the prohibition of certain methods of and weapons for the hunting, killing and capturing of fauna. It was the first legal instrument permitting protection of flora and fauna in Africa.</li> </ul>	<p>Accession 1936</p>

International Convention — Location and Year of Adoption, Purpose of Convention	Action by Guinea
<b>International Plant Protection Convention, Rome (1951)</b> <ul style="list-style-type: none"> <li>This convention is a multilateral treaty establishing standards for international phytosanitary trade measures to protect plants against harmful organisms and providing for an international forum for the sharing of knowledge with regard to plant protection.</li> </ul>	Effective 1952 Amendments 1979 & 1997
<b>African Convention on the Conservation of Nature and Natural Resources, Algiers (1968)</b> <ul style="list-style-type: none"> <li>This convention is intended to “enhance protection of the environment, promote conservation and sustainable use of natural resources, harmonize and coordinate policies in these areas, and establish development policies and programs that are ecologically rational, economically sound, and socially acceptable.”</li> </ul>	Ratification 1989
<b>Ramsar Wetlands Convention (1971)</b> <ul style="list-style-type: none"> <li>The conservation and wise use of wetlands by national action and international cooperation as a means of achieving sustainable development throughout the world.</li> </ul>	Ratification 1993
<b>World Heritage Convention, Paris (1972)</b> <ul style="list-style-type: none"> <li>This convention addresses the identification, protection and preservation of natural or cultural sites having exceptional universal value. Such sites are registered in the World Heritage List established by the Convention.</li> </ul>	Adopted 1979
<b>Convention on International Trade in Endangered Species (CITES), Washington (1973)</b> <ul style="list-style-type: none"> <li>This convention regulates international trade to safeguard species (flora &amp; fauna) in danger of extinction.</li> </ul>	Adopted 1981
<b>Bonn Convention on Migratory Species, Bonn (1979)</b> <ul style="list-style-type: none"> <li>The goal of this convention is to conserve and preserve migratory species and their habitat (land, sea &amp; air) over their entire migration area.</li> </ul>	Ratified 1992
<b>Vienna Convention for the Protection of Ozone Layer (1985)</b> <ul style="list-style-type: none"> <li>Through this convention, nations agreed to take “appropriate measures...to protect human health and the environment against adverse effects resulting or likely to result from human activities which modify or are likely to modify the Ozone Layer”.</li> </ul>	Accession 1992 Ratification 1993
<b>Montreal Protocol on Substances that Deplete the Ozone Layer (1987)</b> <ul style="list-style-type: none"> <li>An international agreement designed to protect the stratospheric ozone layer.</li> </ul>	Accession 1992
<b>Convention on Biological Diversity, Rio de Janeiro (1992)</b> <ul style="list-style-type: none"> <li>This convention was an agreement on developing national strategies for the conservation and sustainable use of biological diversity.</li> </ul>	Ratification 1993
<b>Convention on Climate Change, New York (1992)</b> <ul style="list-style-type: none"> <li>The United Nations Framework Convention on Climate Changes has been the centerpiece of global efforts to combat global warming. It also has been one of the international community’s essential tools in its efforts to promote sustainable development.</li> <li>With respect to air pollution, Guinea has drawn up its national policy statement on climate change and its second draft communication was reviewed in October 2006.</li> </ul>	Ratification 1994
<b>United Nations Convention to Combat Desertification, Paris 1994</b> <ul style="list-style-type: none"> <li>The purpose of this convention is to correct ecological, economic and social imbalances stemming from soil deterioration and the destruction of production systems, especially in the world’s poorer countries.</li> <li>With respect to desertification, Guinea’s position has been developed and reviewed by a national forum, the PAN/LCD (National Action Program to Combat Desertification).</li> </ul>	Ratification 1997
<b>Kyoto Protocol to UN Framework Convention on Climate Change (1997)</b> <ul style="list-style-type: none"> <li>The Protocol was adopted in December 1997 in Kyoto, Japan to achieve quantified emission limitations and reduction commitments of greenhouse gases (GHG) in developed countries and countries that are undergoing the process of transition to a market economy.</li> </ul>	Signed 2000



## CHAPTER 3

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### Approach and Methodology



### **3. APPROACH AND METHODOLOGY**

The environmental and social impact study was carried out in concordance with the methodology and Guinean environmental impact study procedure set forth in Order No. 990/MRNE/SGG/90, dated March 31<sup>st</sup>, 1990. This procedure is intended to ensure that projects are environmentally and socially viable.

#### **3.1 STUDY AREAS**

The Simandou Project is located in the south-east region of the Republic of Guinea near its borders with Ivory Coast and Liberia. It extends over the Upper Guinean and Guinean Forest natural regions. The area includes a linear mining concession located at altitudes ranging from 700 m to 1,500 m, the principal landmarks of which are the Gbing (or *Gobing*) range, the Pic de Tibé, and the summits of Ouéléba, Dabatini, Pic de Fon and Signal de Foko.

Precise study areas were defined for each preparatory works component of the Simandou Project to include all environmental elements likely to be directly or indirectly affected by construction or operation of the planned infrastructure. Figure 3.1 shows Project component locations and the boundaries of the three preparatory works study areas.

The Simandou Project preparatory works are located in the N'Zérékoré administrative region and cover the western portion of the Beyla Prefecture and Beyla-Centre, Nionsomoridou and Boola Sub-prefectures. The preparatory works have no impact on the western slope of Simandou range, located in the Macenta Prefecture.

It is important to note that an expanded study area, extending beyond the study area perimeter, was used to analyze parameters such as the socio-economic aspect and the noise environment.

#### **3.2 PUBLIC CONSULTATION**

##### **3.2.1 Public Consultation and Information Disclosure Strategy**

Rio Tinto recognizes that good relations management at the regional and local levels is essential to the development of the Simandou Project. It has therefore developed, as part of the Project, a *Public Consultation and Information Disclosure Strategy* and an *Operational Guideline – Community Engagement*, designed to establish a procedure for maintaining lasting relations with, and obtaining a commitment from, the communities affected by the Project. Subsection 7.4 of the Environmental and Social Management Program (ESMP) describes the strategy Rio Tinto will employ to promote discussion and maintain lasting relations with local communities throughout the course of the Simandou Project.

##### **3.2.2 Consultation for the Preparatory Works**

Various consultation activities for the study were carried out in two phases. The first phase, carried out in August 2006, aimed to inform the stakeholders (mainly the various levels of government and local communities) about the project and to collect baseline information in order to evaluate potential environmental and social impacts. At the time of consultation, Rio Tinto requested that the stakeholders provide their concerns and

comments regarding the project so that they could be considered during the preparation of the environmental and social assessment.

The second phase of consultation, referred to as the “Environmental and Social Impact Study Workshop”, was held in Beyla on December 19, 2006, and was intended to present the results of the preliminary version of the Simplified Environmental and Social Impact Study for the Simandou Project preparatory works, for the purpose of eliciting the concerns and suggestions from the authorities and populations affected by the Project. This final version of the ESIS incorporates the results of this Workshop.

### 3.2.2.1 Consultation for the Impact Study

#### □ Objectives and Strategy

The purpose of the initial consultation was to inform the population about the Project and to address their concerns. More specifically, the objectives of the consultation were:

- From the beginning of the environmental assessment process, to establish a constructive and continuous participative dialogue with the stakeholders and to provide them with the available project information to enable them to provide informed opinions;
- To understand the desires of the people directly affected by the project at an early stage, in order to allow for their integration into the environmental and social study;
- To collect the baseline data necessary for the impact survey, to identify the potential impacts of the project, and if possible, the measures to avoid or mitigate those impacts.

The overall objective of the consultation process and impact survey is to develop the “best project” for the environment, the community, and the company.

#### □ Consultation Team

The consultation team members included an official Rio Tinto representative residing in Guinea; three employees from the consulting firm selected by the proponent to conduct the environmental and social impact study (the Canadian company SNC-Lavalin Environment Inc.) and a Guinean specialist from the *Centre d'Études et de Recherche en Environnement* of the University of Conakry (the Work Team members are listed in Appendix A).

In order to facilitate the carrying out of the simplified SEIS and to ensure the best monitoring at the community level, the consultation activities were carried out in the presence of Mr. Sidibé Mouloukou Souleymane, head of the department of *Service National des Études et Évaluations Environnementales (SNEEE)* of the Ministry of the Environment. The persons in charge of the prefectural departments also participated in certain consultation activities related to their areas of responsibility.

**Figure 3.1                      Location of Project Components and Study Area Delineation**

**A3 (1 page)**



## ❑ Selection of Public Groups Consulted

Public selection was carried out via the traditional structures in the villages where the future construction will take place and where the people are likely to be affected. Selection was based on the administrative structures in cities and villages where the public is concerned, but not necessarily affected. The following groups were selected:

- Inhabitants of neighbouring villages at each of the three sites where construction will take place, including dignitaries, young people, women and children;
- Urban and rural populations in the administrative district of Beyla;
- Civil authorities (national, prefectural, sub-prefectural, and communal);
- Private organizations;
- Regional and national civil servants concerned by the planned works.

Consultations were held at the national, prefectural, sub-prefectural or communal, and local levels. Preparatory and planning meetings were held in addition to the formal meetings held to organize the consultations. Individual meetings, village committee meetings, and visits to each site in the company of village residents also provided sources of relevant information.

## ❑ Consultation Methodology

Consultation at the national level was conducted by invitations extended to various groups likely to be interested in the preparatory work. Participants expressed themselves in accordance with accepted deliberative assembly rules.

At the regional level, information meetings were held and followed up with two public information sessions to which the entire population and regional organizations were invited. These sessions had two objectives:

- To provide the population with information about the preparatory works to be done;
- To determine the population's perception of the proposed work.

The consultation efforts were focused on the village populations directly concerned and potentially affected by the project. The village consultation usually lasted approximately two hours. Minutes of these consultations were recorded in the prefecture of Beyla (refer to Appendix C); a copy of the minutes was also forwarded to the Ministry of the Environment in Conakry. All comments were compiled, irrespective of their origin. During the village consultations, handwritten notes were used to collect information and many photographs were taken (refer to photographs in Appendix D).

## ❑ Consultation Process

Table 3.1 shows the meeting process and summarizes the questions and concerns raised during the meetings that followed the initial public consultation.

The consultation team held a dozen meetings in the Beyla and Conakry prefectures with various players involved in the project. In all, approximately 580 people

participated in the meetings. The list of the governmental authorities and the representatives of Beyla is provided in Appendix C.

#### ❑ **Public Opinion and Expressed Concerns**

Public consultation informs people of the project and allows them to raise questions about the project's potential impacts. It is also the basis for developing mitigative and compensatory measures. The following paragraphs summarize the questions and comments raised during consultation activities.

##### Economic Development

Consultation revealed that the population perceives economic development to be the main benefit derived from the Simandou Project. The project is perceived as a stimulant for the regional and even national economy, and the population is hoping for job creation and the job training that will qualify them for these new jobs. The local population also wishes to participate in the creation of local enterprises that will supply (especially agricultural) services and products to the construction workers and workers' camps. They also hope for support to help them qualify as suppliers for the project.

The women hope that they will have access to the jobs and programs created by the project. They hope that their husbands and children will be able to secure direct employment with the project during construction or operation, and that there will be a springboard-effect that increases their own commercial activities. Above all else, they hope that their children will have the opportunity for work that will give them financial security in their old age, in a domain more reliable than agriculture.

Young people have a lot of hope for the Simandou Project, because a large majority do not want to work in agriculture given the current conditions. However, young people are aware that due to their lack of reading and writing skills, they will not be qualified for all of the jobs generated by the project. However, a significant number are willing to become educated and take training courses in order to secure work on the project. They expect future opportunities to be better than what is currently available.

##### Access to Services and Public Infrastructure

The population hopes that the project will improve their quality of life by providing local services, which are currently non-existent or underdeveloped. The population prioritises access to high-quality drinking water. The population hopes that the project will stimulate the construction of infrastructure such as schools and clinics, etc. At a regional level, the population wishes for rural road improvement.



**Table 3.1 Summary of Consultation Results**

Date	Type, Number of Meetings	Location, Public Involved	Proceedings / Questions and Concerns Raised
August 14 <sup>th</sup> & 28 <sup>th</sup> , 2006	Meetings with national authorities (2)	<ul style="list-style-type: none"> <li>Conakry (Camayenne Hotel)</li> <li>Rio Tinto office in Conakry</li> </ul>	Introduction to project and environmental assessment team. Project support and rules of procedure in effect. Initial project feedback from Guinean authorities. Report on preliminary mission results.
August 18 <sup>th</sup> & 25 <sup>th</sup> , 2006	Meetings with Beyla departmental authorities (2)	<ul style="list-style-type: none"> <li>Prefect's Residence</li> <li>Prefect's Office</li> </ul>	Introduction to project and environmental assessment team. Official approval of mission. Report on preliminary mission results.
August 19 <sup>th</sup> , 2006	Informational meetings (5)	<ul style="list-style-type: none"> <li>Kéoulendou</li> <li>Piyaro</li> <li>Moribadou</li> <li>Traoréla</li> <li>Beyla</li> </ul>	Introduction to environmental assessment and consultation team, and to the project and its anticipated consequences. Project presentation. Obtain local authorities' support for consultation.
August 20 <sup>th</sup> & 21 <sup>st</sup> , 2006	Public hearings (4)	<ul style="list-style-type: none"> <li>Morisangarédou</li> <li>Kéoulendou</li> <li>Moribadou</li> <li>Beyla</li> </ul>	General introduction to project, environmental assessment team, & consultation process. Discussions with participants. Clarifications with regard to people's expectations and Proponent's commitments. Main points raised: <ul style="list-style-type: none"> <li>General approval of future airstrip;</li> <li>People want to have job opportunities for the mining project as a whole, and for airstrip construction and operation activities;</li> <li>Request for support for youth education to increase their job opportunities.</li> </ul>
August 20 <sup>th</sup> , 2006	Village meetings (2)	<ul style="list-style-type: none"> <li>Kéoulendou</li> <li>Piyaro</li> </ul>	Meetings in villages concerning the airstrip. Interviews with various targeted groups (dignitaries, young people, women). Group investigation of potential impacts of airstrip construction. Discussion of various participants' viewpoints. Main points raised: <ul style="list-style-type: none"> <li>Job opportunities for local population;</li> <li>Consequences of increased traffic in terms of safety and dust;</li> <li>Impact on farming and herding, in particular regarding livestock around airstrip;</li> <li>Impact on business;</li> <li>Impact on maintenance of road to Beyla;</li> <li>Impacts on pedestrian and livestock traffic on and around airstrip;</li> <li>Mention of the prestige the nearby airstrip represents to them.</li> </ul>

Date	Type, Number of Meetings	Location, Public Involved	Proceedings / Questions and Concerns Raised
August 21 <sup>st</sup> , 2006	Village meeting (1)	<ul style="list-style-type: none"> <li>Moribadou</li> </ul>	<p>Village meetings concerning the access road and camp. Interviews with various target groups (dignitaries, young people, women). Group investigation of impacts of construction of access road and Canga East Camp expansion.</p> <p>Main points raised:</p> <ul style="list-style-type: none"> <li>Job opportunities for local population;</li> <li>Potential increase in village population;</li> <li>Impacts of increased traffic in terms of safety and dust emission;</li> <li>Anticipated effects on population STD rates;</li> <li>Risks and dangers of blasting;</li> <li>Impacts on some useful trees along the access road;</li> <li>Direct impacts on agricultural activities;</li> <li>Access road to give access to previously inaccessible agricultural areas;</li> <li>The old village of Mamouroudou (the site of an old foundry) would be located in the sector of the proposed access route<sup>1</sup>.</li> </ul>
August 22 <sup>nd</sup> , 2006	Village meeting (1)	<ul style="list-style-type: none"> <li>Traoréla</li> </ul>	<p>Village meetings. Interviews with various target groups (dignitaries, young people, women). Group investigation of impacts of access road construction.</p> <ul style="list-style-type: none"> <li>Concerns that the Traoréla road will no longer be maintained by Rio Tinto.</li> </ul>
August 19 <sup>th</sup> -24 <sup>th</sup> , 2006	Individual meetings (4)	<ul style="list-style-type: none"> <li>Rio Tinto workers' union</li> <li>Meeting with camp security guards</li> <li>Meeting with Moribadou health professionals</li> <li>Meeting with Beyla merchants</li> </ul>	<p>Discussions revealed that:</p> <ul style="list-style-type: none"> <li>Jobs are the major concern for the region;</li> <li>The second greatest concern are the health issues associated with access to potable water;</li> <li>Education is the third priority.</li> </ul>

<sup>1</sup> Location of the old foundry to be determined, if necessary.

### Farming and Livestock Husbandry

Those consulted understand that only a few fields will be affected by preparatory work. The farmers concerned are not opposed to having their farming or pasture parcels partially affected, as long as they receive just and effective compensation that will provide them with a quality of life that is at least comparable to their current situation. They believe that there is enough space available nearby and are prepared to relocate some of their activities to accommodate planned works.

### Social Concerns

Women all expressed the same fear for the safety of their young daughters due to the presence of workers during project construction. They said they feel unprepared for this situation and sought advice on what protection measures they should take.

### Maintenance of the Road from Traoréla to Nionsomoridou

The major concerns for the village of Traoréla are:

- That the number of jobs currently held by village residents be maintained or increased;
- That the new road could result in the company no longer maintaining the road to Nionsomoridou, which would be an inconvenience as their dominant market is in this sub-prefectural area.

It should be noted that Rio Tinto never carried out maintenance on the Traoréla road, and are not responsible for maintaining the road in good condition. Rio Tinto was only responsible for flattening the road in former years to allow the passage of the drilling equipment.

### Issues Associated with Planned Infrastructure

Livestock activities will not be affected by the airstrip as long as it is not fenced in, limiting the ability of livestock to pass through. Should the airstrip eventually require fencing in, paths or detour routes would have to be provided for animals as well as the pedestrians that currently traverse this area. In the villages of Piyaro and Kéoulendou, the people concerned believe that the loss of pastures caused by the airstrip will be more than compensated for by the benefits it will bring. Should a fence need to be erected, the population would like to perform the work themselves, using local resources.

Regarding the expansion of the workers' camp, people generally do not anticipate any impact other than an increase in the number of jobs and the number of people passing through their area. They see this as a source of economic growth with no notable disadvantages. In individual interviews, particular concerns were voiced, however, concerning the growth of the camp and village of Moribadou (more foreigners, risk of theft, less agricultural land), the increase in human traffic (less peaceful, risk of accidents, increase in dust) and an increase in the rate of sexually transmitted diseases.

The people of Moribadou village agree to the access road that is to run near the village of Mamouroudou, provided that it bypasses as much as possible some particularly useful trees and the remains of the old village of Mamouroudou.

### 3.2.2.2 Impact Study Workshop

#### □ Workshop Objectives

The Simandou Project preparatory works Environmental and Social Impact Study (ESIS) Workshop was held in the conference room of the Beyla *Maison des Jeunes* on December 19, 2006, and was chaired by the Prefect of Beyla, Fadama Itala Kourouma.

As part of the Ministry of the Environment's *Service National des Études et Évaluations Environnementales* validation process, the workshop's objectives were to present the results of the study and elicit concerns, suggestions, and recommendations from the authorities and populations affected by the Project for the purpose of improving the quality of the ESIS and facilitating the population's support for the Project's implementation.

The consultation team consisted of three Rio Tinto representatives and a representative from the consultant retained to conduct the ESIS – the Canadian firm of SNC-LAVALIN Environment Inc. The workshop was chaired by the Prefect of Beyla and was also attended by Mr. Abdel Kader Bangoura from CEGENS, Mr. Mouloukou Souleymane Sidibé from SNEEE, and Mr. Seidou Sidibé, Head of the Ministry of the Environment's Education Service.

#### □ Public Consulted

The workshop brought together managerial staff from central, regional and prefectural administrations, local elected officials, civil society, and the private sector for a total of 127 registered participants (see photographs 31 and 32 in Appendix D). The public categories consulted in the workshop are listed in Table 3.2.

#### □ Workshop Proceedings

Presentation of the results of the Study addressed the following items:

- Placing the preparatory works in the context of the overall Simandou Project;
- Environmental and social requirements and procedures governing the ESIS;
- Description of each component of the preparatory works;
- Main anticipated risks and impacts, as well as proposed mitigation measures;
- Environmental and Social Management Program;
- Subsequent Project steps.

The ESIS presentation was followed by a question, observation, and comment period. The Rio Tinto and consultant representatives then provided answers to the participants' questions and comments.

**Table 3.2 Public Categories Consulted in Workshop**

<b>Public Category</b>	<b>Representatives</b>
Central administration departmental managerial staff	Ministry of the Environment (CEGENS, SNEEE)
Regional administration departmental managerial staff	Forestry Centre of N'Zérékoré N'Zérékoré Regional Environment Inspector
Prefectural administration departmental managerial staff	Prefect Sub-prefects Prefectural managers Secretary general
Regional Development Commune	RDC chairman Communal Council
Workers' representatives	Transport unions Local workers' union
Groups	Women's groups Youth groups Religious communities
Controlling forces	Police Gendarmerie Customs
Economic development	Rural Credit Chamber of Commerce
Civil society	Village or sector chiefs Dignitaries Neighbouring populations <i>Bureau des ressortissants</i>
Non-governmental organizations (NGO's)	ADGR VISFAD CERAD AGAR/GT GACOBO WEG/ACEB GUIAEB ACEB MANO-River ADEAE

#### ❑ Concerns, Observations, and Comments Expressed

In spite of the fact that the presentation clearly made the point that the ESIS and workshop focused solely on the Simandou Project preparatory works, several comments and questions from the participants had to do with the Project as a whole (mine, railway, and deep-water port).

Table 3.3 summarizes the concerns, observations, and comments expressed in the workshop. Comments with respect to the preparatory works were separated from those concerning the Project as a whole.

**Table 3.3 Summary of Concerns, Observations, and Comments Expressed in the ESIS Workshop, Beyla – December 19, 2006**

Subject	Concern / Observation / Comment
Canga East Camp expansion	<ul style="list-style-type: none"> <li>Canga East Camp housing should avoid using prefabricated construction.</li> <li>The number of workers per room should be increased.</li> </ul>
Airstrip	<ul style="list-style-type: none"> <li>Airstrip should have dual use: mining and civilian.</li> <li>Airstrip should be paved to prevent dust emission and fenced in to prevent risks of accidents.</li> <li>Replace the term "Airstrip" with "Airport".</li> <li>Apply measures to prevent river and stream contamination in the airstrip area.</li> <li>It appears unlikely that borrow pits will not be operated to construct the airstrip.</li> <li>Anticipated impact (noise and water pollution) on schools near the airstrip.</li> </ul>
Ouéléba access road	<ul style="list-style-type: none"> <li>The prescribed measures seem to be inadequate to limit sediment contribution to rivers and streams.</li> <li>Request for protection of the old Mamouroudou village site.</li> <li>Concern for safety during blasting.</li> <li>To minimize risks of road collisions with people and animals, traffic signals should be installed and speed bumps constructed to reduce traffic speed.</li> </ul>
Project impacts/Risks	<ul style="list-style-type: none"> <li>ESIS focuses on negative impacts. It should also highlight positive impacts.</li> <li>Comment to the effect that the project has little impact on the environment and local populations.</li> <li>What measures are provided to reduce greenhouse gas emissions?</li> </ul>
Economic benefits /Employment	<ul style="list-style-type: none"> <li>Specify the economic benefits of the preparatory works.</li> <li>Give high priority to local job creation (including Beyla nationals).</li> <li>Beyla Prefecture should be the first to benefit from jobs.</li> <li>Job offers should also take other neighbouring prefectures into consideration.</li> <li>How many jobs have been created to date, by socio-professional category?</li> <li>What will Rio Tinto do to enable job access for illiterates (since the majority of the population is illiterate)?</li> <li>Rio Tinto is asked to train children so that they can find work.</li> </ul>
Community development project	<ul style="list-style-type: none"> <li>Economic benefits will be used to set up projects at the prefecture level.</li> <li>What short, medium, and long-term actions is Rio Tinto planning with respect to community development?</li> <li>Determine Beyla's potential in terms of local NGOs and small businesses in order to involve them.</li> <li>Support for improvement of agricultural activities.</li> <li>Support for produce supply.</li> <li>Construction of schools and day care.</li> <li>Support for Beyla Urban Community waste disposal.</li> </ul>

Subject	Concern / Observation / Comment
Community development project (cont'd)	<ul style="list-style-type: none"> <li>Promote village electrification.</li> <li>Support creation of "small jobs".</li> <li>What is Rio Tinto thinking about doing for the City of Beyla?</li> <li>In terms of community development, consideration should be given to the fact that Beyla is religious population.</li> <li>We have many expectations: electricity, telephones, etc.</li> </ul>
Potable water	<ul style="list-style-type: none"> <li>Given the risk of surface water pollution during construction, better wells should be built.</li> <li>Develop potable water points in the communities bordering the Pic de Fon Classified Forest.</li> </ul>
Health	<ul style="list-style-type: none"> <li>Enhance the worker awareness program with regard to HIV/AIDS.</li> <li>Generalize awareness about STD's/HIV/AIDS to all socio-professional strata.</li> <li>Involve local NGO's in promoting awareness of HIV/AIDS and other diseases.</li> </ul>
Environmental & Social Management Program	<ul style="list-style-type: none"> <li>Environmental and Social Management Plan to be developed in the final version of the ESIS (Rio Tinto commitment).</li> <li>Take community development plan into account when preparing specific action plans.</li> <li>Revise the ESMP in conformance with Rio Tinto policies and instructions as well as the new SFI directives.</li> <li>Set up a prefectural environmental management committee and enhance the committee's skills.</li> <li>The Project has a major handicap with regard to the environment: there are no water, air, or waste water discharge quality monitoring stations in the Canga East Camp.</li> <li>Rio Tinto should measure the Project reference status (water, air, soil, vegetation).</li> <li>Create a farmer assistance program in the form of an aulacode raising project to limit the negative impacts of hunting and uncontrolled brush fires.</li> <li>Propose a plan to protect and conserve plant species that are threatened or in danger of extinction.</li> <li>Install water quality monitoring stations along streams and rivers near the preparatory works.</li> </ul>
Natural resources	<ul style="list-style-type: none"> <li>Management of the Simandou Chain involves CEGENS, the Ministry of Agriculture, and N'Zérékoré Forestry Centre.</li> <li>Hold a workshop to define the management approach for the Simandou Chain.</li> <li>Propose a program for the use of gas in the camp to reduce the pressure on timber resources.</li> </ul>
Social concerns	<ul style="list-style-type: none"> <li>Minimize the migration rate in the area.</li> </ul>
Overall Simandou Project (mine, port, railway)	<ul style="list-style-type: none"> <li>Prepare a climate change action and adaptation plan (Guinea is in 8th place amount the underdeveloped countries in this matter).</li> <li>Rio Tinto is asked to build a detoxification centre during the mining phase.</li> <li>Desire to have the worker's city located alongside the City of Beyla so that the latter would benefit from the population (citation of the case of the camp near the City of Famoïla that did not benefit the population).</li> </ul>

Upon completion of the workshop, and as stipulated in the minutes thereof (see Appendix C), only those comments and observations relevant to the three preparatory works components were taken into consideration in preparation of the final version of the ESIS. The other items will be addressed as part of the overall Project Environmental and Social Management Program.

### **3.3 REVIEW OF EXISTING BASELINE STUDIES**

Since 1998, several baseline studies have been carried out under the direction of Rio Tinto as part of the Simandou Project. As a first step, these existing Simandou Project studies were summarized. The document review consisted of collecting and integrating all existing information relevant to the completion of the preparatory works ESIS.

### **3.4 SITE VISITS AND INVENTORIES**

The sites were visited from August 19<sup>th</sup>-25<sup>th</sup>, 2006, to survey the physical, biological, and human environments in the expropriated and surrounding areas of the future Simandou Project preparatory works infrastructure.

The proposed sites for the camp, the airstrip near Beyla, and the Ouéléba access road were surveyed for plant cover, human land use, river and stream crossings, surface deposits, and other elements. In the case of flora, 20 m x 20 m parcels of land were surveyed in the planned work areas, and beyond ("control parcels"). In addition, information collected by a team of botanists from The Royal Botanical Gardens, Kew was also used to inform the baseline.

The information collected during these site visits was used to produce land use maps and to validate satellite image interpretation. A GPS was used to locate the surveyed items on the ground, and photographs were taken to validate the classification.

The background noise environment was characterized by taking ambient noise readings prior to the start of preparatory works. Readings were taken from September 14<sup>th</sup>-19<sup>th</sup>, 2006, in the day and night-time, in the main villages and hamlets potentially affected by construction of the camp, the Ouéléba access road, and the airstrip. The noise measurement point locations are shown in Figure 3.2.

The same figure shows the location of water quality sampling, weather monitoring, and other monitoring stations relevant to the preparatory works.

### **3.5 ENVIRONMENTAL & SOCIO-ECONOMIC IMPACT ASSESSMENT METHODOLOGY**

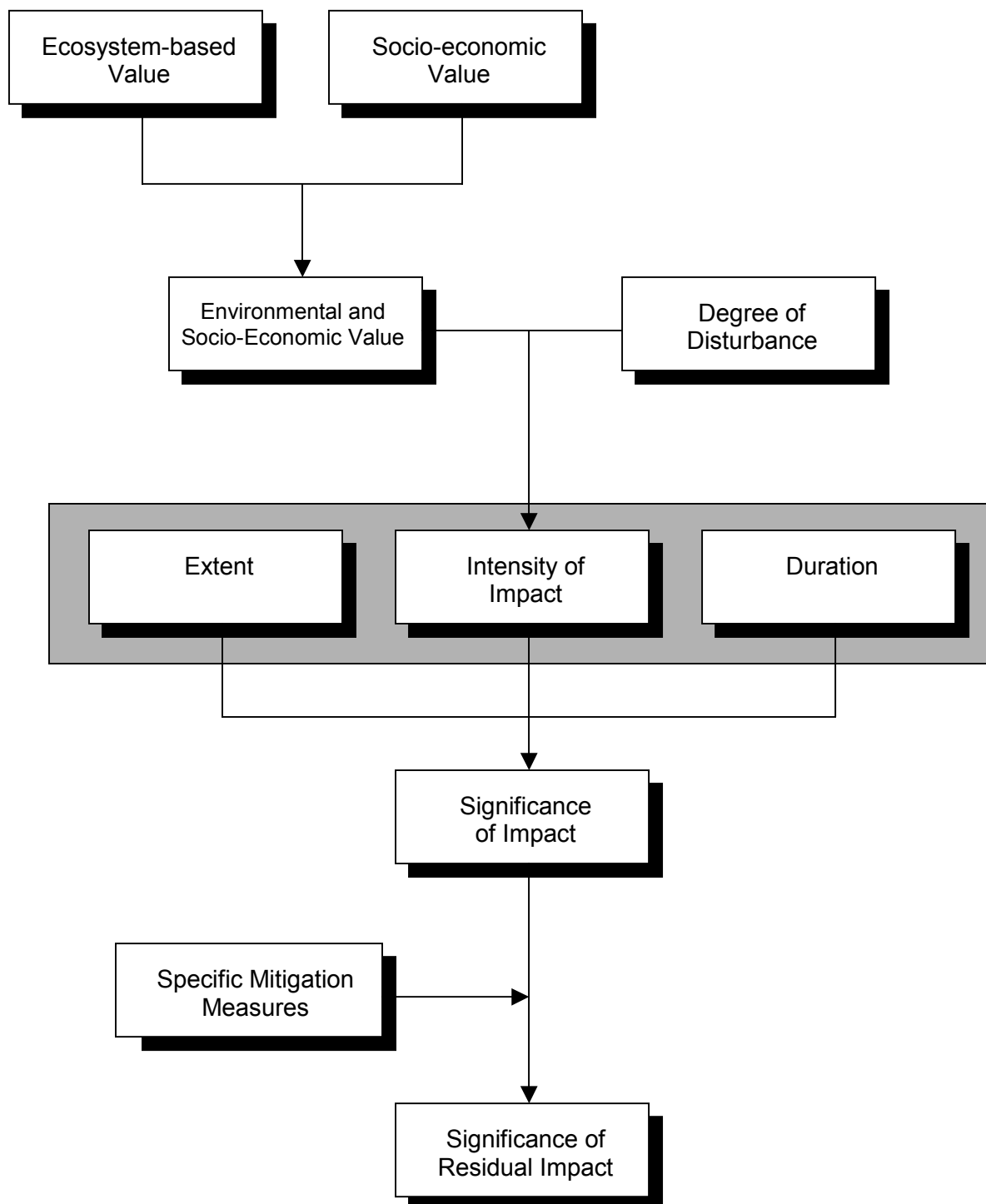
The methodological approach used to assess the environmental and socio-economic impacts of the preparatory works first determines the magnitude, extent, and duration of the anticipated positive and negative impacts. These three characteristics are combined into a summary indicator –impact significance – that represents a judgment with respect to the Project's foreseeable overall impacts on a given environmental component. Figure 3.3 shows a diagram of the significance assessment process.



**Figure 3.2                      Location of Monitoring Stations and Environment Follow-up**

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**Figure 3.3 Environmental and Socio-Economic Assessment Methodology**

The method for determining noise impact intensity is based primarily on the ISO 1996<sup>2</sup> standard (Appendix B).

### 3.5.1 Intensity of the Impact

The Intensity of an impact expresses the relative importance of consequences attributable to a change in an environmental or socio-economic component. The Intensity of impact is an integration of the component's Environmental and Socio-economic Value with its Degree of Disturbance and can be either positive or negative.

The Degree of Disturbance for a component describes the scope of the changes that affect the component given its sensitivity to the proposed project. The changes for a given component may be negative or positive and the effect on the environmental component may be direct or indirect.

The cumulative, synergistic or delayed impacts, beyond the simple relation of cause and effect, could amplify the degree of disturbance of an environmental component when the environment is especially fragile and therefore must be considered. The degree of disturbance is:

- High, when an impact strongly affects the continued viability of the environmental component, and irreversibly impairs the component, or restricts its use in a significant way;
- Medium, when the impact changes, either by reducing or increasing the quality or use of the environmental component affected, without, however, compromising its integrity;
- Low, when the impact affects the quality, use or integrity of the environmental component in a way that is barely perceptible; and
- Undetermined, when it is impossible to assess how and to what extent the component will be affected.

When the Degree of Disturbance is undetermined, the impact assessment cannot be completed for that component.

The Environmental and Socio-Economic Values of a component are the synthesis of its Ecosystem-Based Value and its Socio-economic Value, where the two are weighted equally.

The Ecosystem-Based Value expresses the relative importance of a component to the ecosystem as measured by its function or role, representation, patterns of use, diversity, or rare or unique characteristics. This value is the result of the judgment of specialists following a systematic analysis of the characteristics of the environmental component.

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<sup>2</sup> ISO-1996-1, Acoustics – Description, Measurement & Assessment of Environmental Noise, Part 1, Basic Quantities and Assessment Procedures, 2003.

The Ecosystem-Based Value of a given component is considered:

- High, when the component is of major interest in terms of its ecosystem-based function, biodiversity, or exceptional qualities, and there is a consensus in the scientific community that it should be conserved or protected;
- Medium, when the component is of strong interest and has recognized qualities, and there is concern, although not consensus, for its conservation or protection; and
- Low, when the component holds little interest, has few notable qualities, and there is little concern for its conservation or protection.

The Socio-economic Value of a component expresses the relative importance attributed to the component by the public, the various levels of government, or any other legislative or regulatory authority. The Socio-economic Value indicates the popular or political desire or will to conserve the integrity or the original character of a component. This will is expressed through the legal protection that the component is accorded, or by the concern of the local or regional public for the component. The Socio-economic Value also integrates the social and cultural context of the project, such as the concerns of the affected populations regarding health and safety, land use, quality of life, and cultural and religious value. The Socio-economic Value evaluation is based on information gathered during various public consultations and social characterization studies carried out in the study zone.

The Socio-economic Value of a given component is considered:

- High, when the component is the object of legislative or regulatory measures (threatened or endangered species, conservation parks, etc.) or is essential to human activities (e.g., potable water);
- Medium, when the component is valued or used by a significant portion of the concerned population, but is not legally protected; and
- Low, when the component is of little concern or is not used by the population.

The Environmental Value integrates the Ecosystem-Based Value and the Socio-economic Value and retains the higher of the two values as shown in Table 3.4.

**Table 3.4 Table for Determining Environmental Value**

Socio-economic Value	Ecosystem-Based Value		
	High	Medium	Low
High	High	High	High
Medium	High	Medium	Medium
Low	High	Medium	Low

As stated above, the Intensity of the impact results from the interaction of the three Degrees of Disturbance (High, Medium and Low) with the three classes of Environmental Value (High, Medium and Low). Table 3.5 shows the possible combinations these inputs and the resulting Intensity.

**Table 3.5 Table for Determining Intensity of an Impact**

Degree of Disturbance	Environmental Value		
	High	Medium	Low
High	High	High	Medium
Medium	High	Medium	Low
Low	Medium	Low	Low <sup>(1)</sup>

Note 1: This intensity should be quantified as "very low" to maintain the grid logic, but to limit the number of categories this class has been replaced by low. This leads to an overestimation of the impact intensity of these components, but the overall consequences are negligible.

### 3.5.2 Extent of the Impact

The Extent of the impact expresses the spatial influence of the effects produced by an intervention in the environment. This refers either to a distance or an area over which a component will undergo changes. It could also refer to the portion of the population that will be affected by the changes.

Extent is quantified as one of three levels:

- Regional: when an impact affects a large geographic area or a number of components located a significant distance from the project, or when it is experienced by the entire population in the study area;
- Local: when the impact affects a relatively restricted area or a limited number of components located within, near, or at a limited distance from the project site; or when it is experienced by a limited portion of the population in the study area; and
- Site-Specific: when the impact affects only a very restricted area or population in the proximity of the project site; or is experienced by only a small number of individuals in the study area.

### 3.5.3 Duration of the Impact

The Duration of the impact describes the period of time during which a component undergoes changes due to the impact. Duration is not necessarily equivalent to the period of time during which the direct source of impact is active, but must take frequency into consideration when the impact is intermittent. Duration is characterized as:

- Long: when the effects are experienced continuously for the life of the facility or beyond;
- Medium: when the effects are experienced over a relatively prolonged period of time, but less than the duration of the life of the facilities; and
- Short: when the effects are experienced over a limited period of time, generally corresponding to the period of construction, the start-up period, a single season, etc.

### 3.5.4 Significance of the Impact

The interaction between the Intensity, Extent, and Duration defines the Significance of an impact. Table 3.6 presents the grid for determining Significance and differentiates between five levels of significance, ranging from Very High to Very Low. This analysis considers the level of uncertainty of the assessment and the probability that the impact will occur.

The Significance of each impact is assessed, considering the general mitigation measures integrated into the baseline project. For example, if the project states as a general mitigation measure that forests near water courses will be protected, the impact analysis assumes that forests will be untouched wherever there are activities near water courses. When the general mitigation measures reduce impacts to the point of rendering them very low or negligible, they are excluded from further analysis.

Once the Significance of an impact is established as more than Very Low, it is described and additional, specific mitigation measures may be proposed to allow optimal integration of the project into the environment.

The final assessment phase consists of determining the residual significance of the impact after all mitigation measures are considered. The issue is therefore to determine how mitigation measures change one or several of the inputs in the impact assessment process described above.

**Table 3.6 Table for Determining Impact Significance**

Intensity	Extent	Duration	Significance
Very high	Regional	Long Medium Short	Very high Very high Very high
	Local	Long Medium Short	Very high Very high High
	Site-specific	Long Medium Short	Very high High High
High	Regional	Long Medium Short	Very high High High
	Local	Long Medium Short	High High Medium
	Site-specific	Long Medium Short	High Medium Medium
Medium	Regional	Long Medium Short	High Medium Medium
	Local	Long Medium Short	Medium Medium Low
	Site-specific	Long Medium Short	Medium Low Low
Low	Regional	Long Medium Short	Medium Low Low
	Local	Long Medium Short	Low Low Very low
	Site-specific	Long Medium Short	Low Very low Very low



## CHAPTER 4

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### Canga East Camp



## **4. CANGA EAST CAMP**

### **4.1 BACKGROUND**

There are currently two exploration camps in the Rio Tinto mining concession (see Figure 3.1).

Canga East is the largest camp in the Pic de Fon exploration area. It currently has a capacity of approximately 200 people and is located on the eastern slope of the Simandou range, within the boundaries of the Pic de Fon classified forest, and approximately 7 km from the village of Moribadou.

The Ouéléba camp is located on the crest of the Simandou range, approximately 12 km north of Pic de Fon, and is used by the Ouéléba area exploration team. It is also located inside the Pic de Fon forest boundary, and is currently accessible by an access road from Traoréla.

The Canga East Camp will be expanded to accommodate an additional 300 people (approximately), including 100 cadre (management and senior staff) and 200 non-cadre (support staff), and will accommodate the mining exploration teams and those responsible for the Simandou Project feasibility study.

### **4.2 COMPONENT DESCRIPTION**

#### **4.2.1 Selection of the Canga East Camp Location**

The Canga East Camp was established in 1999 on a grassland savanna plateau on the eastern slope of the Simandou range, a site chosen to minimize impacts on the mountain forests concentrated on the western slope.

In order to minimize the impacts on the host environment and maximize the use of the existing Canga East Camp infrastructure, it is proposed that the capacity of the existing camp be increased (see Figures 4.1 and 4.2).

The new camp facilities will cover an area of approximately 6.6 ha. With the exception of the potable water treatment unit, which will be built in the north-west of the access road to Pic de Fon, the new facilities will be established south of this road (see Figure 4.1).

The Canga East Camp facilities will accommodate approximately 500 people upon completion of the camp expansion.

#### **4.2.2 Canga East Camp Components**

##### **4.2.2.1 Living Area**

Additional lodging will be located south of the existing road (see Figure 4.1). The new living areas will include:

- 3 cadre units for the management staff (45 m<sup>2</sup> unit);
- 12 cadre units (91 m<sup>2</sup> unit);

- 6 non-cadre units (186 m<sup>2</sup> unit).

The cadre dwelling units will accommodate about 100 people. Each unit will have a bathroom and an air conditioning system. The non-cadre units will accommodate approximately 200 individuals. Sanitary blocks will be provided for each of the non-cadre units.

All these additional housing units (including the bathrooms) will be in prefabricated modular structure form (ready-to-assemble structures).

#### **4.2.2.2 Central Facilities for Cadre and Non-Cadre Personnel**

Each of the two common areas will have a dining room and kitchen. The camp will also have a modular Laundromat, and bulk storage space for linens and bulk cleaning products.

#### **4.2.2.3 Amenities**

The amenities will include:

- Two recreational facilities (for cadre and non-cadre personnel);
- A barbecuing area for the cadre personnel;
- A modular gymnasium;
- A multi-purpose sports court, swimming pool and soccer field;
- Toilets and washrooms to serve the common areas;
- An outdoor movie theatre.

#### **4.2.2.4 Ancillary Services**

Services will include:

- Power supply and distribution: power for the camp will be provided by three self-contained diesel generators diesel with a capacity of 1,280 kW each (Caterpillar 3512B HD). All generators will be installed outdoors, each within a metal housing. The existing generator near the Canga East mechanical building will no longer be used.
- Potable water supply: the Project plans include adding a modular, independent water treatment plant, two potable water storage tanks and a distribution system. The water treatment plant will be built at the north-west extremity of the existing camp, north of the access road. The potable water system will meet the needs of the expanded camp, and will be stored in two tanks, with a capacity of 1,000,000 L each. The tank currently being used at the Canga East Camp will no longer be used. Water treatment will consist of filtration and addition of potassium permanganate and disinfection with sodium hypochlorite. Potable water standards set by the World Health Organization (WHO) will be applied.

**Figure 4.1                      Layout of the Canga East Camp**

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**Figure 4.2                      Plan View of Canga East Camp Expansion**

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- Domestic waste water treatment: the Project will include the addition of an autonomous modular wastewater treatment plant, drain pumps, a collection system and a sludge handling system. The waste water treatment plant will be built at the eastern extremity of the camp expansion. Waste water will be treated in a biological reactor-type secondary treatment system. The proposed treatment chain will consist of a pre-treatment unit, a buffer tank, a biological reactor, a holding pond, a sludge tank and a disinfection system. The sludge will then be dried to 30% solids content. The final effluent will be discharged directly into the environment. Because no effluent discharge guideline exists in Guinea, either the World Bank's general environmental guidelines or Rio Tinto's standards (when more stringent) will be followed.
- Fire protection system: the camp will be provided with mobile fire / ambulance services (including an emergency water tank). Fire extinguishers and fire blankets will be placed in all strategic locations throughout the compound. Hard-wired smoke detectors will be installed in all buildings, including accommodation units.
- Landfill site, HAZMAT Pad and portable incinerator: the hazardous waste sent to the hazardous materials site (HAZMAT Pad) will consist mostly of waste contaminated with petroleum products, oils and lubricants, batteries, filters, ashes, etc. The HAZMAT Pad will be contained by a dike with 110% containment capacity. Final disposal of hazardous materials will occur at an authorized site. Virtually all non-hazardous solid waste will be incinerated. The incinerator will burn wet kitchen waste, plastic, paper, cardboard and a variety of packing materials, and will produce very small amounts of ash. The ash will be disposed of at the HAZMAT pad.
- Security fencing will be used to prevent unauthorized access to electrical components and gasoline, oil, and lubricant storage facilities, and to control traffic at the camp access road entry point.
- Satellite telecommunications: a satellite telecommunications system will be used to transmit and receive data: it will provide internet, radio, television, UPS and telephone services for the camp using Communication and Information Systems (CIS).
- Fuel storage and fuelling station: three 50,000-litre above-ground fuel tanks will be installed in a new compound. Fuel from these tanks (#2 diesel fuel) will be used to feed the generators and refuel motor vehicles. The fuel tanks will be equipped with double walls, so a dike will not be necessary, but should the fuel tanks used be single-walled, a diked area with a 110% containment capacity will be added. The fuel tanks will be located next to the generators, south-west of the gate house (Figure 4.1). Spill kits will be placed near the fuel storage area.
- Stormwater drainage system: precipitation falling onto the site will be fully contained by the site drainage system, which will channel the water to existing waterways. Provisions will be made for removing suspended solids from the runoff water.
- Gravel roads will be built to provide access to all key buildings, vehicle parking and the bus stop.
- Computer system: will include computer hardware, software, and peripheral equipment such as the server and printers.

### 4.2.3 Analysis of Alternatives

#### □ Site selection

Expansion of the Canga East Camp will take advantage of existing facilities, such as the medical clinic, and will minimize the amount of infrastructure to be built. It will also allow common use of service infrastructure (potable water treatment systems, waste water treatment, waste treatment, etc.) and improve those in the existing camp.

The option of expanding the existing camp will minimize the footprint of the preparatory works on the receiving environment. In fact, the initial site choice was intended to minimize potential impacts on the montane forests. Furthermore, since in the immediate vicinity of the existing Canga East Camp site there are no agricultural activities, its expansion will not have any negative impact on the local population agricultural activities. Lastly, the grassland savanna colonizing the present site has limited fauna potential.

There are no seasonal or permanent dwellings within 2.5 km of the base camp. The nearest villages – Lamadou and Moribadou are located 6 km and 7 km away from the base camp (respectively), and will not be directly affected by the camp expansion.

Consequently, no other alternate camp location was analyzed.

#### □ Choice of Technology

##### Water Treatment Unit

Considering the remoteness of the camp, the potable water treatment plant needs to be modular for easy transport (to the camp). The water treatment unit also needs to be self-contained and must require little human intervention for operation by an unskilled workforce. The technology that meets these criteria consists of filtration, potassium permanganate dosing (to eliminate the iron present in the groundwater), followed by disinfection with sodium hypochlorite to ensure microorganism-free water distribution.

##### Domestic Waste Water Treatment Plant

Domestic waste water treatment consists of a two-stage secondary treatment to produce treated water that can be discharged directly into the environment. The primary treatment consists of a biological reactor, using microorganisms to clean the water. This type of process produces treated water that meets the strictest discharge standards and limits the use of chemicals (when chemicals are used, transport costs can be significant, storage can be problematic, and the recovered sludge can be very hard to treat and dispose of). The addition of an aeration system is required to provide the oxygen needed by the microorganisms. This choice of technology allows the treated water to be used for agricultural purposes.

### Incinerator

The choice of a portable incinerator is particularly appropriate considering the remoteness of the base camp and the absence of an authorized waste management site near the base camp.

#### **4.2.4 Construction Phase**

The camp expansion will require very little site preparation because the site is already relatively flat, and because the intent is to minimize destruction of the natural vegetation. Site preparation will be limited to the module sites, underground laying of cables and construction of infrastructure, and the gravel parking lot. The construction phase includes the following steps:

- Clearing and grubbing of the above-mentioned areas: the vegetation to be cleared consists mostly of grassland savanna and shrubbery; timber from tree-felling will be set aside for recovery by the local population.
- Topsoil stripping: topsoil will be stripped and recovered for future use, and stored in the borrow pit located near the camp.
- Excavating, backfilling and compacting: excavation will be done where necessary; cut material will be used to restore the borrow pit. Excavations will then be backfilled using lateritic material from the existing borrow pit.

#### **4.2.5 Work Schedule**

The preliminary schedule for the construction of the Canga East Camp is as follows:

- March 2007– Transportation of materials, equipment and supplies to the camp
- April 2007 to July 2007 – Camp construction
- August 2007 – Commissioning of camp

### **4.3 DESCRIPTION OF THE ENVIRONMENT**

#### **4.3.1 Study Area**

The proposed camp study area is located in the administrative region of N'Zérékoré, in the Nionsomoridou Subprefecture specifically, which is in the Beyla Prefecture (see Figure 3.1). This area is outside the village farmland, as it is located inside the Pic de Fon forest boundaries. The study area covers an area measuring approximately 2,150 m by 2,000 m, or 4.3 km<sup>2</sup> (see Figure 4.3). The camp study area lies entirely within the Rio Tinto mining concession.

#### **4.3.2 Physical Environment**

##### **□ Climate**

Dominant winds are the most significant climatic factor in camp location selection and design criteria. They were a factor in determining the dumpsite and trash and waste water treatment sites, among others. The dominant winds in the Simandou

region are from the west during the monsoons (rainy season) and dry, hot winds from the northeast during the Harmattan (Hatch, 1998a).

According to 2004 and 2005 wind data from the Mafindou meteorological station located approximately 11 km east of the Canga East Camp (see Figure 3.2), the dominant winds blow southeast from October to January, and south-southwest the rest of the year. The average annual wind speed is approximately 1 m/s, and a maximum monthly speed of 14.4 m/s was recorded in March. Simandou Project weather conditions are described in greater detail in the Airstrip chapter (see subsection 5.2.2).

#### □ **Ambient Air Quality**

The main sources of atmospheric contaminants in the Simandou region are:

- Bush fires (slash burning) lit by farmers during the dry season;
- Dust raised by vehicle traffic on dirt roads;
- Fuel oil combustion by the Canga East Camp generators;
- Dust raised by wind during the dry season;
- Burning of various fuels (wood, naphtha and kerosene) in domestic cooking.

There are no available data or ambient air contaminant concentration measurements to quantify these emissions.

Brush fires (slash burning) can be of considerable significance during the dry season (December through February) and can cause fairly thick and continuous smoke plumes over the region.

The only stationary source of sulphur dioxide (SO<sub>2</sub>) and nitrogen oxides (NO<sub>x</sub>) is the Canga East Camp generator. Because it is small, the ambient NO<sub>2</sub> and SO<sub>2</sub> levels are considered negligible. Other emission sources in the region are relatively insignificant given the small population and limited number of vehicles.

The air quality in the study area is therefore generally considered good, although at certain times during the dry season, the levels of airborne particulates can become more significant (mainly in the few weeks during slash burning).

#### □ **Initial Noise Environment**

The initial noise environment is that prior to camp expansion and new infrastructure installation. It was characterized by day- and night-time sound readings taken near the Canga East Camp on September 17<sup>th</sup>, 2006 (see methodology in Appendix B). The noise measurement point locations are shown in Figure 3.2.

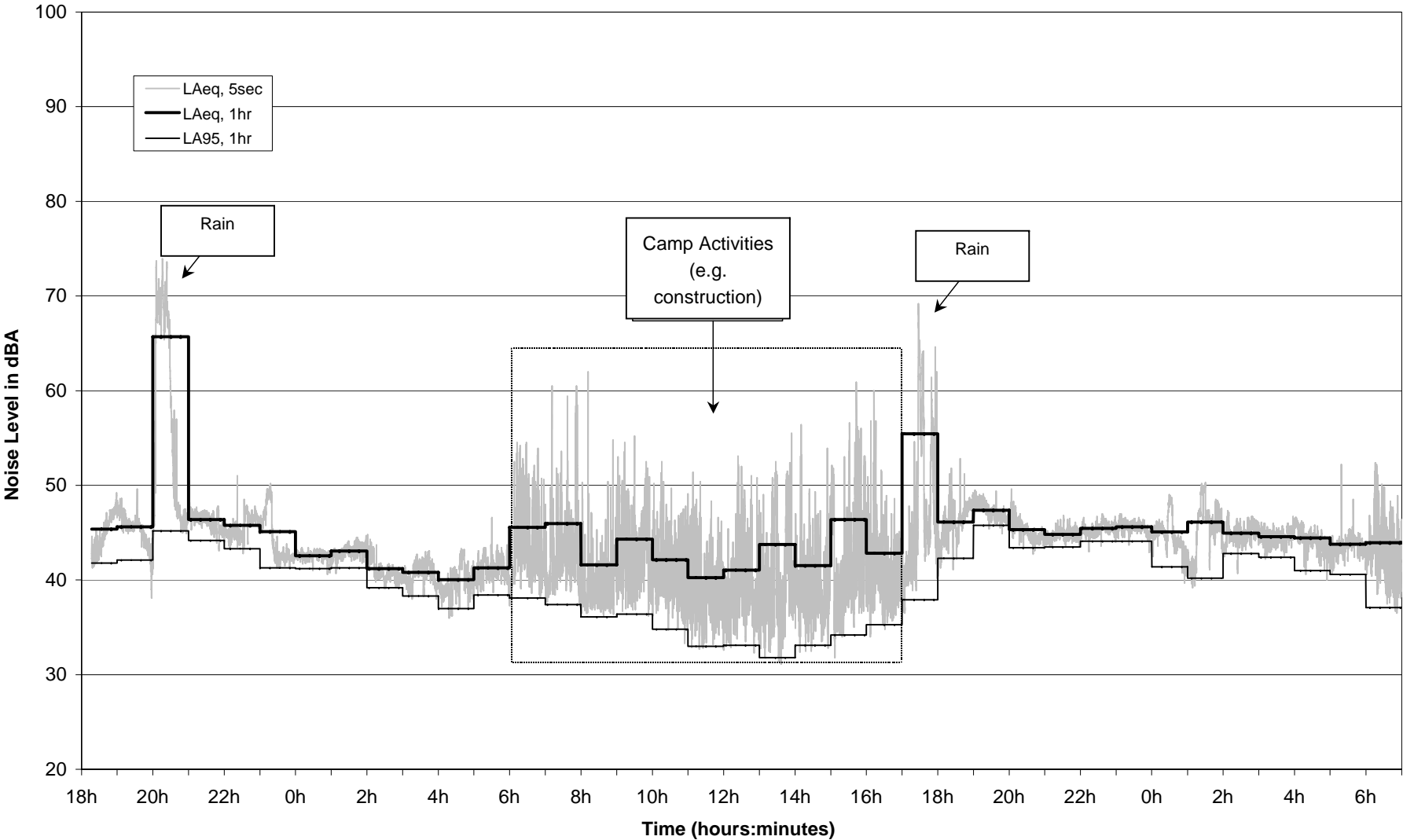
The equivalent continuous noise level (L<sub>Aeq,T</sub>), which represents the average noise level in the camp, is 41 dBA during the day and 45 dBA at night; the background noise (L<sub>AF95</sub>) that is exceeded 95% of the time is 33 dBA during the day and 41 dBA at night (see Table 4.1 and the glossary in Appendix B). The Canga East Camp ambient noise profile taken in five-second intervals over a 24-hour period is shown in Figure 4.4.

**Figure 4.3**                      **Land Use in the Canga East Camp Study Area**

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**Figure 4.4**      **Noise Level as a Function of Time - Canga East, September 17<sup>th</sup>, 2006**



The main sources of noises identified are insects and birds chirping, thunder, rainfall, and human activities. The background noise is generally higher at night (41 dBA) than during the day (33 dBA) due to the continuous chirping of insects. The average noise level ( $L_{Aeq}$ ) is similarly higher at night (45 dBA) than during the day (41 dBA) during calm periods with no rainfall.

**Table 4.1 Initial Noise Level Measured During Calm Period with No Rainfall**

Measurement Points	Start Date & Time (hh:mm)	Duration (hh)	Day		Night	
			$L_{Aeq, 1h}$ (dBA)	$L_{A95, 1h}$ (dBA)	$L_{Aeq, 1h}$ (dBA)	$L_{A95, 1h}$ (dBA)
Canga East Camp	September 17 <sup>th</sup> , 2006 5:00 pm	36	41	33	45	41
Moribadou	September 18 <sup>th</sup> , 2006 9:00 am	24	38	30	45	40

#### □ Physical Geography, Geology and Nature of the Soils

The Simandou range, the crest of which is located approximately 2.5 km from the camp, overlooks the Canga East Camp valley (see photo in Appendix D). The existing camp sits on a plateau at an elevation between 950 m and 960 m above sea level (Figure 4.3). Valleys carved out by flowing water on both sides of the plateau are oriented along a southwest-northeast axis. From the central plateau, the topography descends in all directions except to the southwest where it rises towards the Pic de Fon.

The Simandou chain is a metamorphic mountain range with highly uplifted biotite gneiss, amphibolites, and pyroxenite formations, alongside quartzite and schists (soapstone, chlorite slate, mica schist) (Germain, 1984). Granitic formations, though present, are scattered widely.

The substratum consists of an iron-rich block conglomerate, cemented by lateritic material. Lowland surface deposits are topsoil with variable thickness and traces of iron transported by groundwater.

#### □ Hydrology and Hydrogeology

The camp plateau is bound by valleys with northeast-flowing streams. The Canga East Camp study area is part of the Loffa River (which flows southwest) watershed.

Seasonal stream flow variations are very large, causing large variations in water levels. As a result, the lowlands and valley floors are flooded during the rainy season. Despite a major reduction in flow during the dry season, about 80% of the streams are perennial.

Hydrogeology in the Simandou region consists of crystalline hard rock, which is part of the West African Precambrian Shield. The hydraulic properties of this type of rock are mainly associated with the fracture network that develops within the rock mass: the rock mass itself has low porosity and permeability. Such geological formations usually form poor aquifers, and water-supply wells tapping into the groundwater will typically produce small yields.



Currently, little is known about Pic de Fon groundwater flow. Numerous springs on the mountain slope have been recorded and logged. The groundwater flow system is assumed to connect to the major surface water features flowing down the mountain. The presence of springs on the mountainside suggests that some perched aquifers may be encountered at higher elevation, however, many of the areas of iron mineralization are extremely porous.

#### □ Surface and Groundwater Quality

There is little data available about historical surface and groundwater quality in the study area. The existing data have been analyzed based on water quality criteria established by the World Health Organization (WHO, 2004) for human health, and in terms of nuisances to consumers (water appearance, taste and odour).

In 1998, Hatch & Associates Inc. carried out physicochemical analyses of 19 surface water samples taken in the Simandou Project area (Table 4.2). Results of these analyses show very low water conductivity (<100 µS/cm). The minimum and maximum pH values are outside the WHO criteria; iron concentrations and turbidity exceed the WHO's aesthetic limits. Only one sample exceeded the WHO copper nuisance standard (1.30 mg/l). The levels obtained for nitrates and zinc were well below WHO criteria. Note that the metal (iron, copper, and zinc) concentrations are typical of iron ore deposits.

**Table 4.2 Results of Analysis of Surface Water Samples Taken in the Simandou Project Area in January 1998**

Parameter Units		Conductivity µS/cm	pH	Turbidity NTU	Nitrates mg/l	Iron mg/l	Copper mg/l	Zinc mg/l
Minimum		6.6	6.4	2	0.01	1.12	0.06	0.26
25 <sup>th</sup> percentile		22.3	6.9	4	0.04	1.44	0.06	0.41
Average		34.7	7.3	6	0.07	1.56	0.10	0.51
75 <sup>th</sup> percentile		63.5	7.7	11	0.12	2.62	0.13	0.55
Maximum		88.7	8.7	52	0.63	8.82	1.30	0.62
WHO quality criteria (2004)	(1) Health	-	6.5 – 8.5	-	50	-	2	-
	(2) Nuisance	-	-	5	-	0.3	1	3

(1) Concentration in drinking water above this value or outside this range having a significant impact on human health.

(2) Concentration in drinking water potentially causing nuisance to consumers because of appearance, taste, or odour.

Concentration exceeding WHO quality criteria.

Source: Hatch, 1998a.

Since 2005, Water Management Consultants has been conducting a hydrological monitoring program in the Simandou Project area. Preliminary water quality results from approximately 85 springs are shown in Table 4.3. Specific results for the Canga East Camp supply spring (Whisky 1) indicate good quality: pH between 5.8 and 6.5; conductivity (indication of dissolved solids) less than 20  $\mu\text{S}/\text{cm}$ ; dissolved oxygen saturation varies from 70% to 95%, and turbidity is less than 10 NTU during the dry season, and varies from 0 to 50 TNU in the rainy season (WMC, ongoing monitoring).

**Table 4.3 Results of Analysis of Spring Water Quality Samples Taken in the Simandou Project Area in 2005 and 2006**

Parameters	Units	Minimum	Maximum
pH	-	4.2	7.5 (2 springs had pH of 10.9)
Conductivity	$\mu\text{S}/\text{cm}$	2	25
Dissolved oxygen	% saturation	0%	92 %
Oxidation/reduction potential	mV	53	1276

Source: Water Management Consultants, 2006 (Ongoing monitoring).

Two water samples (surface and spring water) were taken in the Canga East Camp area in September 2006 to analyze various potential camp supply alternatives, and a sample of spring water was taken in 2004 in the Canga East area (see sampling station locations in Figure 3.2 and the results in Table 4.4). Analysis of the data indicates that most of the parameters in the surface and spring water analyzed in 2006 are below WHO criteria, except for iron, cadmium and manganese, which exceeded the limits. In the samples taken during 2006, the 0.3 mg/l criterion for iron (nuisance criteria) was exceeded; the 0.003 mg/l for cadmium (criteria likely to have a significant impact on human health) was exceeded (in two samples), and the 0.4 mg/l criterion for manganese (health criterion) was significantly exceeded (in two samples). In the case of the spring water analyzed in 2004, only aluminium, nickel and lead appear to exceed WHO health criteria, but care should be taken in interpreting this data as the detection limits used appear to be very high.

**Table 4.4 Results of Analysis of Water Samples Taken in Canga East**

Parameter	Units	Spring Water Whisky 1	Surface Water (Canga East sampling site)	Spring Water Whisky 1	WHO Quality Criteria (2004)	
Date		2006-09-13	2006-09-13	2004-02-10	(1) Health	(2) Nuisance
Alkalinity	mg/l	25	25	6	-	-
Aluminum	mg/l	-	-	< 0.5	-	0.2
Antimony	mg/l	-	-	< 0.005	0.02	-
Arsenic	mg/l	-	-	< 0.005	0.01	-
Cadmium	mg/l	0.025	0.049		0.003	-
Calcium	mg/l	0.41	0.35	0.4	-	-
Chlorides	mg/l	10	10	0.3	-	250
Chromium	mg/l	-	-	< 0.05	0.05	-
Conductivity	$\mu\text{S}/\text{cm}$ at 25°C	13.5	8.7	4	-	-
Colour	UPC	2	4	-	-	-

Parameter	Units	Spring Water Whisky 1	Surface Water (Canga East sampling site)	Spring Water Whisky 1	WHO Quality Criteria (2004)	
Date		2006-09-13	2006-09-13	2004-02-10	<sup>(1)</sup> Health	<sup>(2)</sup> Nuisance
Copper	mg/l	0.09	0.17	< 0.05	2	1
Cyanides	mg/l	0.001	0.004	-	-	-
COD	mg/l	300	365	-	-	-
Hardness	mg/l	-	-	< 3	-	-
Total iron	mg/l	<b>0.35</b>	<b>0.31</b>	0.08	-	0.3
Fluorides	mg/l	0.2	0.4	< 0.2	1.5	-
Magnesium	mg/l	4	2	0.3	-	-
Manganese	mg/l	<b>19</b>	<b>5</b>	< 0.02	0.4	0.1
Suspended solids	mg/l	-	-	< 1	-	-
Nickel	mg/l	-	-	<b>&lt; 0.05</b>	0.02	-
Nitrates	mg/l	0.8	0.8	< 0.2	50	-
Nitrites	mg/l	0.10	0.15	-	3 / 0.2 *	-
pH	°C	6.8	7.0	6.1	6.5 – 8.5	-
Phosphorous	mg/l	-	-	< 0.2	-	-
Lead	mg/l	-	-	<b>&lt; 0.05</b>	0.01	-
Potassium	mg/l	-	-	0.2	-	-
Silicon	mg/l	-	-	5.9	-	-
Sodium	mg/l	-	-	0.2	-	200
Dissolved solids	mg/l at 105 °C	-	-	34	-	1000
Sulphates	mg/l	1.6	2	< 0.2	-	250
TA		0	0	-	-	-
TAC	°F	1.5	2.0	-	-	-
Turbidity	FTU	0.70	2.48	-	-	5
Zinc	mg/l	-	-	< 0.02	-	3

<sup>(1)</sup> Concentration in drinking water having a significant impact on human health.

<sup>(2)</sup> Concentration in drinking water potentially causing nuisances for consumers due to appearance, taste or odour.

\* Acute (short-term exposure) / Chronic (long-term exposure).

**Concentration exceeding WHO quality criteria.**

The Canga East Camp expansion project includes plans for the installation of a potable water supply treatment system to minimize the risks associated with waterborne disease, specifically those of bacterial origin. In order to determine the water treatment method, microbial analyses were conducted by Rio Tinto staff in September 2006, upstream of the camp water supply intake point, at the intake point and at the camp outlet (Table 4.5). The results indicate an absence of heat-resistant bacteria in the spring water (which was exposed to several seconds of ambient air prior to sampling); an average of 40 colonies/100 ml at the intake point, and 12 colonies/100 ml at the Canga East Camp valve outlet.

**Table 4.5 Results of Analyses of Heat-Resistant Bacteria in the Canga East Water Supply, September 13<sup>th</sup>, 2006**

Sampling Station	Sample Volume (ml)	Total Number of Colonies*	Number of Colonies per 100 ml
<b>Whisky 1 Spring Water</b> (510711 E / 944942 N)			
Sample I	100	0	0
Sample C	50	0	0
Sample D	100	0	0
		<b>Average</b>	<b>0</b>
<b>Surface Water (Canga East Camp supply point)</b> (511151 E / 945030 N)			
Sample M	100	38	38
Sample L	50	21	42
Sample A	50	20	40
		<b>Average</b>	<b>40</b>
<b>Canga East Shower Valve</b> (513000 E / 946092 N)			
Sample N	100	13	13
Sample F	100	11	11
Sample H	50	6	12
		<b>Average</b>	<b>12</b>
<b>Control Sample **</b>			
Sample Y	100	0	0

\* Oxfam Delagua test.

\*\* Control sample was distilled water.

Source: Water Management Consultants, 2006 (data transmitted by e-mail).

### 4.3.3 Biological Environment

#### □ Biodiversity

##### Regional Biodiversity Context

According to the authors of the *Monographie Nationale*, “Guinea possesses a bio-ecological heritage that is unique in West Africa, especially with regard to its wet relic forest comprising the north-eastern extremity of the Great Guinea-Congo Rainforest”. Unfortunately, overall biodiversity is poorly understood. A survey of the literature on biological diversity inventoried 6,926 species (*Centre d’échange d’informations de la Guinée*, 2006), an obvious underestimate for a tropical country. By contrast, Canada – a temperate country – has 71,500 known species (Environment Canada, 2003).

Despite the limited knowledge of Guinean biodiversity, a number of scientists agree that the *Guinée Forestière* comprises the country’s largest biological diversity basin. Only the Nimba chain has been surveyed on site several times, and the richness of the flora and fauna found there is a good indication of what should be found in the Simandou Range. It is therefore not surprising that Pic de Fon Classified Forest Rapid Assessment Program (RAP) (McCullough, 2004) conducted in 2002, enriched Guinea’s natural heritage by at least 25 new species, probably 8 to 10 of which are new to science. Since the RAP did not cover the planned preparatory works and mine operation area, it is difficult to assess the biodiversity of this sector of the Simandou Range.

### Biodiversity Overview of the Pic de Fon Classified Forest

The Canga East Camp is located inside the boundaries of the Pic de Fon classified forest (see Figure 3.1). The classified forest area covers a total of 25,600 ha and was declared classified on November 4<sup>th</sup>, 1953 by virtue of Order No. 8113 SE/F. An estimated 40-50% is covered in forest.

It was given classified status with the following objectives (RTI International, 2006):

- To maintain the hydrographical system and protect the many waterways fed by the mountain source that feeds the hydrographical basins of the Loffa, Dion, Diani and Milo Rivers;
- To strengthen the natural barrier formed by the mountain range between the tropical easterly winds (*alizés*) from the south and the Harmattan from the north;
- To preserve habitats and biodiversity.

The 1953 classification order granted exclusive usage rights to riparian village inhabitants, namely (RTI International, 2006):

- To harvest the coffee and cola plantations that existed at the time of classification, with no possibility of plantation expansion or renewal;
- To maintain crops that existed at the time of classification and to harvest products thereof until abandonment by the farmer.

These management rules were followed until the country's independence in 1958, after which they were disregarded (RTI International, 2006). Management of the Pic de Fon classified forest is currently the responsibility of the N'Zérékoré Forestry Centre which reports to the *Direction Nationale des Eaux et Forêts*. Management of the classified forest is done in collaboration with the CFZ, the forestry division of Beyla, and the forestry units. By virtue of Order No. 2005/4006/ME/CAB, the Mount Nimba and the Simandou range Environmental Management Centre (CEGENS) is mandated with the mission of coordinating and promoting protection activities and sustainable development of the resources in those mountains and their areas of influence.

The Pic de Fon classified forest is located at the southern end of the Simandou range in the transition zone between the dense and humid forests of southern Guinea and the savanna areas in the northern part of the country. These two formations, separated by the crest of the Simandou range, provide a variety of habitats ranging from rainforest to humid Guinean savanna to mountain and ravine gallery forests (McCullough, 2004).

Despite the fact that the little documentation exists on the richness of the Guinean forest, the Simandou range is known for its biological richness. It was also designated a priority biodiversity area during the Conservation International's Priority-Setting Workshop in Elmina, Ghana, in 1999 (McCullough, 2004). Given the Pic de Fon's potential wealth of biodiversity, Rio Tinto arrived at an agreement with Conservation International (CI) for a regional biodiversity assessment. A Rapid Assessment Program (RAP) was conducted in November and December of 2002 by a multidisciplinary team of 13 international and regional scientists. The RAP team catalogued over 800 species, 50% of which are plants, 28% birds; the rest insects, amphibians and reptiles, mammals, and primates (McCullough, 2004). Some of

these species were new for Guinea and others are of national or international importance in terms of conservation (IUCN Red List, CITES list and *Liste de la Monographie Nationale*).

It should be noted, however, that both RAP inventory sites were located on the western slope of the Simandou chain in high-quality primary forest, while the Canga East Camp is located on the eastern slope, which has been heavily degraded by human activity, and only relics of gallery forests remain in the ravine areas. Based on observations made during fieldwork and from communication with the local communities, it was found that the eastern slope is subject to yearly uncontrolled brush fires, and traces of slash burning are visible up to the very summit of the mountain range.

Interpretation of aerial photographs and satellite images taken of the land within the Pic de Fon classified forest boundaries reveal temporal forest cover regression. In 1951, the forest covered 54% of the area; approximately 45% in 1978, and just over 26% in 1998 (RTI International, 2006). The main causes of natural resource deterioration at Pic de Fon are uncontrolled brush fires, shifts in agriculture, over-use of pastureland, demographic growth, and firewood gathering. Note that most of the primary forests are concentrated in the southern portion of the mountain chain, specifically on the western slope.

#### Main Threats to Biodiversity

The main threats to biodiversity in the Pic de Fon Classified Forest (RTI International, 2006) are the same as those encountered throughout this developing country, and are directly associated with poverty:

- Encroachment of agriculture, which is considered the primary cause of forest ecosystem degradation (fundamental cause is demographic growth);
- Exploitation of timber for heating fuel, construction materials, etc.;
- Gathering of non-ligneous forest products for food and medicinal purposes;
- Uncontrolled hunting to provide bush meat to the villages and towns;
- Overfishing, also to procure animal protein;
- Spontaneous, accidental, and especially, intentional brush fires;
- Influx of a large number of refugees in the region in the past few years as the result of political problems in neighbouring countries (Liberia, Sierra Leone and Ivory Coast);
- Uncontrolled mining of various mineral resources;
- Road development, facilitating access to forests and other ecosystems.

Environment fragmentation and commercial mining operations are also identified as future threats to biodiversity.

#### □ **Vegetation**

A map of the plant species in the Canga East Camp expansion study area is provided in Figure 4.3. Plant classification is based on that used by Royal Botanic Garden (RBG Kew, 2006). The Canga East Camp sits on a lateritic plateau characterized by mountain prairie or grassland savanna vegetation, depending on

the altitude<sup>1</sup>. A thin strip of gallery forest lines the streams located in the bottom of the valleys surrounding the plateau. The slopes themselves exhibit a mosaic of disturbed tree and bush savannas.

A vegetation inventory was conducted in August 2006 at the future camp location. Four 20 m-by-20 m parcels were inventoried, including one control parcel located outside the camp limits. Detailed results of the vegetation inventory are provided in Appendix E, and the inventory parcel locations are shown in Figure 4.3.

Despite the plateau's altitude (over 900 m), the plant species recorded in the alpine meadow – grassland savanna – are typical of species seen in the foothills. The grass cover consists of a grassland mosaic approximately 0.5 to 1.0 m in height on the lateritic hardpan (see photo in Appendix D) and grassland savanna from 1.5 to 2.0 m in height in places where the substrate is gravelly with a thin layer of topsoil. There are only a few trees and shrubs scattered around the grassland savanna. Note that this plateau, like most of the Beyla Prefecture territory, is subject to yearly brush fires (between December and March) set by farmers to renew the pasture and clean out crop fields.

The tree stratum (1 to 8 m in height) covering less than 5% of the area of the parcels included in the inventory is represented by three species: *Lophira lanceolata*, *Schefflera barteri* and *Pterocarpus erinaceus* (Appendix E). The shrub stratum (over 8 m in height) that covers approximately 5% of the parcel area is mainly represented by *Pterocarpus erinaceus*, *Albizia zygia*, *Entada africana*, *Hymenocardia acida* and *Schefflera barteri*. The grassland stratum that covers approximately 90% of the parcels consists primarily of species of the Poaceae family, including *Loudetia kagerensis*, *Wan* and *Sön* (in Koniaké) and *Aira caryophyllea*. The mosaic shrub stratum constitutes a mixture of various shrubbery that has been disturbed by anthropogenic activity. The species in the impact area parcels are similar to those found in the control areas.

In 2006, RBG Kew sampled a parcel close to the existing Canga East Camp, near the guardhouse (on the northwest side of the road, see parcel location in Figure 4.3). Among other things, they inventoried the greatest concentration of terrestrial orchids in all the parcels surveyed in the Pic de Fon classified forest (Table 4.6). None of the six orchid species observed had limited geographical distribution, and several are widespread in Africa (RBG Kew, 2006. Data transmitted by e-mail).

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<sup>1</sup> The classification used by RBG Kew is based on White (1983), which identifies two major types of vegetation, with distinction at an altitude of 800 m, but for the purposes of this study, an altitude of 900 m was used, as it seemed to correspond more closely to a formation change according to observations made in the field and satellite image spectral analysis.

**Table 4.6 Species of Orchids Inventoried Near the Canga East Camp**

Latin Name	Family	Protection Status
<i>Nervilia adolphi var adolphi</i>	Orchidaceae	None
<i>Nervilia adolphi var suposita</i>	Orchidaceae	None
<i>Platycoryne paludosa</i>	Orchidaceae	None
<i>Habenaria clavata</i>	Orchidaceae	None
<i>Liparis nervosa</i>	Orchidaceae	None
<i>Eulophia odontoglossa</i>	Orchidaceae	Endangered according to CITES

Source: RBG Kew, 2006 (data transmitted by e-mail).

Although the plateau occupied by the camp is not used by local people, it does host several plant species that are primarily used for medicinal purposes (see Appendix E).

Of all the species inventoried in the Canga East Camp area, only the *Eulophia odontoglossa* orchid is mentioned in the Convention on International Trade in Endangered Species list of flora and fauna threatened with extinction (CITES, see list in Appendix F). None of the species inventoried in the future camp location has an at-risk status on the IUCN Red List or the Guinean *Monographie Nationale*<sup>2</sup>.

The main species inventoried in the gallery forests located southeast of the plateau where the new camp will be constructed are: *Schefflera barteri*, *Erythroleum guineense*, *Parkia biglobosa*, *Pterocarpus erinaceus*, *Spatodea campanulata*, *Syzygium guineense* and *Ficus sp.* None of these species are included among IUCN, CITES or the *Monographie Nationale* threatened or endangered species. However, *Pterocarpus erinaceus* is listed as a forest species that benefits from special protection under the terms of the Forest Code (Article 78, see Appendix F), and can only be cut with authorization of the Forest Service.

#### □ Fauna

Although the inventories carried out as part of the RAP (McCullough, 2004) indicate that the Pic de Fon classified forest hosts a wide diversity of fauna, the Canga East Camp area has little faunal potential. This type of habitat (grassland savanna) is rarely frequented by fauna, and the disturbances caused by camp operation and area traffic are not conducive to such use, either. At the time when the inventories were carried out (August 2006), no faunal species or indication of faunal presence were observed on the plateau where the projected camp will be situated.

<sup>2</sup> The *Monographie Nationale de la Diversité Biologique* is a national study produced by committees of experts and was used to prepare the *Convention sur la diversité biologique* that was signed by the Republic of Guinea at the 1992 Earth Summit in Rio de Janeiro, Brazil. It was the second African signatory country and the sixteenth of all the parties to the Convention.



#### 4.3.4 Human Environment

##### 4.3.4.1 General Framework Common to All Three Preparatory Works Components

Because all three Simandou Project preparatory works components are located in the Beyla Prefecture, this section describes the socio-economic context common to the work areas, and places it in the national context. Sub-section 4.3.4.2 describes the specific human environment at the camp.

##### □ Administrative Organization

Guinea is divided into seven large administrative regions, each under a governor's responsibility. The city of Conakry is excluded from these regions as it is considered an autonomous administrative entity. Within the regions, there are 33 prefectures, 38 townships, 303 sub-prefectures, 303 Rural Development Districts (*Commune rurale de développement* - C.R.D.), and 1,615 districts. The country's general administration has been decentralized since 1984.

All preparatory works will be done in the Beyla Prefecture, in the region of N'Zérékoré. Beyla Prefecture is subdivided into towns (one of which is Beyla, where the airstrip is to be constructed) and Subprefectures (including Nionsomoridou where the Ouéléba access road will be built and the Canga East Camp expanded).

Beyla Prefecture (17,452 km<sup>2</sup>) is the largest prefecture in *Guinée Forestière*. The prefecture's total budget for 2005 was NGF 98,000,000 (approximately € 20,000 at the current rate) (Synergy, 2006). The prefecture has two main sources of income: tax receipts and administrative receipts (Synergy, 2006).

##### □ Modern and Customary Land Ownership

Property rights in Guinea are complex, given their overlapping nature (state-owned or modern rights, customary rights and influence of Islamic law). Historically, Islamic law, in recognizing individual property rights, has contradicted customary land ownership rights that recognize communal property and reserve property rights for the historic or first occupants of the property.

State-owned property rights are currently described in legislation that institutes the fundamental sovereignty of the state. While these indicate that the state is the owner of the land, it also supports the concept of private property, allowing that construction, amenities and farms belong to their owners or those who have historic claims to the land. The right to use (but not own) developed lands and exploit and harvest its fruits (planting and cultivating) is also recognized. The right to occupy undeveloped property can only be exercised if it has been previously authorized. Thus, undeveloped land can be taken by the state, in part or its entirety, for its own purposes.

Customary rights are the historical reference point for most of the population, especially those in the rural environment where traditional practices dominate. The role of the founding families, their lineage and the advice of elders is very important in the study area villages in terms of property rights and management. In the study area rural communities, agricultural and pastoral lands as well as plantations are allocated based on traditional land allocation rules. A local patriarch (the chief of land), a descendant of the founding family, manages the land near their villages in

the study area. The boundaries between the properties are stationary and have been respected for generations. Founding families also exert their right to control the lands they have allocated to each host family. Farming lands are a family patrimony managed by the head of the family who has the obligation to allocate lands to any child who marries and starts a family.

The Guinean pastoral code, based largely on local customs, dictates the use of land for herding. It is well-respected and honoured by the villagers. In general, the land and its resources cannot be used for grazing, watering, etc., without the prior approval of the landowner. It is sometimes a source of conflict between breeders and farmers.

In the Beyla region, intra-community conflicts are mainly caused by (RTI International, 2006):

- Destruction of seed beds and plantations by livestock, resulting from farmers and livestock raisers cohabiting the same village;
- Potential problems with boundaries between farms. Conflicts are rare, however they do arise given the low occupancy of the land, the small size of the farms, the availability of more or less rich land in different places, and the powers of customary arbitration bodies.

Inter-community conflicts arise mainly between groups of people belonging to different ethnicities or generations. Such conflicts can be aggravated by external factors such as the arrival of new farmers, unilateral installation of livestock raisers by a community without approval from neighbouring villages or as a result of historical antecedents (RTI International, 2006).

Natural resources such as fruit, wood, straw, and medicinal plants are considered common resources. Only plantations can require a pre-authorization by the owner, but most of the time, this too is considered common property.

Inheritance remains the most common method of land transfer. Inheritance passes from father to son with women being excluded. Women cannot be landowners; even if her husband dies, the land will be passed on to their sons or revert back to her husband's parents. Land can also be transferred in the form of a gift (grant of land use), but this is relatively rare and essentially only takes place between close relatives.

The sale of property is another form of land transfer, but it is rare in the rural environment, as opposed to in the urban environment. After an agreement on the price, the owner can authorize the sale, and the transaction is often ratified by the signatures of the two parties and witnesses to the agreement.

## □ Historical Context

The history of Guinea can be divided into four phases: the pre-colonial period, the French colonial period (1890-1958), the 1st Republic (1958-1984) which was oriented toward collectivism, and finally, the 2nd Republic which has a liberal economic reform focus.

The pre-colonial period is characterized by the organization of various ethnic groups and by the progressive Islamization of the country. In the 15th and 18th centuries,

successive waves of Muslim Peul settled the Fouta-Djallon and adjacent areas, driving out the former populations, mainly Dialonké and Soussou, who occupied the territory that today comprises the Department of Beyla. A major cultural transformation ensued with Islam almost completely replacing the traditional animist religions.

The French colonised Guinea between 1890 and 1958, greatly influencing the language, economics and legal system. During this period, colonial powers surveyed the major natural resources and began to exploit them. The First Republic, presided over by President Sékou Touré after Guinea gained independence in 1958, was oriented toward socialism collectivism.

The First Republic and the government of Sékou Touré came to an end in 1984. At that time, General Lansana Conté became President of Guinea (the Second Republic), and is still president today. His regime focused on the restoration of democratic processes, respect of human rights, and economic liberalism.

#### □ **Population Characterization**

Traditional oral history, which predates the colonial period, tells us that the region was occupied by hunter-gather and farming peoples including the Loma and Kpelle. They were displaced toward the south and west by Muslim Mandingo tribes from the north and east, before being overtaken by settlements of Sarakole, Malinka and Peul peoples. The rich pastures led to the development of animal husbandry. Soon thereafter, Kissi, Toma and Guerzé groups also settled the region. More recently, sub-regional conflicts in Liberia, Sierra Leone and Ivory Coast have led to population migrations. When peace was restored in the area, they returned, but changes in demographics left permanent marks.

#### □ **Socio-Economic Profile**

##### Demographic Conditions

The population of the Republic of Guinea is currently approximately 9,250,000 (SNC♦LAVALIN Environment Inc. 2005). According to the last census, taken in 1996, the Republic of Guinea had a population of 7,156,406. Between 1983 and 1996, the average annual population growth was 3.1% (Republic of Guinea, 2000a). On a regional level, Guinean Forest recorded the most rapid growth (4.1%) because of the massive influx of refugees and Guinean nationals coming from Liberia and Sierra Leone.

The population distribution is skewed between farming zones and urban centres, where 70% and 30% of the population live, respectively. The distribution between the sexes is nearly equal: women comprise 52% of the population and men, 48%. The Guinean population is very young: almost 48.4% of the population is under 15 years old. The 15-64 age bracket represents nearly half of the population (47%), and the rest (4.5%) are over 65 years of age. Based on current trends, the total population of Guinea should reach about 10,824,000 inhabitants in 2010 (Republic of Guinea, 2000d).

The Beyla Prefecture had a total population of 167,410 in 1996, with a density of 12 inhabitants per km<sup>2</sup>. Table 4.7 shows the estimated populations of the villages in the study area. According to the census, the population of Beyla Prefecture rose

from 120,610 in 1983 to 167,410 in 1996, an average annual increase of 2.47% – the lowest for the *Guinée Forestière* region – compared to 3.1% for the country as a whole (Synergy, 2006). Projections for Beyla Prefecture are 235,589 by 2010 (Synergy, 2006).

**Table 4.7 Population of the Study Area Villages (1996 Census)**

Village	Men	Women	Total
Moribadou	368	400	768
Mafindou	113	116	229
Banankoro	261	312	573
Nionsomoridou-Centre	363	407	770
Wataférédou	65	66	131
Traoréla	159	170	329
Kéoulendou	n.a.	n.a.	Approx. 600
Piyaro	n.a.	n.a.	Approx. 200
Kotila	n.a.	n.a.	Approx. 100
Beyla Township	5,886	5,336	11,222

Source: RTI International (2006); Synergy (2003).  
n.a. not available.

Approximately one-quarter of Beyla's population is located in the northern part of the Prefecture, which is dominated by savanna plains typical of Upper Guinea. This sub-region has limited agricultural potential.

About 40% of the population of Beyla Prefecture lives in the central region where preparatory works infrastructure will be installed. This region consists of a transition zone between the northern savanna and the wetter southern area, which is dominated by fertile plains. This is the meeting point between Upper Guinea, *Guinée Forestière*, and Ivory Coast, and this is reflected in the diversity of cultures present.

Lastly, the southern region is characterized by favourable weather conditions and has significant agricultural potential. This region covers less than one-third of the Prefecture's area and holds approximately 20% of its population (Hatch, 1998).

Demographic change in Beyla Prefecture is marked by a phenomenon of migration in both directions (RTI International, 2006):

- While there is no documented data, according to the local habitants, there is a significant emigration, not only toward the country's large cities such as Conakry, but also toward neighbouring countries (Liberia, Sierra Leone, and Ivory Coast) and toward Western European countries and the U.S. These emigrant populations are known for their dynamism and business sense, but are less likely to come back to the region;
- Progressive immigration over a long period of herders seeking pasturage. This immigration began with a single transhumance from Upper Guinea and Foutah Djallon during the dry seasons. These populations of herders tend to remain longer since rainfall levels are propitious all year long;

- Recent massive immigration, following civil wars in Sierra Leone, Liberia, and – more recently – Ivory Coast, of people from the regions who had emigrated toward those countries.

Despite the increase in population and competition between the various users of the land (herders, farmers, and miners), there apparently has not been any excessive pressure on the region's natural resources (RTI International, 2006).

### Ethnicity

The Konianke appear to be widely scattered throughout the Beyla Prefecture except in the southern and northern extremities, which are mainly populated by Guerzé and Peul respectively (Hatch, 1998).

The population of Moribadou was originally primarily Malinké, but migratory influences are such that many Susu, Guerzé and Toma are found there now (Synergy, 2003). In Mafindou, Banankoro and Wataférédou, the population is 100% Malinké.

Refugee migrations influenced the ethnic diversity of the Guinean regions that share a border with Sierra Leone, Liberia and Ivory Coast. Because the Beyla Prefecture is on the border, it absorbed a high proportion of refugees and Guinean expatriates fleeing the combat areas.

The proximity of the Simandou Mining Project has drawn job seekers to Moribadou. These new arrivals came to settle and have contributed to the village's diversity. Some indigenous people from the village have also returned to settle, hoping to find stable employment at the mine.

### Religion

The population of Guinea is predominately Muslim (approximately 84%) (DNS and ORC Macro, 2006). Other religions are practiced by more than 13% of the population; nearly 11% of them Catholic. It should be noted that more women (2.5%) than men (1.1%) declare themselves atheistic, and the proportion of Muslims is higher in rural areas than in the urban centres.

In the Beyla Prefecture, 90% of the population is islamist, 7% animist and approximately 1% catholic (Hatch, 1998).

In the study area, all of the residents in the villages investigated indicated that they are Muslim. Islam plays an important role in the area, as evidenced by the presence of places of prayer and mosques constructed by the communities.

An overwhelming majority of the population of Moribadou and the immediate region are Muslim. Some traditional beliefs still exist among the villagers, thus creating some contradictions between Islam and traditional beliefs (sacred sites, earth rituals, evil spirits, protective spirits, etc.). There is also obvious Christian population in the region, in Moribadou and Beyla.

### Social Structure

In the villages investigated, as in the majority of Guinea, the social structure is based on a patriarchal, or patrilineal, system. The village is generally comprised of a core population consisting of several patriarchal families and the founding family. The villages consist of dwelling units and gardens grouped along family lines. These villages are ruled by the patriarchs, who assign land, organize social life and arbitrate conflicts.

### Role of Women

In Guinea, the social status of men and women is generally unequal (Republic of Guinea BNR, 2000e). A woman is rarely head of a household, a role almost always held by a man: only 19% of the households in urban areas are headed by women in contrast with 16% in rural areas. Usually, girls are given in marriage by their parents or are chosen by their husbands.

On average, Guinean women have their first child at 18.9 years old, while, in the study area, this average is around 16 years. Childbirth generally occurs with the assistance of an elder woman or a matron, usually between 40 and 50 years of age and with no training as a midwife. 62% of Guinea births are carried out without suitable medical supervision (*Direction Nationale de la Statistique* (DNS), 2006).

In Moribadou, there are four midwives, one nurse, and the Rio Tinto doctor who does consultations in the village one day a week (as needed). If complications occur during childbirth or if there is an accident that requires his or her attention, the doctor goes to the villages. Women can go to the hospital in Beyla, but it is difficult to reach due to limited means of transportation. According to medical professionals, there is a large number of stillborn children, and the mortality rate of mothers following childbirth is also high. The perinatal death rate<sup>3</sup> in the N'Zérékoré region is one of the highest in the country, with an average of 47% (DNS, 2006).

Guinean women have very little education compared to Guinean men, even though the number of girls in school has been growing significantly over the last few years. Thus, nearly three women out of four were declared to be uneducated in 2005 and close to 84% of women are illiterate in Guinea. In the study area, the female literacy rate is very low among adults (14.1% for N'Zérékoré administrative region) but higher for young girls, who have been attending school since 2003 in the ratio of one girl for every two boys, according to the teaching resource people consulted. In general, people believe that Moribadou offers better educational opportunities for their children than the other villages in the region.

In the study area villages, women have a heavy burden of work: they participate in the preparation and maintenance of the fields in addition to performing all the domestic chores (cooking meals, collecting water and firewood, etc.). They also see to the children's education.

In the study area, women play a significant role in their household economies. In particular, they sell agricultural produce at the weekly market, and manage their

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<sup>3</sup> The rate of perinatal mortality is the sum of still-born children and children deceased from 0 to 6 days, divided by the number of pregnancies (7 months or more) (DNS, 2006).

individual incomes garnered from their field crops. With this money, they buy food, dishes and clothes for their families and pay for their health care.

Lastly, modern economic activities are usually occupied by men, and women have few paying jobs, although some women do work in the Canga East Camp.

#### □ **Economic Activities**

The Guinean economy is relatively diversified because of its variety of natural resources. However, it is still largely dependent on minerals, agriculture and animal husbandry, and other sectors are not very developed in spite of their potential. It is estimated that close to 56% of the Guinean population works in agriculture, which is mainly subsistence. Rice (grown on 38% of cultivated lands), peanuts, fonio, corn, cassava and potatoes are Guinea's main food products.

The mining sector represents Guinea's most lucrative resource. The country has one of the biggest bauxite ore reserves in the world. The Guinean territory also has significant potential as a producer of iron, and possesses diamond deposits. In Beyla Prefecture, illegal panning activities have been noted, especially in Nionsomoridou Sub-Prefecture (Hatch, 1998).

The secondary sector of the Guinean economy is under-developed, and accounts for 12% of its GDP. Industrial activities are mainly concentrated in the mining sector, the food, oil and chemical industries, in building materials and textile. In 1998, Guinea's GDP was US \$510 per habitant.

Agriculture plays an important role in the Beyla Prefecture. In the southern portion of the Prefecture (mostly covered with forest), rice, coffee, palm oil, cocoa, bananas and peanuts are cultivated (Hatch, 1998). Fonio, manioc, tobacco, sweet potatoes, and onions are the main crops in the northern plains and central part of the Prefecture.

In 1998, it was estimated that approximately 95% of the prefecture's active population was engaged in farming activities. The inhabitants of Moribadou, Mafindou and Banankoro rely on agricultural production to meet all of their needs. They grow most of their foodstuffs and exchange or sell the surplus to pay for other needs such as medical expenses, marriage costs, and foods they do not grow themselves (Synergy, 2003). Even teachers and health providers grow crops to support their families. Rice and manioc are the basic crops, followed by beans, corn and fonio. They also grow onions, okra, peanuts, watermelon and other produce (sweet potatoes, yams, taro, pepper, eggplant, tomatoes, and others). Some farmers have avocado, kola nut, mango, palm oil, coffee, banana, orange, papaya, banana, and grapefruit plantations (Synergy, 2003).

Agrarian systems differ in shallow lowlands and elsewhere. In shallow lowlands, there are no fallow fields, and the cultivation practiced year round includes flooded rice paddies followed by a second planting (peanuts, market garden crops). During the rainy season, the crops planted on the plateaus and mountain sides consist mainly of corn, millet, manioc, peanuts, etc. Such plantations usually last no more than three to five years because, when the output declines, the land lies fallow for a period of six or seven years.

Land located near dwellings is used for gardens (called “Maninka nangban” in the local tongue). During dry periods, this land is reserved for livestock pasturing (RTI International, 2006).

Beyla Prefecture is known for the quality of its pastureland and livestock production. Its livestock included 133,000 head of cattle in 1995 (Hatch, 1998). However, there are few animal breeders in the immediate neighbourhood of Moribadou village.

Three main types of livestock production occur in the commune of Beyla (RTI International, 2006):

- Small-scale or customary livestock production (poultry, small ruminants, and cattle for heavy work). Grazing areas are not very far from the fields and dwellings;
- Sedentary livestock production by farmers/herders and, to a lesser degree by shepherds. Pasturage consists of farm fields in fallow periods;
- Transhumance cattle raising practiced by herdsmen (RTI International, 2006).

Extensive livestock production is traditional in style. Cattle roam freely until the end of May and are then tied in farming fields or nearby (RTI International, 2006) during the planting period.

Because of its natural potential (abundant and fertile land, vast grazing areas, and numerous rivers), the Beyla region is not only targeted by farmers, but also by transhumance livestock producers from Foutah Djallon and Upper Guinea. This situation is increasing the pressure on the land and forest resources, and is a source of tension between farmers and cattlemen.

Most of the people are amateur hunters and hunt in the areas around crop lands. The great hunters remain in the woods for a week or two until they trap an animal. People from outside the area sometimes come there for commercial hunting, and others set up camp to hunt warhogs (Synergy, 2003). However, hunting is in decline in the region.

The livelihoods of the region also depend on natural resources, such as firewood, palm fruit (for the production of palm oil), medicinal plants, year-round fishing in streams, spices, wild fruits and honey, and building materials such as vines, plant materials for roofing, and bamboo (Synergy, 2003).

There are a few shops in Moribadou, with vendors of miscellaneous items, carpentry material vendors and one bakery (Synergy, 2003). There is a Sunday market with a variety of products, something that used to be available only in Beyla.

Wataférédou is different from the other villages in the area because it is an iron-working village rather than a farming village (RTI, 2006). The village economy is based on exporting farm implements to Moribadou. There are four active blacksmiths in the village; the rest of the families depend on farming.

In Beyla Prefecture, the aquatic fauna have been overexploited. Dynamiting and poisoning sections of the rivers have destroyed a major portion of the aquatic life in the rivers frequented by several villagers (Hatch, 1998).



Beyla Prefecture has hydroelectric potential with the Césou site near Famoïla, and tourism potential with Mont Bérou and Manobéri Falls (Synergy, 2006). The 752 km border with Ivory Coast provides a major commercial trading site but is currently less active due to instability in the Ivory Coast (Synergy, 2006).

#### ❑ Infrastructure and Public Services

There is currently a shortage of personnel and logistical resources that is undermining management of the various administrative departments in Beyla Prefecture (Synergy, 2006). Many job positions remain unfilled, and there are high rates of turnover and absenteeism (Synergy, 2006).

#### Health

The use of health services in Guinea has increased considerably over the last 20 years, but the availability of human and material resources has not kept pace with this growing demand. In addition, recruitment of personnel is difficult because of the distance to urban centres and the difficult work conditions. Equipment at the clinics and health centres is often insufficient and decrepit.

The national system set up by the Guinean government gives patients access to free medical checkups and to current drugs at a low price. The treatment for malaria, the most common illness, is subsidized by the Guinean government, making it more affordable for the general population.

In the villages, deliveries are generally carried out by matrons who are not trained as midwives; hospitals are only used when complications occur.

Table 4.8 summarizes the main health indicators recorded by the Guinean Ministry of Public Health. The population is young and is increasing rapidly with a yearly growth rate of 3.1% and a birth rate of 36.9‰ (per thousand). In Guinea, the overall mortality rate is 14.2‰; however, it is as high as 91‰ for infants. The average life expectancy is low (54 years). The population of children under five is especially vulnerable to disease and suffers most seriously from the main illnesses: malaria, dysentery and acute respiratory infections. In addition, 34.8% of children under five suffer from chronic malnutrition (DNS, 2006).

Between 1970 and 1994, eight cholera epidemics were reported in the Republic of Guinea. The World Health Organization (1999) estimated that 55,000 people are living with HIV/AIDS in Guinea, of whom 52,000 are adults between 15 and 49 years. USAID estimates that 97,000 adults between the ages of 15 and 49 were living with HIV / AIDS in Guinea at the end of 2001. In 1999, the same organization estimated that 5,600 Guineans died from the illness. In the last 15 years, the number of AIDS cases has increased significantly, having multiplied tenfold since 1990. The most recent Demographic and Health survey, carried out in 2005, estimated the HIV/AIDS prevalence rate at 1.5% among people between 15-49 years old. This investigation has also shown that this disease strikes more women (1.9%) in this age group than men (0.9%) (DNS, 2006).

Nationwide, the causes of mortality vary, but in 1999 the main causes of death were non-drepanocytic anemia and pernicious malaria.

**Table 4.8 Main Health Indicators in the Republic of Guinea**

Indicator	Value
Average age of the population*	23 years
Natural growth rate *	2.6 %
Yearly rate of growth *	3.1 %
Birth rate *	36.9 ‰
Mortality rate*	14.2 ‰
Infant mortality (< 1 year old)**	91 ‰
Juvenile death rate (Between 1 and 5 years old)**	79 ‰
Infant juvenile death quotient (< 5 years old) **	163‰
Maternal mortality**	980 for 100,000 live births
Fertility Index**	5.7 children per woman
Life expectancy *	54 years

Sources: \* Republic of Guinea, 1999b.

\*\* Direction Nationale de Statistique (DNS), 2006.

There is a lack of health care service infrastructure and qualified personnel in Beyla Prefecture. Shortages in basic medications are frequent, and health care personnel often do not have the means of transport needed to provide basic sanitary services (Synergy, 2006).

The available health services in the Project area include the hospital in Beyla, a health centre in the village of Moribadou (actually in recruitment) and the Rio Tinto medical clinic in the Canga East Camp. There is no health centre in Mafindou; the nursing assistant from Moribadou is called when needed. Banankoro has no infrastructure or health personnel. A health agent comes from Beyla every three months to administer vaccinations and educate the villagers (Synergy, 2003). However, there is a group of women who handle deliveries and keep a birth registry that is sent to Beyla every month.

The government health centre in Beyla is used by all of the region's urban and rural population. The services offered conform to Department of Health standards but the costs of care and the remoteness of some villages (approximately 30 km from Moribadou) limit access to the centre.

Construction of the Moribadou health centre is complete, but it is not yet open due to a lack of equipment. The centre will provide:

- A point of sale for medication;
- Primary consultation and curative services;
- Prenatal and postnatal consultation services; family planning; a delivery and recovery room;
- An office dedicated to the expanded vaccination program.

Rio Tinto has a private dispensary in the Canga East Camp with a small consultation room and a permanently-assigned physician who provides health services to the workers and their families. Construction of the new Rio Tinto dispensary is now complete and the dispensary will be equipped soon.

The Canga East physician also has a consultation hut in Moribadou and visits one day a week. The doctor sees patients regardless of whether they are employee family members or others, and the government nurse follows up between the doctor's visits. There is a very-high frequency radio in the village for contacting the Canga East Camp doctor for cases requiring an emergency visit.

According to the Rio Tinto physician and the nurse working in Moribadou, there are two major health problems in the region:

- The potable water problem is the main cause of disease in Moribadou. Eight visits out of ten are for waterborne diseases, five of which involve parasitic diarrhoea. All are associated with poor water quality;
- Malaria is the second cause of disease in the region. It often accompanies water quality-related diseases. Children are affected by malaria more frequently than adults because of their weaker immune systems, caused primarily by a lack of hygiene and presence of stagnant pools of water around the residential areas.

Traditional medicine is still widely used in Moribadou, but the more available modern care becomes, the more it is used.

Consultations for STDs are still fairly rare. There are no statistics on the number of cases of infection in Moribadou. In the administrative region of N'Zérékoré, where Moribadou is located, the prevalence rate is estimated to be 1,7% among the adult population (15-49 years old). This rate reaches 2.2% for adult women (DNS, 2006). On the nutritional level, Moribadou has little surplus to deal with lean periods, but the population does not suffer from a lack of food. Cases involving malnutrition are related to a balanced diet and not to the amount of food available.

### Education

Guineans enrolled in school are distributed unevenly according to their level of study: 78.3% in primary education, 20.1% in secondary education, 0.7% in vocational training and 0.9% in higher education. These figures show that few students reach higher education: only 1% of women and 4% of men have completed their secondary level studies. This is due to insufficient educational infrastructure in rural areas and to the young average age of pregnancy. Throughout the country, the index gender parity<sup>4</sup> for school is 0.83 at the primary level and 0.55 at the secondary level. This means that on equal footing, the girls of a school-going age have more difficulties than the Guinean boys in completing primary school, and even more difficulty completing secondary studies. Many reasons can explain why girls face such discrimination in education: for instance, due to the high cost of education, parents prefer to keep the girls at home to help in domestic tasks and encourage the boys to pursue their studies. Also, early marriages and pregnancies can help to explain the why many young girls abandon their studies.

Over the last 30 years, school attendance in Guinea has increased dramatically. However, in 2005, less than half of the population 6-11 years old (44%) attended primary school. This low rate of attendance indisputably shows that other efforts

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<sup>4</sup> An index close to 1 indicates total equality between gender while a weak index, which tends towards 0, means an increased disparity between boys and girls in education.

must be deployed to achieve the UN Millennium Development Goals (ensure universal access to basic education).

The literacy rate in Guinea is low, with an average rate of 25% (Republic of Guinea, 2002). In the rural areas, this percentage is as low as 7% for women versus 27% for men. The gender gap is especially pronounced in the rural areas, where the literacy rate for women is six times lower than urban areas (Republic of Guinea 2000c).

The education rate is particularly low in Upper and Central Guinea where it is estimated that the literacy rates are 13% and 19%, respectively, compared to 26% for *Guinée Forestière*.

The average level of education reached by Guineans is low. In 2005, 55% of the male population over 6 years old had received no formal education. This percentage reaches 72% for the female population.

In Beyla Prefecture, only 40% of school-age children attend classes on a regular basis.

Beyla Prefecture does not differ from the rest of the country in terms of having an inadequate number of schools and teachers, resulting in low enrolment rates and a high level of illiteracy in adults (Synergy, 2006).

Moribadou has a government school with three classrooms, and had a total of 107 students in 2003 which included 24 girls (Synergy, 2003). The percentage of girls compared to boys is higher in the lowest grade level as a result of an education of young girls awareness campaign. There is also a Koranic school with 83 students.

In Mafindou, the village has a Koranic school and, since 2003, a community school with 40 students, most of whom are girls (Synergy, 2003). The village also has a mosque and a youth hostel. There is a school in Banankoro with a potential for three classrooms, but due to a shortage of teachers, only two are operational. In 2003, the school had 100 students, including 27 girls. There is no school or mosque in Wataférédou, but there is a teaching Imam who teaches prayers to the children.

### Infrastructure

The Beyla Prefecture is accessible along the east-west axis by road N-1 from Nionsomoridou to Beyla, which continues in the north-south direction to N'Zérékoré. Approximately 11 km south of Beyla, the road forks off into a trail that provides access to Pic de Fon via the villages of Banankoro, Mafindou, Moribadou, and the Canga East Camp. It is maintained by Rio Tinto. The local people use a large network of trails to reach other communities, farming and grazing areas. However, the bad condition of the roads in the Beyla Prefecture make it very difficult to access agricultural production areas (Synergy, 2006).

Drinking water is drawn from wells in the villages and creeks around the villages. In most cases, the water sources contain bacterial coliforms, one of the main causes of disease in the region. There is insufficient good quality drinking water of in the rural zones of the Beyla Prefecture (Synergy, 2006). There are three wells in the village of Moribadou, but two are not operational; the other dries out quickly when used and the water is turbid during the dry season. The lack of potable water is the limiting factor for this village. There are no boreholes, but the Service national de l'aménagement

des points d'eau has visited twice to locate four drilling points (Synergy, 2003). There is one well in Mafindou and two in Banankoro. The latter two do not produce enough water for the village's needs and are dry for part of the year. There is no well in Wataférédou; water is drawn from the streams.

Electricity is produced by gasoline-powered generators belonging to some individuals and merchants. Telephones are not yet being used in the region, and Rio Tinto operates a high-frequency radio communication system.

#### ❑ **Cultural Heritage and Sacred Sites**

As defined by the United Nations, "cultural property" includes sites with unique archaeological (prehistoric), paleontological, historical, religious or natural values.

No archaeological sites have been observed or reported by communities in the Project's area of influence, but some study area locations are considered heritage sites and are of cultural interest.

In terms of heritage, the site of the old village of Mamouroudou (close to the future Ouéléba access road) and remnants of the old colonial airstrip building near Beyla are located in the sector affected by the preparatory works. With regard to the remnants of the airstrip building, use of the location for other purposes does not seem to be a problem for Beyla village dignitaries.

Culturally speaking, the village woods that comprise the natural resource reserves (forest, water) that provide food and support their livelihoods, the cemeteries, mosques located in or near villages, and the spring heads (where devils live) are considered the main sites of interest. Village cemeteries are traditionally located in woods near the dwellings, generally no more than 400 m from the village core.

#### **4.3.4.2 Specific Camp Framework**

##### ❑ **Administrative Organization**

From an administrative viewpoint, the Canga East Camp is located in the Subprefecture of Nionsomoridou, in the Beyla Prefecture (Figure 3.1). Because it lies within the boundaries of the Pic de Fon classified forest (1953 Decree), the territory does not include any village farmland. However, this portion of the classified forest is surrounded by Moribadou farmland. The entire camp study area is within the Rio Tinto mining concession.

##### ❑ **Socio-Economic Profile**

There are no seasonal or permanent dwellings within 2.5 km of the Canga East Camp. Lamadou and Moribadou, respectively located 6 km northwest of the camp and 7 km northeast are the closest village. In 2003, Lamadou was comprised of approximately 40 families, and Moribadou had a population of approximately 1,700 (Synergy, 2003). During the last census in 1996, the population of Moribadou was estimated at 768 inhabitants, including 309 over the age of 14. Moribadou's original population was 100% Malinké. Between 70 and 100% of the new immigrants are non-Malinké, giving the village a total of 4 to 6% non-Malinké (Synergy, 2003).

Kotila, a Moribadou farming hamlet, is located 2.5 km south of Canga East. About 15 families (some 100 people) live there permanently (Synergy, 2003). This hamlet lies at the edge of the Pic de Fon classified forest. The villagers there make their living growing rice, corn, sweet potatoes, taro, millet, yams, tomatoes, eggplant, peanuts, onions, peppers, fonio, beans, and bananas, and selling the surplus to Moribadou (Synergy, 2003). Kotila suffers a lean period in August. They draw their water from a small stream originating on the Simandou chain; when it dries up, they dig a hole in the stream bed to extract the water that accumulates there.

#### □ **Economic Activities**

There is no economic activity (farming or herding) on the plateau where the Canga East Camp is located, nor in its immediate surroundings. The Canga East Camp employs workers from the Moribadou village, including several women. There is a bus transportation service, in the morning and evening, for the workers who live in Moribadou.

#### □ **Infrastructures and Utilities**

A laterite road, built and maintained by Rio Tinto, connects the Canga East Camp to the village of Beyla and provides access to Pic de Fon. None of the trails used by the communities passes through the camp study area.

The existing camp has a capacity to house about 200 people. In addition to the dwelling units (individual or dormitory), health centre, administration buildings (logistics and geological offices, laboratory), the workshop, cantine and kitchen, the camp includes the following services:

- Potable water supply from a spring located approximately 2.5 km away (Whisky 1, see Figure 3.2);
- Electrical power supplied by a 150 kW generator;
- Toilets with septic tanks and drain fields;
- Telecommunication services;
- Petroleum product storage area with recovery enclosure;
- Heliport;
- Open refuse pit;
- Borrow pit.

The Canga East Camp is under 24-hour surveillance by guards and security cameras.

#### □ **Landscape**

The Canga East Camp is located on the edge of the foothills landscape unit. It was built on a plateau with an average altitude of 950 m with a sloping relief toward the Simandou range. The mountain landscape, oriented north-to-south, comprises the crest of the Simandou range with an average elevation of 1,100 m and overlooks the foothills. The crest is a strong focal point in the regional countryside and offers a panoramic view of the Canga East Camp and its surroundings. The Pic de Fon tops

out at 1,656 m and is itself an important visual landmark in the regional landscape, for both the Beyla and Macenta Prefectures.

There is no line of sight to the Canga East Camp from the village of Moribadou located about 7 km northeast, or from the hamlet of Kotila on the level below the foothills, 2.5 km south of the camp. However, the camp itself (at an elevation of 950 m) has a scenic view of the mountain range and valleys below.

#### **4.4 ASSESSMENT OF RISKS AND ENVIRONMENTAL AND SOCIAL IMPACTS AND PROPOSED MITIGATION MEASURES**

In accordance with the simplified impact study method, this section summarizes the potential risks and impacts associated with the construction of new infrastructure works and their operation, maintenance, and permanent presence in the environment. Table 4.9 provides a detailed description of the risks and anticipated impacts, assessed significance thereof, and associated mitigation/valorization measures and residual impacts that will remain after implementation of the mitigation measures, for each environmental element affected by the project.

The following text summarizes the risks and potential impacts by type of environment affected: physical, biological, and human. The procedure used to assess the impacts of the project is presented in Chapter 3.

##### **4.4.1 Physical Environment**

###### **□ Surface and Groundwater**

Implementation of the prescribed mitigation/valorization measures conforming to IFC *Performance Standard 3 – Pollution Prevention and Abatement* and Rio Tinto's *Operational Guidelines (Hydrocarbon Management, Waste Management, Camp Management, etc.)* will reduce or eliminate the most significant disturbances.

During camp construction, the main anticipated impacts will be the risk of altering the quality of the water through contribution and/or re-suspension of sediment or hydrocarbons in the event of an accidental spill. These risks will be managed by doing the work in the dry season (as much as possible), settling runoff water before discharging it to the river, safely storing hydrocarbons on-site, and refuelling site vehicles at least 50 m away from any rivers or streams. Accidental spill response kits will be available on the site for immediately accident response.

The potential risks to water quality during the Canga East Camp operating period are associated with rupture of the diesel storage tank used to supply the generators and vehicles, or rupture of a chemical tank holding potable water treatment products. Table 4.10 lists the hazardous materials and the maximum amounts of each that will be stored on the site (Material Safety Data Sheets are provided in Appendix G). Using double-walled tanks or installing tanks inside retaining basins capable of holding 110% of the tank volume is recommended to reduce the risk of a spill. Applying Rio Tinto's *Operational Guideline – Hydrocarbon Management* will also reduce the potential risk considerably. Should such an incident occur, the availability of response kits on site and implementation of an emergency response plan, if required, will allow for prompt and effective response in the event of an accident.

Installation of the waste water and waste treatment systems, which will serve both the existing and new camp, will reduce the risk of surface water and groundwater contamination, and will have a positive impact of medium significance. Optimization of this impact will depend upon application of the *Operational Guideline – Waste Management* (for waste produced in the existing camp as well as the new camp); cleanup of the existing waste disposal site; and re-use of the waste water treatment system sludge as fertilizer. Rio Tinto will monitor the quality of the effluent water from the waste water treatment unit to ensure conformity with the surface water discharge limits (see Monitoring Program in subsection 7.5.2).

Despite the great value placed on surface and groundwater (primarily because of their use as a drinking water supply), the negative residual impacts will vary from low to very low because of the proposed measures to reduce the risk of water quality alteration. Installing waste water and waste treatment systems will also have a medium positive impact from an environmental point of view since it will improve the current situation in the existing camp.

#### □ Soils

The presence of construction machinery containing hydrocarbons and the temporary storage facilities needed to expand the Canga East Camp will result in a risk of an accidental spill. The same measures as proposed for surface and groundwater protection will be applied to protect the soil, thus reducing risk to a negligible level.

Camp construction will also involve a risk of eroding stripped grounds, especially during the rainy season. Applying measures to minimize erosion and soil contamination risks, to limit earth-moving activities, recover topsoil, and rehabilitate disturbed areas will reduce the risk to a negligible level.

During the Canga East Camp operating phase, the risks are associated with diesel or chemical storage tank ruptures (see Table 4.10). The same measures as those recommended for surface water and groundwater will limit the likelihood of a risk to the soil occurring, and will allow for rapid response in case of an accident.

The increased Canga East Camp accommodation capacity will result in an increased volume of generated waste. In conformance with IFC *Performance Standard 3 – Pollution Prevention and Abatement*, Rio Tinto will avoid or reduce the production of hazardous and non-hazardous waste as much as possible. Where waste production cannot be avoided, Rio Tinto will recover and re-use this waste wherever possible. Non-recoverable waste will be treated, destroyed, or disposed of in a portable incinerator. If the waste is disposed of by a third party, Rio Tinto will use contractors licensed by competent regulatory agencies in conformance with Rio Tinto's *Operational Guideline – Waste Management*. Application of Rio Tinto's guidelines, combined with cleanup and restoration of the existing dumpsite, will have a positive impact of medium significance on the soil. Similarly, decontamination of the soil in the two sites identified in Figure 4.3, and their management in conformance with relevant recognized international practices will have a positive impact of medium significance.



**Table 4.9**                      **Summary of Risks and Residual Impacts and Mitigation Measures – Canga East Camp**

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**Table 4.10 Fuels and Chemicals Stored at Base Camp**

Material	Use	Maximum Quantity
Diesel	Fuel for generators and vehicles	Three, 50,000 litre tanks
Sodium hypochlorite	Potable water treatment	6,000 litre tank
Potassium permanganate	Potable water treatment	6,000 litre tank
Alum (aluminium sulphate)	Waste water treatment	6,000 litre tank
Polymers	Waste water treatment	6,000 litre tank

#### □ Air Quality

The main sources of atmospheric contaminants in the camp will be the electrical power generators and domestic waste incinerator. The camp's electricity needs will be provided by three generators producing 1,280 kW<sup>5</sup> each. The generators will be diesel-fuelled. Table 4.11 gives an estimate of hourly emissions for continuous operation of the generators. USEPA emission factors (AP 42, 1996) were used for these estimates.

**Table 4.11 Canga East Camp Electrical Power Generator Emissions**

Emission Source Parameter	
Power per unit in kW	1,280
Number of units	3
Contaminant Emission (kg/h/unit)	
NO <sub>x</sub>	18,7
CO	4,28
SO <sub>2</sub> (for fuel with 0.5% sulphur)	3,15
PM	0,54
TOC (Total organic compounds, excluding methane)	1,03
CO <sub>2</sub>	903

The camp generators' impacts on air quality were estimated using the USEPA SCREEN3 model (1995). The model estimates the maximum concentration in ambient air as a function of distance from the source, and scans weather conditions (wind speed and stability) for a given distance from the source to determine the maximum hourly concentration possible at that distance.

The results for one generator were multiplied by three to obtain an estimate for when using all three generators simultaneously. The emission rates used are shown in Table 4.11 and the following generator emission parameters were used as inputs to the model:

- Building: 3 m wide, 6 m deep and 3 m high;
- Stack height: 5 m above ground level;
- Stack diameter: 50 cm;

<sup>5</sup> The existing 150 kW generator will no longer be used.

- Gas temperature: 480°C;
- Gas speed: 23 m/s.

Multipliers recommended by the USEPA (1992) were applied to the SCREEN3 model maximum hourly results to estimate maximum concentrations over longer periods of time (8 hours, 24 hours, 1 year). These factors are 0.7, 0.6 and 0.08, for 8 hours, 24 hours, and 1 year, respectively.

Lastly, the diesel engine NO<sub>x</sub> emissions are composed of 5% to 10% NO<sub>2</sub> and 90% to 95% NO. Only the NO<sub>2</sub> is considered toxic, and its concentration in ambient air is regulated by international environmental protection agencies (World Bank, World Health Organization, see Table 2.3). Depending on the ambient ozone level and atmospheric turbulence, the NO emitted by the diesel engines is gradually transformed into NO<sub>2</sub> in the atmosphere. The NO to NO<sub>2</sub> transformation approach suggested by Janssen (1998) was used to estimate NO-to-NO<sub>2</sub> transformation as a function of distance from the source. The NO<sub>2</sub> / NO<sub>x</sub> ratio is given by  $A(1-e^{-\alpha x})$ , where “x” is the distance from the source in km, and “A” and “α” are constants that depend on and increase with turbulent conditions and ambient ozone levels. The values of 0.81 and 0.25 were selected for “A” and “α”, respectively, correspond to a high ozone level (40-60 ppb) and high turbulence conditions (strong sunlight and high wind speed [5 – 15 m/s]) and were used at all times, although some NO<sub>x</sub> ambient air maximums occur at night and with low winds.


The results of this analysis are shown and compared to World Bank (WB) and World Health Organization (WHO) air quality criteria in Table 4.12. All the results meet WB and WHO standards except for daily SO<sub>2</sub> criterion.

**Table 4.12 Estimated Ambient Air Contaminant Concentrations for Canga East Camp Electrical Power Generators**

Contaminant	Period	Calculated Maximum Concentration (µg/m³)		Air Quality Criteria (µg/m³)	
		100 m from source	500 m from source	World Bank <sup>(1)</sup>	WHO <sup>(2)</sup>
NO <sub>2</sub>	1 hour	159	53	--	200
	24 hours	64	21	150	--
	1 year	13	4,3	--	40
CO	1 hour	487	128	--	30,000
	8 hours	341	90	--	10,000
SO <sub>2</sub> (0.5% S fuel)	1 hour	358	143	--	500 (10 min)
	24 hours	<b>143</b>	<b>38</b>	125	20
	1 year	29	7,6	50	--
PM <sub>10</sub>	24 hours	25	6,5	70	50
	1 year	5	1,3	50	20
PM <sub>2.5</sub>	24 hours	25	6,5	--	25
	1 year	5	1,3	--	10

<sup>(1)</sup> WORLD BANK GROUP, 1998.

<sup>(2)</sup> WHO, 2006.

 Quality criteria exceeded.



The WHO's new daily standard is very recent (October 2006) and very stringent ( $20 \mu\text{g}/\text{m}^3$ ) compared to the previous WHO standard of  $125 \mu\text{g}/\text{m}^3$ . To meet this standard, it seems it would be necessary to reduce the sulphur content of diesel fuel to less than 0.05% compared to the 0.5% that was used in this analysis.

The portable incinerator will be oil-fired. It is designed to provide efficient and complete combustion of the materials to be incinerated. As a result, no impact is anticipated on ambient air quality due to operation of the incinerator. The overall impact associated with installation of new infrastructure in Canga East on ambient air quality will therefore be very low.

The new Canga East Camp facilities will produce a volume of greenhouse gasses (GHG) of minor significance. Note that GHG emission will be monitored as part of the overall Simandou Project by installing air quality monitoring stations.

#### □ Noise Environment

After applying the recommended mitigation measures (Table 4.9), residual impacts on the noise environment are anticipated to be of very low significance, both during construction and operation of the camp. These measures include limiting construction activities to daylight hours (7:00-20:00) and keeping stationary sources of noise (generators and incinerator) away from dwelling units, in order to respect the World Bank's guidelines for ambient noise levels (PPAH, General Environmental Guidelines, 1998).

### 4.4.2 Biological Environment

#### □ Flora

Site preparation and construction of the camp buildings and infrastructure will require clearing of the construction area and the consequent loss of approximately 6.6 ha of grassland savanna (or mountain prairie, depending on the altitude). Generally speaking, a low ecosystem value is assigned to grassland savanna, but because it is located inside the Pic de Fon classified forest, it has been assigned a medium value. Given the small area in question and the proposed reforestation measures, a residual impact of low significance on vegetation is anticipated.

#### □ Fauna

Because grassland savanna has low faunal habitat potential, a low residual terrestrial and avifauna loss (associated with site clearing and the nuisance caused by site engine noise) is anticipated during the construction period. Also, as workers will be prohibited from taking faunal resources, it is anticipated that the camp operation period will entrain a very low impact associated with disturbance of the peace.

#### □ Biodiversity

The International Finance Corporation's *Performance Standard 6 (Biodiversity Conservation and Sustainable Natural Resource Management)* stipulates that a project must not have a measurable negative impact on the essential habitat of high diversity. According to the World Conservation Union (IUCN), essential habitats include:

- Habitats needed for the survival of threatened or endangered species as defined in the IUCN Red List or by national legislation;
- Areas of special importance to endemic species or those with a limited distribution range;
- Sites essential to the survival of migratory species;
- Areas supporting large concentrations or a significant number of specimens;
- Areas having a unique mix of species;
- Biodiversity areas with social, economic, or substantial cultural importance to local communities.

The proposed site for the Canga East Camp expansion does not meet any of these criteria and therefore is not included as an essential high diversity habitat.

Expansion of the Canga East Camp will result in a loss of about 6.6 hectares of modified habitat<sup>6</sup> and the risk of introducing foreign invasive species. The mitigation measures and prescribed compensation to minimize the risks and impacts on biodiversity and pressure on natural resources are:

- Cleaning of construction site machinery before transporting it to the Simandou area to prevent the propagation of non-native invasive species and other undesirable contaminants;
- Keeping the footprint and disturbance to the receiving environment to the minimum area required;
- Reforestation of temporary construction areas and areas disturbed by construction work with indigenous species;
- Prohibiting workers from exploiting natural resources or depending on them for food or other purposes, through an awareness campaign;
- Marking and protecting vegetation within the G-1 inventory parcel identified by RBG Kew (see Figure 4.3) near existing camp, to preserve the orchid species included on the CITES list of threatened species.

Note that no threatened plant species were inventoried on the planned camp expansion site; only one species of orchid, located aside the existing camp (north side of the road) is included on the CITES list of threatened species. Since the work will be done on the south side of the road; workers will be forbidden to exploit forest resources; and the parcel where the orchid species was observed will be marked; no impact is anticipated to threatened species. Nor is any impact anticipated to direct biodiversity users since the resources on the site are not used by local communities.

Facilitating access to sites that used to be difficult to access, in combination with potentially increased pressure on the environment from newcomers attracted to the region by the direct and indirect jobs created by the project, represents an indirect impact on biodiversity. Such pressures may manifest themselves through the construction of dwellings in significant biodiversity areas, increased use of forest resources for construction and means of subsistence, increased hunting, and brush

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<sup>6</sup> Area where obvious modification to the natural habitat has occurred, often with the introduction of foreign animal and plant species, as is the case in agricultural areas.

fires. Implementing the Biodiversity Action Plan outlined in subsection 7.3.3 will result in an overall positive biodiversity balance during construction of the Simandou Project. These actions can be carried out by developing new protected areas or consolidating existing ones; reinforcing local operators' skills with regard to sound management, protection and development of biodiversity; etc.

The modified habitat on the planned camp location has a medium environmental value because of its location in the Pic de Fon Classified Forest. Given the limited scope of the work and application of the proposed mitigation and compensation measures, the residual impact on biodiversity is considered low.

#### **4.4.3 Human Environment**

The assessment of the impacts of the camp expansion on the human environment is based on vulnerable groups, gender, induced migration, human health, safety, land use, employment, economic benefits and the landscape. The (positive) environmental impacts associated with the construction of infrastructure such as the waste water treatment unit and trash disposal site were covered in subsection 4.4.1 concerning the physical environment.

The fact that utilities (water, electricity, waste management, health services, etc.) for the existing and new camps will be integrated greatly contributes to minimizing their impacts on the human environment.

##### **□ Vulnerable Groups**

Although the preparatory works are limited in scope, some vulnerable groups or individuals<sup>7</sup> may be affected by construction and operation of the proposed infrastructure.

Without appropriate assistance measures, these groups or individuals could be socially excluded from the employment process or be affected by the construction and operation of the planned infrastructures. For example, some vulnerable persons may not understand the signs that will be used to secure the work area during construction or may be more vulnerable to noisy activities like blasting (e.g., the mentally handicapped, the blind).

To the extent that any vulnerable (or disadvantaged) groups or individuals might be affected by the preparatory works or that the Project might have a negative discriminatory impact on them, Rio Tinto will provide appropriate assistance so that they can understand the information or benefit from the opportunities that the Project will offer on an equitable basis with the rest of the population. The assistance measures that will mitigate the impact on vulnerable groups and individuals are:

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<sup>7</sup> According to the IFC definition (Performance Standard 1), vulnerable (and disadvantaged) groups and individuals generally include physically or mentally handicapped persons, the poor, illiterate, sick, aged, widows, orphans, persons socially or culturally discriminated against, refugees, or others who, because of their precarious situation, could experience the adverse effects of the project more severely than the rest of the population.

- Identifying vulnerable or disadvantaged groups or individuals as to type and severity of their vulnerability, through community liaison officers, before construction begins;
- Consulting vulnerable groups and individuals to ensure that the objectives, impacts and potential dangers of the Project and the safety measures in place are well understood;
- Provide an opportunity, wherever possible, for vulnerable or disadvantaged groups to enjoy the Project's economic benefits.

Since there are no dwellings within 2.5 km of the base camp, the only element that is liable to have a direct impact on vulnerable groups during base camp construction is truck traffic on local roads transporting the equipment and materials needed to expand the camp. Rio Tinto's community relations agents will ensure that signs announcing the work heavy vehicle traffic will be fully understood by these vulnerable groups.

During the operating period, operation of a camp with approximately 500 people will generate needs for goods and services, especially a demand for food products (fresh produce). It would be appropriate to target certain vulnerable groups and give them an opportunity to become suppliers (e.g., certain agricultural products required to operate the camp).

The socio-economic value associated with vulnerable groups is high. During camp construction and operation, the impact significance will be low, because of the limited extent of the works. Taking the proposed mitigation measures into account, the residual impact on the vulnerable groups is deemed to be negligible.

#### □ **Gender**

The social and traditional practices in the study area are such that women are generally less involved in decision-making and distribution of wealth. Special attention will be paid to women during the preparatory works. The following measures will be taken:

- Ensuring that women are consulted, and adequately and sufficiently informed, as part of the consultation and restitution process associated with implementation of the Project risk impact mitigation;
- Promoting access for women to direct and indirect preparatory works jobs, particularly during the camp operating period;
- Promoting improved conditions for women through social investment initiatives and the development of income-generating activities (see Community Development Plan, subsection 7.3.4).

The socio-economic value associated with gender is considered high. During the construction and operation period, the positive impact is estimated to be medium as the result of implementation of mitigation measures because of the limited scope of the preparatory works.

## □ Induced Migration

Even though the preparatory works are limited in scope, they are liable to have a significant impact on migration in the area since the people may regard these activities as being the start of construction for the Simandou Project as a whole. Public consultations held as part of the present study elicited the fact that the local population is also interpreting the preparatory works construction phase as the awaited signal for the launch of overall Project construction activities. The consequence of the population's perception of this cycle of Project development is that it is now time for them to qualify themselves as job candidates even though the creation of direct preparatory work-related jobs is marginal, and that it will take several years before the overall Project construction activities commence. If the migration induced by the Project is not adequately controlled and managed from now on, the phenomenon is liable to have the following medium and long-term impacts:

- Risk of social tension if workers are hired from outside the region;
- Land access problems generally accompanied by increased conflicts between existing users and new arrivals. Management of such conflicts might possibly result in the weakening of the traditional decision-making structure in favor of increased involvement of the administrative authorities given the complexities of land management. In fact, a potential transformation of traditional methods of agricultural land attribution and transmission is anticipated to the detriment of the introduction of market value and rental value of the land sustained by more fortunate urban buyers. This could have direct consequences on vulnerable segments of the population, more specifically, poor and illiterate families with a very limited knowledge of modern property rights, who will suffer more immediately from the gradual scarcity of farmland and greater competition with regard to farmland attribution;
- Increased pressure on the natural resources and farmlands that currently provide for the food supply and economic security of the local populations risking sustainability. The pressure on agricultural land and resources could also be exacerbated by the establishment of Pic de Fon Classified Forest conservation measures to limit agricultural exploitation of the land, livestock production, and removal of natural resources presently occurring;
- Increased pressure on existing public service infrastructure that could result in precarious situations (potable water, health, unhealthful villages and hamlets, schools, etc.);
- Accentuation of the social and cultural transformations within some communities through the arrival of expatriates and foreigners with higher education levels or skills and different values, as well as a progressive transition from a subsistence economy to a market economy.

The purchasing of land by wealthier urban migrants and potential associated investments could also contribute to energizing local employment and development, particularly in terms of agriculture and the economy, which represents a positive potential impact. However, without appropriate supportive measures, the local populations would only be able to enjoy a few of the medium and long-term benefits since they would lose control and rights of use of the land, and this would directly affect the viability of their means of subsistence.

The Project – in cooperation with local and regional authorities – must henceforth provide controls over the arrival of workers from outside the region and the influx of migrants in search of employment and settling around the camp and in the neighbouring communities. At present, the pressures on natural resources and the existing rate of use of farmland by the communities are not considered problematic. In this context, the territory would be able to absorb a certain number of migrants whose arrival could not be controlled. The following measures are recommended to minimize potential induced migration:

- Monitor demographic statistics in the Simandou area to plan interventions based on the environment's support capacity;
- Local populations will need to be informed, on a regular basis, through a structured and cooperative approach with local and regional authorities, of the Project's development, execution schedule, number and type of jobs needed for the Project and the times and places of hiring;
- Overall Project advertising campaigns with regard to employment will need to specify that no jobs will be assigned without registering at the Project office;
- Applying Rio Tinto's commitment to local communities to give priority to local hiring (to those with equal skills) to minimize immigration pressure;
- Train local communities so the people qualify for employment.

At the present time in the study area, it is estimated that 186 persons have been identified as seeking employment in Moribadou and 64 are considered non-local. For Traoréla, there are 68 seeking employment, 10 of whom are from outside the village. Note that these two villages are the closest ones to the Canga East and Ouléba camps respectively.

Availability of farmland, natural resources, and public utility services have high values for the local communities. However, given the small amount of migration that will be directly induced by the preparatory works and application of the Labour Management and New Arrivals Plans, which will significantly reduce the induced migration potential and its associated adverse effects, the significance of this residual impact is deemed to be low.

#### □ **Health**

The health risks in both the camp construction and operating periods are primarily associated with an increase in communicable diseases such as the STIs and HIV/AIDS resulting from the temporary or permanent influx of labour for the Project. In addition to these diseases, malaria, waterborne illnesses and respiratory illnesses are liable to impact the workers' health and productivity and manpower availability. There are also related risks of exposing local communities to contagious diseases or disease vectors. In the study area, HIV/AIDS and malaria are endemic diseases to which special attention must be paid.

The arrival of new workers in the region could contribute to propagation of HIV/AIDS in workers and neighbouring populations. The significance of the impact of HIV/AIDS will depend on factors such as workers' origins, health, status and length of stay; area migration flow management; control of contact between workers and other inhabitants; health services provided; and the level of awareness of workers and other affected communities.

In conformity with the IFCs *Performance Standard 4 – Health, Safety and Security*, Rio Tinto will implement its HIV/AIDS Strategy. The following measures should be established at the Canga East Camp in order to reduce the transmission of HIV/AIDS:

- Use a closed management system for the workers' camp;
- Implement restrictions for coming and going at the construction camp gates with possible limitation of movements during certain times of day;
- Provide all required services (food, leisure) at the campsite to prevent workers from having to leave the camp and associate with the local population;
- Implement an awareness program for workers and affected communities about the health risks associated with the presence of workers and newcomers. To ensure that this information is well understood, training will be given in a culturally appropriate form (posters, films, etc.) to facilitate assimilation of the basic principles;
- Encourage infected workers to get treatment.

During public consultation, the women expressed concern for the health of their daughters with regards to the presence of labourers and the operational workforce. However, implementation of Rio Tinto's HIV/AIDS strategy will reduce the potential safety risk.

Malaria is endemic in Guinea. Expatriates and employees from outside the region are more likely to be infected by malaria because they do not have the same levels of resistance as the local population. The following measures will be implemented to prevent increased incidence of malaria in the region, in conformance with the preventive measures recommended by Rio Tinto's *Operational Guideline - Malaria*:

- Set up a malaria control program before the start of construction (preventive medication and insecticide, medical treatment for infected workers);
- Distribute mosquito netting soaked in insecticide to workers;
- Install windows with screens in workers' quarters;
- Train health care workers on malaria prevention (personal protection);
- Prevent any build-up of stagnant water during infrastructure construction and operation that could promote the growth of malaria (anopheles).

The health plan developed by Rio Tinto will be applied to ensure the well-being of workers and local communities (see subsection 7.3.8 of the Environmental and Social Management Program).

The socio-economic value of human health is high. The residual impact significance during construction is considered low because of its short duration. The residual impact significance for the operating period is evaluated to be medium in consideration of its long duration and the proposed mitigation measures.

## □ Safety

During the camp construction period, risks to worker and community safety are associated with the increase in traffic through neighbouring villages and the danger of hydrocarbon fires (diesel and oils) from machinery or temporary machinery storage facilities.

Since the total capacity of the existing camp will be increased to 500 persons, increased traffic through villages on the road to the camp is also anticipated during the operating period. The presence of diesel and potable water treatment chemical storage tanks (see Table 4.10), combined with the transport and handling of these products on the site, is liable to constitute a risk to workers and the community. The potential risks are from spills, explosions, or fires involving these products. Sodium hypochlorite in solution gives off irritating vapours, thus posing a respiratory intoxication hazard. Even though diesel fuel is flammable, it poses little risk of explosion in a non-confined environment due to its low volatility at ambient temperature, but a vapour explosion could occur in the tank, e.g., during tank maintenance.

These risks to the safety of workers and the neighbouring communities will be minimized in terms of probability of occurrence and severity through implementation of the following measures:

- Double-walled tanks will be installed to reduce leaks;
- Tanks will be installed by qualified and competent professionals who will guarantee the safety of the equipment;
- Safety devices will be put in place around the equipment; e.g., security fences, alarms, fire break areas, extinguishers, appropriate 'danger' signs, etc.;
- Access to the camp and storage facilities will be controlled (security guards);
- Personal protection equipment will be worn by employees (gloves, goggles, helmets, masks, etc.);
- Vehicle speed limits will be posted in villages;
- Response kits will be available in the camp and on transport vehicles;
- Rio Tinto's health and safety policy and *Operational Guidelines – Physical Security and Hydrocarbon Management* will be applied;
- The emergency response plan developed for the Simandou Project will be applied in the event of an incident/accident to ensure a prompt and effective response;
- Personnel will receive continuing education in safety measures.

Overall, the socio-economic value associated with safety is considered high. During construction and operation, the significance of the impact is estimated to be medium. Application of the mitigation measures will reduce safety risks to a low level.

## □ Land Use

The site selected for Canga East Camp expansion (surface of approximately 6,6 ha) of is located in a grassland savanna. No agricultural or pastoral activities are



currently taking place at this site. Located on a lateritic plate, the site has a very limited agricultural potential.

Since the camp construction and operation activities will be confined to the camp compound; that timber will be recovered by the local population; that camp workers will be forbidden to use natural resources, the significance of the residual impact is deemed to be negligible, both during construction and throughout the operating period.

The potential effect of induced migration of land use and tenure was addressed in the preceding section (Induced Migration).

#### □ **Cultural Heritage**

No impact is anticipated on cultural heritage since there are no resources of cultural, historical, religious, archaeological significance on the proposed Canga East Camp expansion site or adjacent areas.

#### □ **Employment**

As part of the preparatory works, Rio Tinto will implement the Labour Management Plan developed for the Simandou Project (see subsection 7.3.7); the Plan supports IFC *Performance Standard 2 – Labor and Working Conditions*. The Plan is intended to:

- Establish, maintain, and improve relations between Rio Tinto and workers;
- Promote equitable, fair, and non-discriminatory treatment of workers;
- Protect workers and individual rights;
- Encourage economic growth in the Simandou region by creating local jobs;
- Promote compliance with the Republic of Guinea's *Labour Code*.

Rio Tinto made a commitment to local communities to promote local employment, and has defined clear employment goals and recruitment rules in order to keep this commitment. Simandou Project manpower needs, for equally-skilled non-specialized labour, will be filled in the following order of priority to promote job creation among the populations directly impacted by the preparatory works:

- Persons from villages affected by the Project, including nationals living in those villages;
- Persons from prefectures affected by the Project, including nationals living in those prefectures;
- Persons from Guinea.

To ensure that the communities affected by the preparatory works enjoy as many of the benefits as possible, Rio Tinto intends to offer training so that the people in those communities can qualify for the available jobs.

Given the high value the population places on job creation and working conditions, the suggested enhancement measures will result in a medium (positive) residual impact during construction and operation of the preparatory works.

## □ Economic Benefits

The Simandou Project preparatory works will generate economic benefits for Beyla Prefecture. It is expected that the regional community surrounding the Project will be the first to benefit from these economic benefits. However, the relative absence of goods and services companies and a qualified labour pool means that the direct economic benefits will be relatively small compared to the size of the investments. It became evident, as a result of consultation with local populations for this study, that a major concern shared by all the communities in the study area, was that the Project should provide real economic development opportunities at the regional and local levels, and for all population strata.

At the same time, Rio Tinto explicitly acknowledged that it had a role to play in the economic development of the Simandou region. This recognition is embodied in the principles of its corporate policy with regard to communities, and its *Operational Guideline – Social Investment*.

A regional and local economic benefit management program is therefore recommended to optimize these benefits. To do so, the following measures are proposed:

- Establishing a program, in cooperation with the communities, to distribute information with respect to Project needs to local economic players and agencies involved in manpower training;
- Introducing a regional content criteria promoting discrimination in the selection of contractors and suppliers, and the use of local labour.

Applying these measures would help local entrepreneurs obtain subcontracts and would promote hiring of local labour to a greater extent than would be the case without special provisions.

It is also recommended that the Project proponent make a commitment to promoting regional and local economic benefits by developing measures adapted to each Project component.

Measures to maximize the regional and local economic benefits from the preparatory works include the following:

- Helping create local companies to supply services and products;
- Training local labour from all strata of society, including women and youth (during the public consultations, the people expressed a desire to have training programs be provided to enable them to qualify for the jobs that will be created);
- Awarding clearing and grubbing contracts to local contractors and village groups;
- Dividing contracts into smaller contracts, and awarding small supply or service contracts to local suppliers;
- Inserting contract clauses that oblige contractors to use local labour and shops;
- Directly recruiting a portion of the site personnel from the communities in which the work is being carried out;

- Having a construction schedule that takes the production capacities of the host region into account.

Considering the high value the local population placed on the Project's economic benefits, and that preparatory works are only one component, the suggested enhancement measures would result in a high (positive) residual impact during construction and a very high impact during operation, in conformance with the expectations of the local communities that support the Project.

The Project will also contribute to reducing poverty through its impact on regional development. Poverty is characterized chiefly by inadequate income and lack of access to health and education services and to vital products and goods. Job creation is central to reducing poverty. The Project strategy of promoting local employment will have a lasting positive impact on poverty. Employment will contribute to improved living conditions by increasing family income for some residents.

#### □ **Landscape**

Because the new proposed Canga East infrastructure will be harmonized into the existing facilities in terms of shape, colour and materials, a very low visual landscape alteration impact is anticipated. Note that the camp location is not visible from the villages and hamlets surrounding the camp.



## CHAPTER 5

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### Airstrip



## **5. AIRSTRIP**

### **5.1 COMPONENT DESCRIPTION**

#### **5.1.1 Justification**

The Beyla region has no air transport infrastructure. Getting to the Simandou Project region from Conakry involves a 24-hour trip over 986 km of roads and trails that are sometimes in very poor condition. The closest airfield to Canga East is located in N'Zérékoré, 141 km and four hours away. To facilitate transport of the personnel and material that will be assigned to the pre-feasibility study, Rio Tinto is proposing to build an airstrip in the Simandou region.

The selected airstrip site is located approximately 40 km northeast of the Canga East Camp, near the town of Beyla (see Figure 3.1). The local, regional and national authorities have confirmed that the site is available for this purpose.

It should be noted that this site was also the location of the colonial-era airstrip, inaugurated in 1962. In the early 1980s, the site was again developed in approximately the same place as the colonial airstrip, but on a slightly different axis. Political circumstances caused the project to be abandoned.

#### **5.1.2 Technical Description of the Airstrip**

The airstrip will be composed of laterite (with the option of sealing this in the future), including the airstrip and the airplane manoeuvring and parking areas, as well as the service area. All of these components will be enclosed by a fence (see Figure 5.1 and Appendix J), and will cover an area of approximately 50 ha. The airstrip is designed to accommodate small two-turbo-prop DASH-8/200 (or equivalent) aircraft. The service area will accommodate 50 people including their luggage.

The dimensions of the airstrip will be 1,600 m long by 30 m wide (see Figure 5.1), with a shoulder and a drainage ditch on either side. The total width of the airstrip including the shoulders and ditches will be 90 m. The airstrip will not be paved; the base and surface materials will consist of crushed laterite or lateritic gravel (with the possibility of sealing the airstrip in the future).

The main specifications for the airstrip are the following:

- The airstrip will have 2C technical specifications based on the classification of the International Civil Aviation Organization (ICAO);
- At the end of the airstrip, 60 m safety areas will be added. The clearing on the side of the watercourse will be extended;
- Drainage ditches will be dug along the shoulders to drain the surface run-off;
- Runway edge strips (3 m + 1 m) will be identified with white paint;
- The landing direction indicator (square) will have the following dimensions: 12 m on each side with a band width of 2 m.

There are no aircraft refuelling facilities planned for the site, however, a diesel tank has been planned for fuelling a generator. The airstrip buildings will only be open during the day, and the airstrip will not be equipped for instrument flights.

Airstrip construction will require rerouting of a 2 km section of National Route N-1. The new section of the road to be built will have a total width of 18.5 meters: two 3.75 m-wide lanes, two 1.25 m shoulders, and 4 m-wide runoff drainage ditches.

### 5.1.3 Airstrip Buildings and Services

The following airstrip buildings and services will be provided:

- Parking area (900 m<sup>2</sup>);
- Two wind socks;
- Emergency lighting for night-time medical emergencies;
- Signalization will conform with ICAO standards;
- A fence will be built around the entire airstrip to deter children and livestock from entering the area;
- Waste management: waste will be collected on a weekly basis and sent to the Canga East Camp site;
- Ground-level communication: ground-level communication will consist solely of a satellite phone.

### 5.1.4 Analysis of Alternatives

Due to the undulating topography of the territory, the Beyla Prefecture is an unlikely site for a 1,600 m long airstrip. After analysis, two sites were considered. One, located on national road N-1 between Piyaro and Kéoulendou *west* of Beyla and the other site *south* of Beyla, more specifically, the junction of road N-1 and the road leading to Moribadou (Figure 3.1). After investigation, the second site, *south* of Beyla, was rejected because its topography would not permit installation of the airstrip. As a result, the only viable option is the site *west* of Beyla.

### 5.1.5 Construction Phase

The construction phase shall consist of the following:

- Grubbing and clearing of the airstrip zone (mostly grass and shrubs);
- Topsoil stripping: the thin layer of topsoil will be stripped from the area reserved for compaction and will be recovered for future use;
- Excavation, backfilling and compacting: solid and stable local material will serve as the airstrip load-bearing layer. Excavation and backfilling will be kept to a strict minimum. The base and surface materials will be composed of crushed laterite or lateritic gravel. Because excavated material will be used as backfill for the site, there will be no need to use a borrow pit. An area of about 3 ha will be used for storing construction debris (see Figure 5.1). Within this area, debris will be placed in two separate piles: one for topsoil, and the other for non-reusable excavated material.

No blasting will be necessary during construction of the airstrip.



**Figure 5.1**                      **Planned Installations at the Airstrip**

A3



### 5.1.6 Construction Schedule

The preliminary airstrip construction schedule is as follows:

- March 2007 – Airstrip construction begins
- September 2007 – Commissioning of facilities

## 5.2 DESCRIPTION OF THE ENVIRONMENT

### 5.2.1 Study Area

The selected airstrip study area is located in the N'Zérékoré administrative region of the Beyla-Centre Sub-prefecture, in Beyla Prefecture (see Figure 3.1). The surface of the area is approximately 5.2 km by 5.7 km, a total of approximately 3,000 ha (see Figure 5.2).

### 5.2.2 Physical Environment

#### □ Climate

The Guinean Forest climate is subequatorial and characterized by a long rainy season (mid-March to late October). Annual rainfall varies from 1,750 to 2,500 mm, depending on altitude (1,500 to 2,000 mm in the foothills of the eastern side of Pic de Fon, and 1,750 to 2,500 mm on the western slope). The mean annual temperature is 24°C. The lowest yearly temperatures occur during the months of December through February (18 to 20°C) and the highest temperatures in March (22 to 26°C). Humidity is generally high year-round, averaging 80% (IRAG, 2006). The dominant winds are the monsoon from the west in the rainy season, and the Harmattan from the northeast in the dry season. These winds explain the microclimatic differences between the eastern and western slopes of Simandou range (Hatch, 1998a).

According to the data recorded at the Beyla weather station, located approximately 7 km east of the airstrip, the average annual temperature from 2000 to 2002 was 25.2°C (Table 5.1). During this same period, minimum and maximum temperatures varied from 17.6 to 31.7°C. The minimum and maximum annual rainfall recorded from 1980 to 2005 varied from 607 to 3,160 mm, with an annual average of 1,710 mm. Maximum rainfall occurred during the month of August (average of 307 mm); the driest month was January. The average annual wind speed measured from 2002 to 2005 was 0.9 m/s, and the average maximum was 1.2 m/s.

Since 2002, Rio Tinto has been recording temperature, rainfall and wind data at the Mafindou station located 14 km southwest of the airstrip. Average monthly temperatures are fairly constant, varying in 2002 to 2005 from 21.5 to 24.7°C, with an annual average of 22.7°C (Table 5.2). The minimum average temperature was recorded in January (about 12°C) and the maximum in February and March (34.6°C). From 2002 to 2005, the average annual rainfall at Mafindou was 1,530 mm, less than at Beyla. According to the 2004 and 2005 data, the dominant winds blew southeast from October through January, and south-southeast the rest of the year. The average annual wind speed was approximately 1 m/s, and the maximum monthly speed of 14.4 m/s was recorded in March.

**Table 5.1 Climatological Data at the Beyla Meteorological Station**

Parameter	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
<b>Temperature (°C)</b>													
Average (2000-2002)	-	-	25.4	25.3	25.1	25.5	25.4	25.7	25.7	25.3	25.0	24.0	<b>25.2</b>
Maximum (2000-2002)	-	-	32.9	31.8	32.2	32.0	31.8	31.7	31.4	31.5	31.0	30.6	<b>31.7</b>
Minimum (2000-2005)	13.2	13.8	15.2	18.8	18.5	18.9	19.1	19.5	19.7	19.1	18.1	17.4	<b>17.6</b>
<b>Rainfall (mm) 1980 – 2005</b>													
Average	-	28.4	91.0	138.9	167.1	217.0	253.5	306.9	280.4	161.2	38.8	26.5	<b>1,709.7</b>
Maximum	-	73.4	219.3	183.8	383.4	418.8	383.5	427.7	425.8	390.1	110.9	143.0	<b>3,159.7</b>
Minimum	-	0.1	8.2	30.6	72.4	68.5	121.2	139.0	145.6	20.6	0.6	0.0	<b>606.8</b>
<b>Wind Speed 2002-2005 (m/s)</b>													
Average	1.3	1.1	0.9	0.7	1.0	0.5	0.8	0.7	0.8	0.9	1.1	0.8	<b>0.9</b>
Maximum	1.9	1.7	1.4	0.9	1.5	0.8	1.1	1.0	1.0	1.1	1.5	0.8	<b>1.2</b>

N.B.: Some missing data has been estimated.

Source: Data provided by Rio Tinto, 2006.

A gauge installed at Canga East (approximately 24 km southwest of the airstrip) has been recording rainfall since 2002. Although data for some years is incomplete, a comparison of rainfall data (2002 to 2005) from the three stations located in the Simandou region lowlands (those most representative of the selected airstrip site) indicates that the rainfall is greater in Beyla than in Canga East and Mafindou (Table 5.3). On average, annual rainfall is 1,910 mm in Beyla, 1,760 mm in Canga East, and approximately 1,450 mm in Mafindou.

**Table 5.2 Climatological Data at Mafindou Meteorological Station (2002 to 2005)**

Parameter	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
<b>Temperature (°C)</b>													
Average	22.6	24.7	24.4	23.6	23.4	22.0	21.6	21.5	21.6	22.1	22.4	22.4	<b>22.7</b>
Maximum	33.2	34.6	34.6	32.4	31.4	30.2	29.4	29.4	30.1	30.7	31.2	32.0	<b>31.6</b>
Minimum	12.3	15.7	16.0	17.7		16.9	16.6	16.5	16.7	16.3	14.2	13.6	<b>15.8</b>
<b>Rainfall (mm)</b>													
Average	20.6	42.5	126.4	107.8	72.3	131.3	160.2	244.5	337.8	161.2	81.0	44.1	<b>1,529.7</b>
Maximum	40.5	60.7	251.8	220.5	118.1	218.1	275.6	351.4	396.9	265.6	104.3	123.9	<b>2,427.4</b>
Minimum	1.6	19.3	27.3	29.3	0.0	18.4	79.7	198.1	276.2	87.6	57.7	0.6	<b>795.8</b>
<b>Wind Speed 2004-2005 (m/s)</b>													
Average	1.1	1.2	1.2	1.0	1.1	1.0	1.1	1.1	0.9	1.0	0.9	0.8	<b>1.0</b>
Maximum	11.7	9.3	14.4	11.3	12.6	11.4	11.8	8.3	10.3	13.0	12.5	9.2	<b>11.3</b>
Average direction (degrees)	125.3	145.2	154.2	164.6	161.4	170.0	182.4	183.6	159.6	123.0	119.8	131.0	<b>151.7</b>

N.B.: Some missing data has been estimated.

Source: Data provided by Rio Tinto, 2006.

**Figure 5.2                      Land Use in the Airstrip Study Area**



**Table 5.3 Average Annual Rainfall (mm) in the Simandou area (2002 to 2005)**

Station	Mafindou	Canga East	Beyla
	Rio Tinto Station	Rio Tinto Gauge	Gov't. Station
<b>2002</b>	1,514	2,051	<b>1,827</b>
<b>2003</b>	<b>1,301</b>	-	1,608
<b>2004</b>	1,502	1,470	<b>1,906</b>
<b>2005</b>	<b>1,595</b>	<b>1,680</b>	<b>2,318</b>
<b>Average</b>	<b>1,449</b>	<b>1,761</b>	<b>1,914</b>

 Incomplete year.

#### □ Air Quality

Because the airstrip is surrounded by a rural environment, the main sources of atmospheric contaminant emissions are brush fires lit by farmers, dust raised by the wind during the dry season and vehicular traffic on National Road N-1, and the burning of wood for domestic cooking. There are no significant stationary emission sources in the villages near the future airstrip. Only in Beyla (approximately 7 km from the airstrip) are there electric generators, but they are not currently used due to problems with fuel supply. There is no data available to quantify these emissions, nor are there any ambient air contaminant concentration measurements.

Air quality in the study area is generally good, although airborne particulate levels can be more significant at certain times during the dry season, mainly during the weeks when agricultural slash and burn activities occur.

#### □ Noise Environment

From September 14th-16th 2006, noise level readings were taken to characterize the initial noise environment in the villages and hamlets around the planned airstrip (Piyaro, Kéoulendou, Morisangarédou and Beyla) and in the airstrip location itself (see Appendix B for methodology). Noise measurement locations are shown in Figure 3.2.

The continuous equivalent noise level ( $L_{Aeq,T}$ ), which represents the average noise level, varies from 38 to 44 dBA during the day and from 42 to 49 dBA at night. The background noise level that is exceeded 95% of the time ( $L_{AF95,T}$ ) varies from 29 to 39 dBA during the day and 39 to 45 dBA at night (see Table 5.4 and Glossary in Appendix B). Ambient noise profiles for each of the locations (taken in five-second intervals over a 24-hour period) are shown in Figures 5.3 through 5.7.

The main sources of noise recorded are insects and birds chirping, rainfall and wind, as well as human activities, such as children's voices and prayers over loudspeakers from the mosque. Background noise ( $L_{AF95}$ ) and average noise levels ( $L_{Aeq}$ ) are generally higher at night than in the daytime because of the continuous chirping of insects.

**Table 5.4 Initial Noise Levels Measured in the Villages and Hamlets Near the Future Airstrip During a Calm Period with No Rainfall**

Measurement Points	Distance from Airstrip (km)	Start Date & Time (hh:mm)	Duration (hh)	Day		Night	
				L <sub>Aeq, 1h</sub> (dBA)	L <sub>A95, 1h</sub> (dBA)	L <sub>Aeq, 1h</sub> (dBA)	L <sub>A95, 1h</sub> (dBA)
Airstrip	0	Sept. 14, 2006 12:13 pm	2.5	38	30	N/A	N/A
Piyaro	3.0	Sept. 15, 2006 12:00 pm	25	44	39	49	45
Kéoulendou	2.5	Sept. 15, 2006 2:00 pm	24	40	31	49	43
Morisangarédou	2.0	Sept. 16, 2006 3:00 pm	23	40	29	47	44
Beyla	7.0	Sept. 16, 2006 4:00 pm	24	42	33	42	39

N/A: Not Available.

#### □ Physical Geography and Nature of Soils

The selected future airstrip study area is located on a plateau with an average altitude of 670 m, interspersed with lowlands with an average elevation of 650 m (Figure 5.2). The area is part of a lowland reaching from Nionsomoridou (to the west), to just beyond Beyla to the east and Mamounougou to the south. The lowland gives way to hilly relief in the southwest, then to the Simandou range foothills.

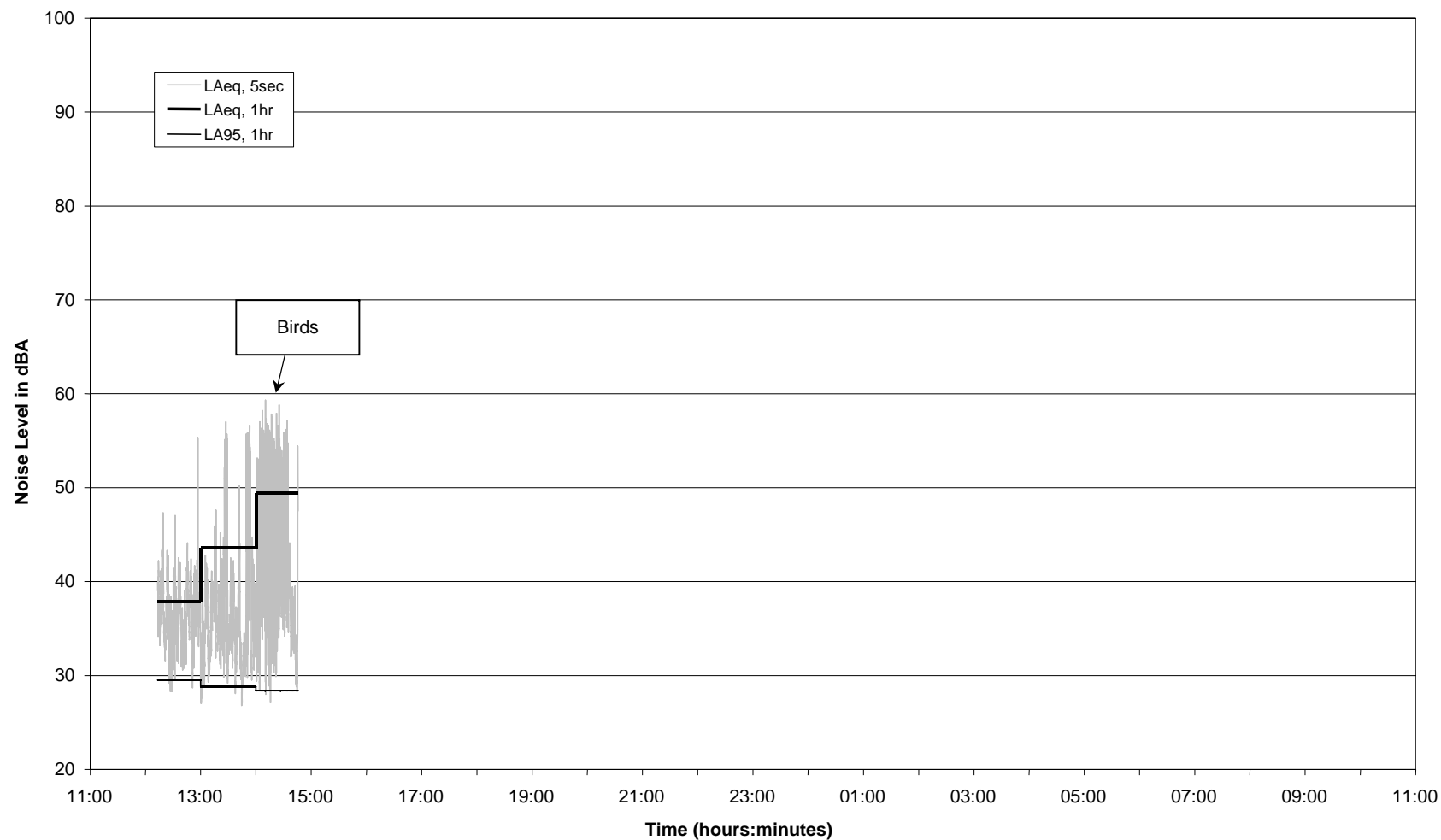
The substrate consists of a conglomerate of ferrallitic soil cemented by lateritic material. The lateritic hardpan is gravelly in places. Substrates of this type provide good base material for airstrip construction and have low erosion potential. The topsoil is a few centimetres thick to nonexistent in several places on the plateau. Brown forest soils belonging to the lithosols are found in the lowlands (IRAG, 2006).

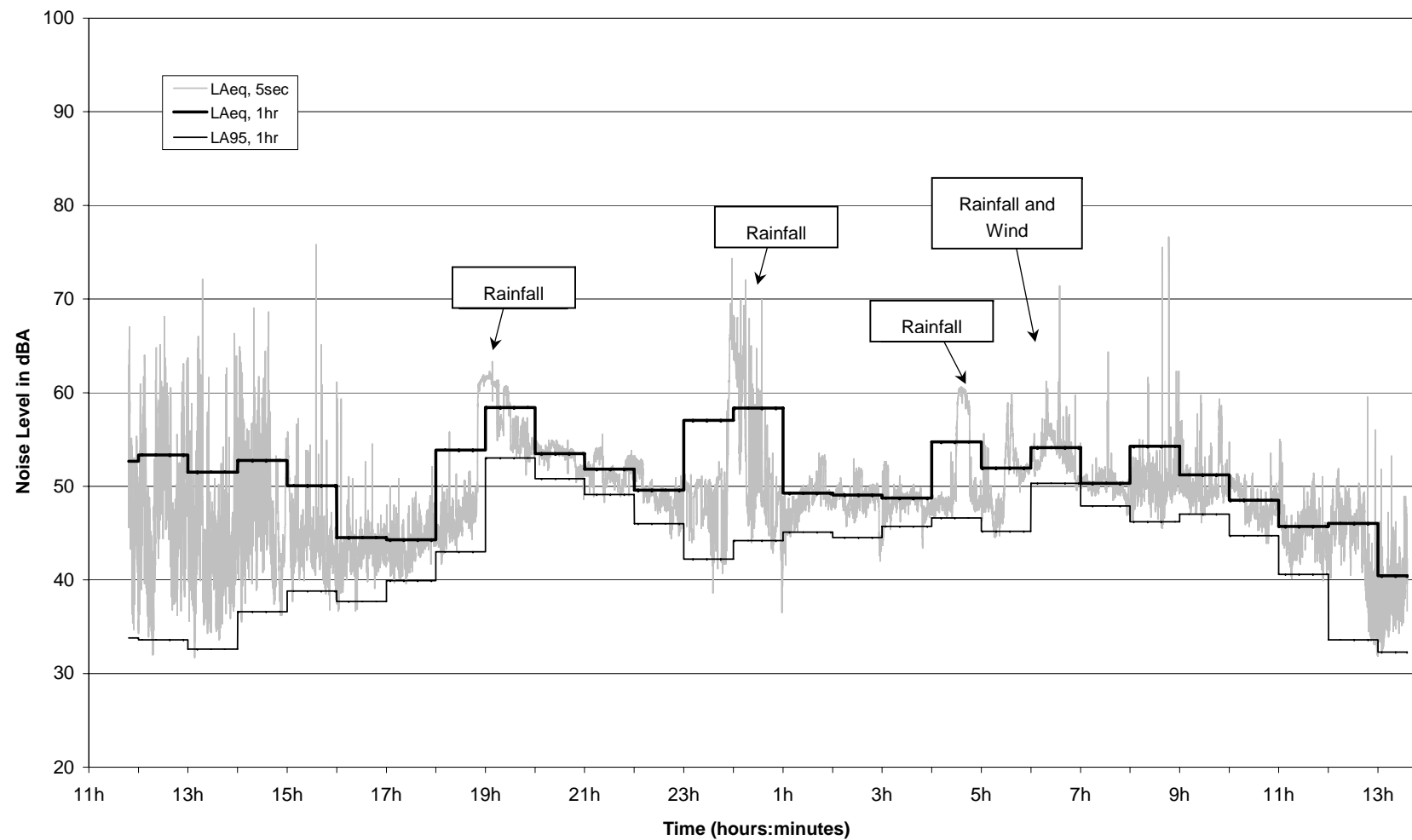
#### □ Hydrology and Hydrogeology

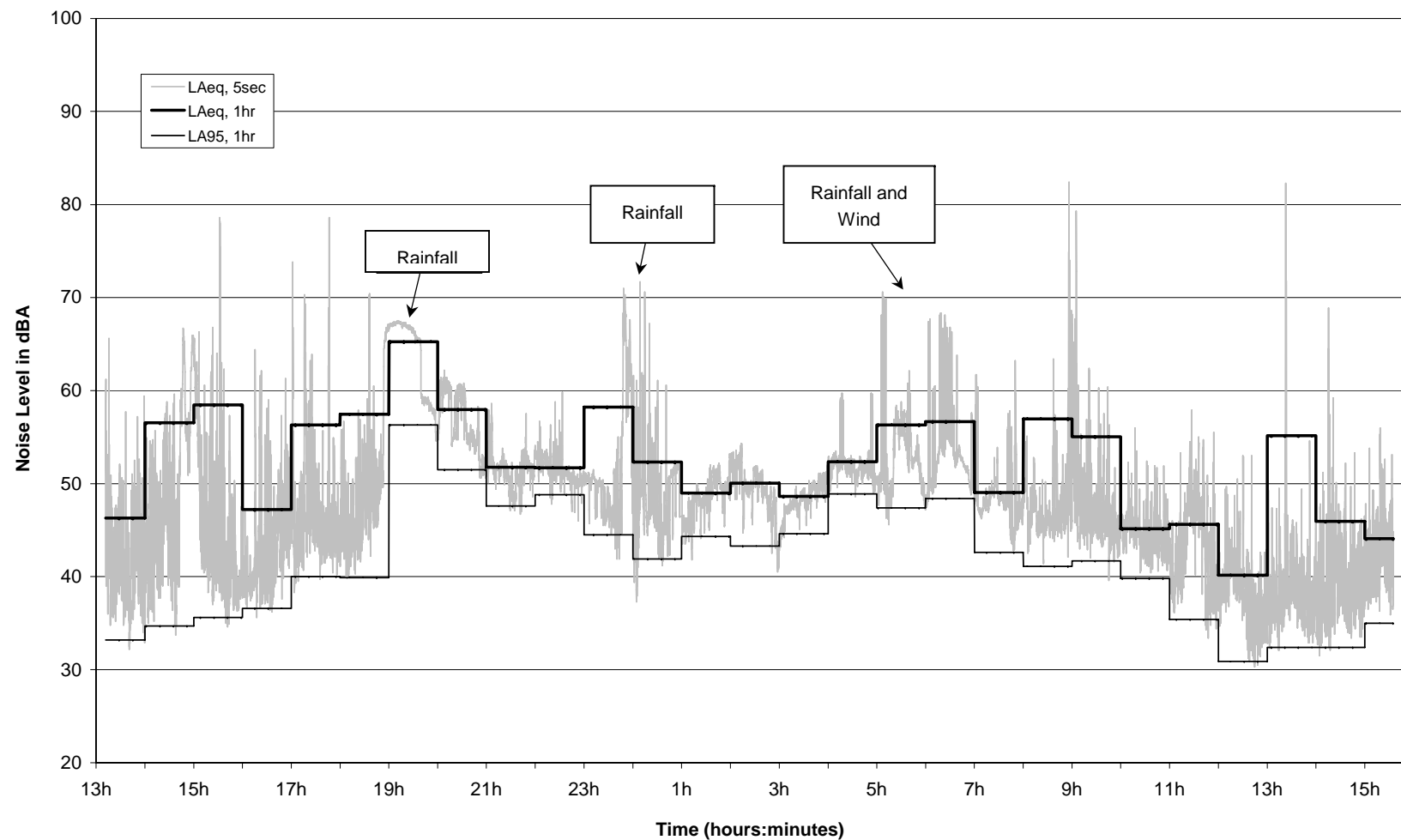
The study area lies in the Dion River watershed. The main body of water in the area, the Ciamco River, traverses the territory in a north-south direction (see photo in Appendix D); its main tributary flows northwest. The planned airstrip lies on the plateau between these two bodies of water (Figure 5.2).

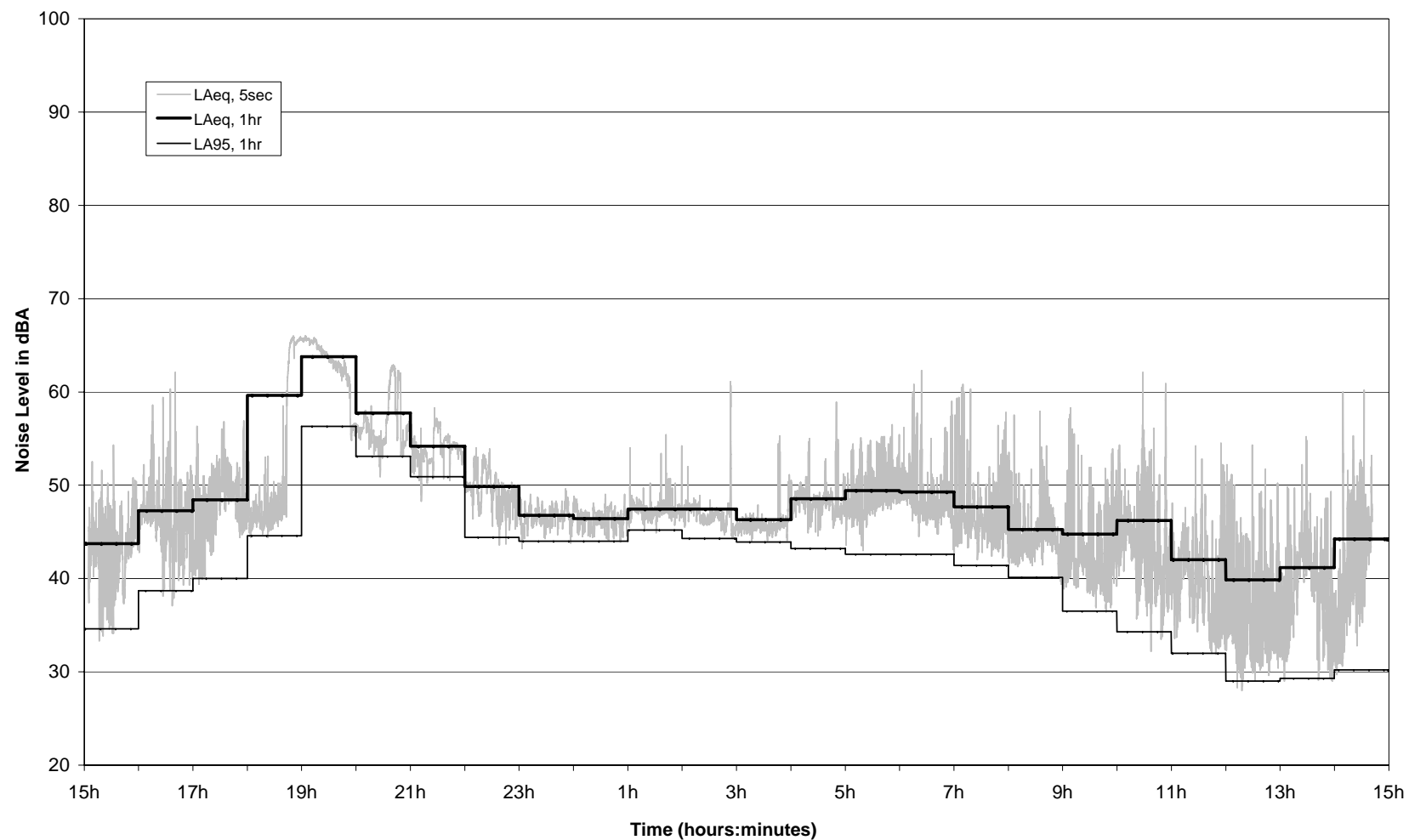
Rainwater, after a heavy rainfall, tends to stagnate because of low runoff infiltration through the lateritic hardpan and the low slopes. There is no water quality or flow rate data for the Ciamco River and its tributaries.

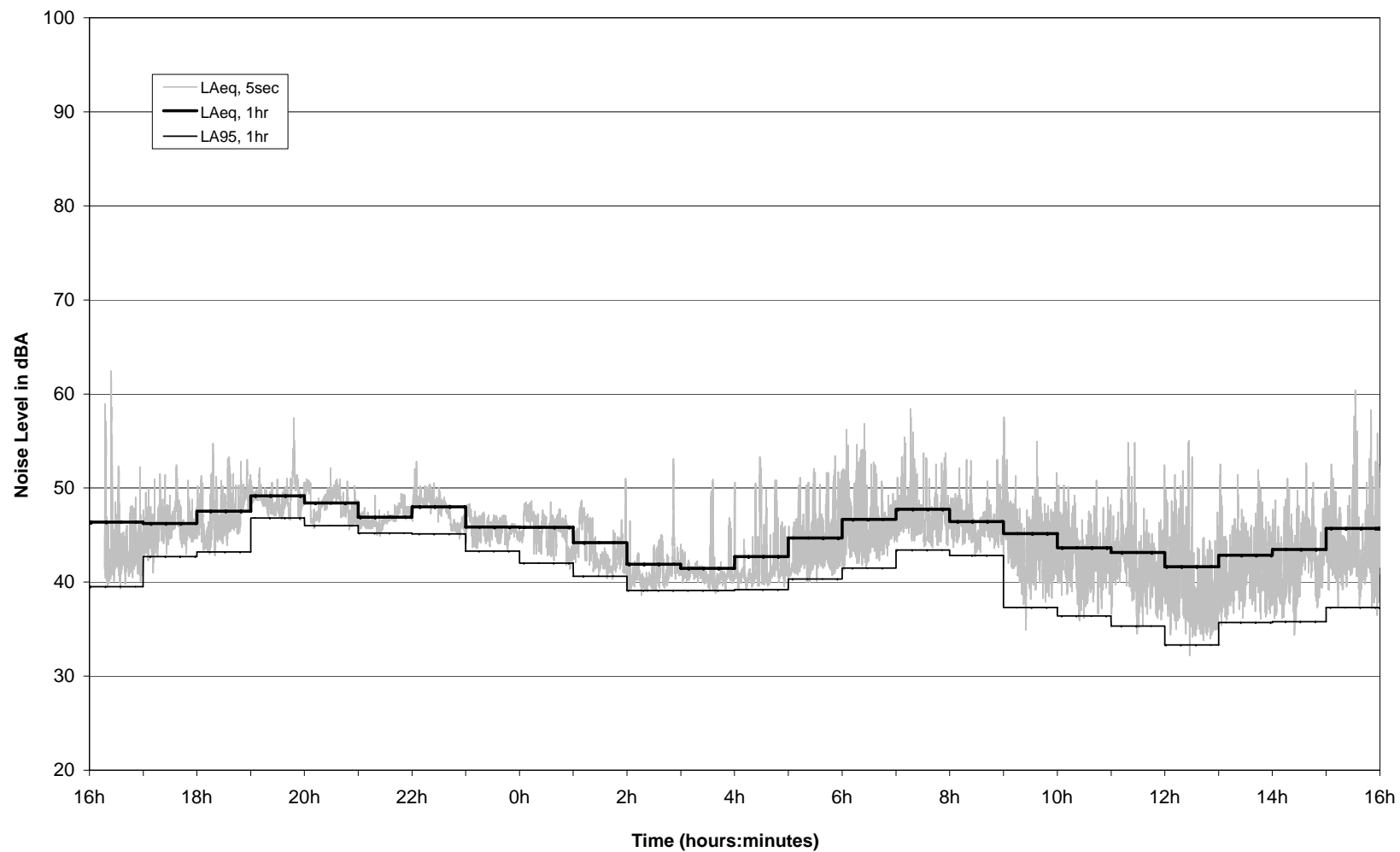


**Figure 5.3 Noise Level as a Function of Time, Airstrip – September 14, 2006**

**Figure 5.4** Noise Level as a Function of Time, Piyaro – September 15-16, 2006

**Figure 5.5 Noise Level as a Function of Time, Kéoulendou – September 15-16, 2006**

**Figure 5.6** Noise Level as a Function of Time, Morisangarédou – September 16-17, 2006

**Figure 5.7** Noise Level as a Function of Time, Beyla – September 16-17, 2006

### 5.2.3 Biological Environment

#### □ Vegetation

Figure 5.2 is a map of the airstrip study area showing the plant groups. Most of the territory is occupied by grassland savanna typical of lateritic hardpan. The savanna contains some scattered bushes that withstand the annual slash and burn activities. The lowlands are used for farming mainly irrigated rice crops, while the slopes are sown with manioc, corn and other crops. Thin strips of gallery forest have been preserved in some areas. Some tree and bush savanna disturbed by human activity remain around the villages and hamlets and on the western side of the Ciamco River.

An inventory of the vegetative cover was conducted on the future airstrip site in August 2006. Eight 20 m by 20 m parcels were inventoried, including 3 parcels on the airstrip, a parcel from where the access road will be re-routed, and four parcels from the surrounding areas of the re-routed access road and airstrip (refer to Figure 5.1). Detailed results of the vegetative inventory are provided in Appendix E.

The airstrip will be constructed on a plateau occupied by a grassland savanna with scattered bushes; the woodland stratum is nonexistent in that area. Note that the area was already cleared and stripped during construction of the old airstrips. Herbaceous vegetation has grown higher on the areas with piles of loose backfill than it has on the adjacent lands that were stripped.

The bushy stratum covers from 20 to 50% of the parcel area, and it is comprised of 18 species, including *Nauclea latifolia*, *Terminalia glaucescens*, *Entada africana*, *Annona senegalensis*, *Hymenocardia acida*, *Vitex doniana* and *Albizzia zygia* (Appendix E). The herbaceous stratum covers 40 to 70% of the parcels and is mainly composed of species of the Poaceae family including Wan, Tî kissè, and Baagbè (in Koniaké). The species in the impact area parcels are similar to those in the control areas. Between 5 and 10% of the parcel areas consist of bare ground (lateritic hardpan with no vegetation).

Although some of the plant species in the plateau inventory include those used by local populations (mainly for medicinal purposes), their use is unlikely because of the distance from the villages and the fact that those species are also found closer to the villages, in similar habitats.

Of the species inventoried on the plateau, only *Vitex doniana* is included among the endangered species in the Guinean *Monographie Nationale*<sup>1</sup>.

#### □ Fauna

The grassland savannas are low-potential fauna habitats because of their high degree of exposure and low diversity. In addition, human activity from the village farming areas of Piyaro, Morisangarédou and Kéoulendou contribute to reducing

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<sup>1</sup> The *Monographie Nationale de la Diversité Biologique* is a national study produced by committees of experts used to prepare the Convention sur la diversité biologique that was signed by the Republic of Guinea at the 1992 Earth Summit in Rio de Janeiro, Brazil. It is the second African signatory country and the sixteenth of all the parties to the Convention. Republic of Guinea, Centre d'échange d'informations de la Guinée. Monographie nationale de la diversité biologique.  
(<http://bch-cbd.naturalsciences.be/guinee/implementation/documents/monogra1/chap522.htm#plantes>)

faunal use of the area. The only traces of fauna use observed in the future airstrip area are ground-hog droppings (*Thryonomys swinderianus*) in the lowlands on the north-western side of the airstrip, near the farmlands. Aulacodes are also known to cause extensive crop damage.

## **5.2.4 Human Environment**

### **5.2.4.1 General Framework Common to all Preparatory Works Components**

The socio-economic context common to all three preparatory works study areas is covered in subsection 4.3.4.1 (Camp) and is not repeated in this section: only those human environment elements specific to the airstrip study area are described here.

### **5.2.4.2 Framework Specific to the Airstrip**

#### **□ Administrative Organization and Socio-Economic Profile**

The airstrip study area is located in the Prefecture of Beyla within the territory of the rural town of Beyla. Beyla is divided into districts, including that of Morisangarédou where the villages of Kéoulendou and Piyaro are found, and between which lies the new airstrip plateau. The study area covers part of the village farmlands of Kéoulendou to the east, Piyaro to the west, and Morisangarédou to the south (Figure 3.1). The area occupied by the planned airstrip is located in the village farmland of Kéoulendou which, in 1996, had a population of approximately 400 (Synergy, 2003).

Apart from the three villages listed above, located, respectively, 2.5, 3.0 and 2.0 km from the future airstrip, the area includes one farming hut – located about 400 m east of the runway and 100 m from the new road (see photo in Appendix D) – and three small farming hamlets situated northwest of the latter, at a distance varying from 520 to 640 m (Figure 5.1).

#### **□ Economic Activities**

The economy of the villages of Kéoulendou, Piyaro and Morisangarédou is primarily based on agriculture and herding. All the lowlands located on either side of the Ciamco River tributaries are used for submerged rice farming (Figure 5.2). Mainly manioc, fonio, corn and many other starchy vegetables are cultivated on the hillsides. Some small plantations interspersed with indigenous trees are also scattered around the study area. The airstrip itself is located in grassland savanna that is likely used for grazing. Note that this territory is subject to annual slash and burn (between December and February) and the latter contributes to limited tree and shrub growth.

Only the village of Kéoulendou will have land directly affected by the construction of the aerodrome. This village was founded in 1900 at the time of the construction of Route N-1 by the Konianké families (Jay and Giovannetti, 2006). The village has 6 large families and the current population is estimated at 600 people.

Because it is relatively far from Simandou, there are no migrants in this village. All the families are landowners and farmers. The village has one school and a small health centre (Jay and Giovannetti, 2006).

## ❑ Infrastructure and Public Services

The selected airstrip site has been zoned for aviation activity for over 50 years. The proposed airstrip is actually on the site of the colonial area airstrip that was inaugurated in 1962 under the administration of Emile Condé (the first governor of Beyla) but never used. Remnants of the unfinished building are still visible (see photo in Appendix D). In the early 1980s, some preparation work was done in the same place as the colonial airstrip which had been cleared and stripped, but along a slightly different axis. Political circumstances led the project to be abandoned.

The airstrip study area is on the national road N-1 between Nionsomoridou and Beyla. The territory is criss-crossed by a highly developed network of trails used by villagers to access their farmland, the national road and the main villages. The future airstrip is also traversed by the national road and three trails.

The city of Beyla has a government-run hospital, and the villages of Kéoulendou, Piyaro and Morisangarédou, as well as the urban and rural population in the region, use it for serious cases. The Beyla Hospital is about 7 km from the airstrip.

## ❑ Cultural Heritage

The selected airstrip site has no archaeological potential and does not affect any sacred sites. The remnants of the old colonial airstrip building may be of some historical interest, and will not be affected by the planned works.

## ❑ Landscape

The airstrip area is characterized by two landscape units separated by the Ciamco River. The east side of the river, where the airstrip will be constructed, is mainly grassland savanna (Figure 5.2). The landscape has open fields of vision because of its relatively flat relief and absence of obstacles such as tree cover. From Kéoulendou, the road offers a view of the plateau that will be occupied by the airstrip (see photo in Appendix D).

The landscape on the west side of the river is a mosaic of grassland, tree and bush savannas interspersed with farmland. The presence of woodland patches limits the line of sight to the future airstrip, although the relief is also a bit higher than on the east side of the river. Only the inhabitants of the hamlet of Morisangarédou are likely to be able to see the airstrip infrastructure.

Note that remnants of the old colonial airstrip building, installed on a knoll north of Route N-1, is a landmark in the plateau landscape.

## 5.3 ASSESSMENT OF RISKS AND ENVIRONMENTAL AND SOCIAL IMPACTS AND PROPOSED MITIGATION MEASURES

The following text summarizes the risks and residual impacts associated with the construction, operation, maintenance, and permanent presence in the environment of the airstrip and its facilities. For each environmental element affected by the project, Table 5.5 describes the risks or anticipated impacts, an assessment of the significance of the risks or impacts, associated mitigation/improvement measures, and the residual impacts that will remain after implementation of the mitigation/improvement measures.



**Table 5.5**                      **Summary of Risks and Residual Impacts and Mitigation Measures – Airstrip**

(6 pages, type A3)

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### 5.3.1 Physical Environment

The physical site characteristic of the airstrip insertion environment has low sensitivity. The planned infrastructure and construction have no impact on any river; the lateritic soil has good bearing capacity and low erosion potential; air quality is good, and there is a low noise level due to the absence of any industrial activity. Application of the mitigation measures prescribed in Table 5.5, in combination with Rio Tinto's adoption of best practices and industry standards will reduce the impacts on the physical environment to a level varying from negligible to low.

#### □ Surface and Groundwater

Construction of the airstrip and Route N-1 risk deteriorating water quality by the introduction of suspended particulates during the earthworks, or of hydrocarbons in the case of an accidental spill. A change of surface drainage conditions is also to be expected. The implementation of proposed mitigation measures, such as the execution of work in the dry season, the interception of surface run-off water before being directed to a watercourse, the refuelling of vehicles at a minimum distance of 50 m from watercourses, and secure storage of hydrocarbons on the construction site will make it possible to reduce the risks to a low level. Should an accidental spill occur, spill kits will be available at all times on site for immediate intervention. Considering the application of these measures, the residual risk level during construction is deemed very low.

During the aerodrome's operation, the anticipated risks to water quality are related to possible contamination from discharge of domestic wastewater from sanitary facilities and an accidental spill from the diesel tank used to supply the generators. Having wastewater managed by the treatment system in Canga East (transported by trucks) and the installation of equipment for hydrocarbon recovery (in case of spill) will make it possible to reduce the risks to a low level.

#### □ Soil

Despite the fact that the airstrip will be built on a lateritic crust that is fairly resistant to erosion, erosive risk for the stripped soil are anticipated during the earthworks, especially in the rainy season. In order to reduce this risk, it is preferable to perform this work during the dry season. Should that be impossible, the surface run-off water will be intercepted and decanted before being released in the watercourse. Conserving removed topsoil for restoring the disturbed areas at the end of construction activities is recommended.

The presence of machinery and temporary storage facilities for the hydrocarbons on the site will also present a risk of soil contamination in case of an accidental spill. The application of Rio Tinto's *Operational Guideline – Hydrocarbon Management* intended to ensure the safe handling and storage of hydrocarbons on the site will enable risk management. Should an accidental spill occur, spill kits available on-site will be used for immediate intervention. Implementation of these measures will ensure that the risks are considered insignificant during construction.

Risks during aerodrome operation are associated with possible soil contamination by wastewater and waste or by an accidental diesel spill from the tank that will be used to supply the generating unit. Since the wastewater and waste produced on the site will be transported and processed by the treatment systems at the Canga East

Camp, this risk will be lowered. In order to proper management of the hydrocarbons on-site, double-walled tanks or tanks with retention basins are recommended. The risk of soil contamination during operations is therefore deemed very low considering the integration of these precautions into the project.

#### □ Air Quality

The impact associated with raising of dust during earthworks for airstrip and road construction will be very low or even negligible if water is used as a dust blanket.

The anticipated effects during airstrip operation are that dust will be raised during take-off and landing of aircraft, and produced by the transportation of passengers between the airstrip and Canga East Camp. Regarding the airstrip, it is recommended to select the grain-size distribution of the material covering the airstrip in order to reduce dust emissions. Since the villages surrounding the aerodrome are located more than 2 km away, this procedure should be sufficient for eliminating the direct impacts on those villages. Vehicles transporting passengers to the Canga East Camp will cause dust emissions in the villages traversed. The speed limit for vehicles will be 40 km/hour in these villages. It is suggested to ensure a follow-up program on potential nuisance related to dust with villagers. If needed, the possibility of constructing a bypass road will be analyzed as part of the overall Simandou project.

During the airstrip's operating phase, the only stationary sources of contaminants will be the two 50-kW generators, only one of which will be in service at a time; the second will be on standby. These generators will be fuelled by No. 2 diesel fuel. Table 5.6 shows an estimate of the hourly emission rates for continuous operation of this equipment. The emission factors (at 80% rated capacity) are taken from U.S. EPA documentation (AP 42, 1996). Given the low power of the apparatus, the airstrip generator atmospheric emissions will be on the order of those from a diesel truck. As a result, the impact on ambient air quality will be very low.

**Table 5.6 Airstrip Electrical Power Generator Emissions**

Emission Source Parameter	
Power per unit (in kW, at 80% rated capacity)	50
Number of units	2
Contaminant Emission (kg/h/unit)	
NO <sub>x</sub>	0,94
CO	0,20
SO <sub>2</sub> (for fuel with a 0.5% sulphur content)	0,12
SP	0,07
TOC (Total Organic Compounds, excluding methane)	0,08
CO <sub>2</sub>	35

#### □ Noise Environment

Considering the distance between the nearest villages and the airstrip (approximately 2 km), the increase in noise levels during construction will be very low. In addition, it is recommended to limit construction to daylight hours (from 7:00 am to 8:00 pm) to reduce disturbance.



Anticipated noise levels during airstrip operation were calculated using the method in the International Civil Aviation Organization (ICAO) Circular 205-AN/1/25. The method calculates sound alleviation in a given receiver during aircraft takeoffs and landings; alleviation is then added to the noise level of the aircraft to obtain the effective noise level of an event (takeoff or landing) at the receiving point. Effective Perceived Noise Level (EPNL) is expressed in EPNdB which represents the subjective impact of aircraft noise on individuals, taking instantaneous noise level and event duration into account.

The anticipated effect of adding a new source to the noise environment was assessed using the initial noise level measured and the anticipated source considered. The dose-effect relationship given in ISO 1996-1 (OACI, 1996) was used. It defines the percentage of the population greatly bothered by the noise as a function of the daily assessment level ( $L_{Rdn}$  in dBA). The latter is obtained by applying correction factors to the initial and anticipated noise levels to take noise type and characteristics, time of day, and environmental characteristics into account. A night-time correction of +10 dBA is used from 10:00 pm to 7:00 am, since noise is more bothersome during that time period.

The magnitude of the change between the initial noise level and the anticipated ambient noise level was determined by the extent of change in the percentage of the population greatly bothered (relative approach) and by the target noise levels (absolute approach), using the methodology shown in Appendix B. Anticipated ambient noise level equals initial total noise level plus anticipated noise level. Extent and duration were then considered using the methodology shown in Section 3.5 to determine the significance of the anticipated impact.

The noise level emitted by a Dash-8 is shown in Table 5.7. It conforms to the limits in Chapter 3 of the Convention on International Civil Aviation (OACI, 2005).

The anticipated noise level associated with once-a-day Dash-8 aircraft takeoff and landing was calculated for the inhabited areas around the future airstrip (Table 5.8).

Because of the distance between the three villages and the airstrip, the anticipated ambient noise level taking the sound of a DASH-8 at the airstrip into account will not be any higher than the current background levels in those villages.

The intensity of the anticipated noise impact will be low, of long duration, and local in extent. The significance of the change in ambient noise level caused by the takeoff and landing of one Dash-8 aircraft per day will therefore be low in the villages and hamlets around the airstrip. The impact will be more a result of the airplane flying over the villages and hamlets than its take-offs and landings at the airstrip, which will be unnoticeable by them (Table 5.8).

**Table 5.7 Noise Produced by a DASH-8 Type Aircraft**

DASH-8	Lateral at Full Power	Approach	Flyover
Noise Level (EPNdB)	86	97	81
Limit Level (ICAO, 2005) (EPNdB)	94	98	89

**Table 5.8 Anticipated Airstrip Noise Levels**

Village/Hamlet	Initial Noise Level $L_{Rdn}^{(1)}$ (dBA)	Anticipated Airstrip Noise Level $L_{Rdn}$ (dBA)	Anticipated Ambient Noise Level <sup>(2)</sup> $L_{Rdn}$ (dBA)	Noise Impact Intensity
Piyaro	55.0	28.5	55.0	Low
Morisangarédou	52.9	18.3	52.9	Low
Kéoulendou	54.8	23.2	54.8	Low
Beyla	48.4	8.7	48.4	Low

Notes: (1) Daily assessment level was obtained by applying the correction factors to take noise type and characteristics, time of day (+ 10 dBA from 10:00 pm to 7:00 am), and environmental characteristics into account.

(2) Sum of initial and anticipated noise levels as perceived in villages and hamlets.

### 5.3.2 Biological Environment

#### □ Vegetation

During construction, clearing the vegetation for the future airstrip and associated infrastructure will result in the loss of approximately 53 ha of grassland savanna; the clearing related to the relocation of the N-1 access road will result in a loss of approximately 3 ha. In addition to that loss, there is the fire hazard caused by the presence of machinery and temporary hydrocarbon storage facilities. The projected footprints of the required work areas will be marked with stakes and ribbons in order to limit land clearing to the minimum required areas. Fire-fighting equipment (extinguishers, etc.) will also be available on-site for rapid intervention.

The grassland savanna is assigned low ecosystem and socio-economic value because it is located outside the limits of the Pic de Fon forest, and is infrequently used by the local population to gather medicinal species. Although the impact on plant cover will be of long duration, it will be low because of its low magnitude and local extent.

During aerodrome operation, there is a risk of fire for surrounding vegetation associated with the risk of a plane crash or diesel handling. Since a firewall zone inside the fenced-in area and around the tanks will be maintained and fire-fighting equipment will be available, the risk is considered negligible.

#### □ Fauna

The negative effects on fauna, during both construction and operation, are mainly linked to the disruption of the area's tranquility caused by noise from work and aircraft traffic. Given the low faunal use in the area (currently crossed by the national road), a low impact on the wildlife is anticipated. Concerning the risk of collision with animals during airstrip operation, a fence will be installed around the airstrip to eliminate the risk.

#### □ Biodiversity

The site planned for the construction of the aerodrome is not an essential habitat with high biodiversity potential according to IUCN categorization criteria. The construction

will however result in the destruction of approximately 56 ha of modified habitat. In fact, it is a grassland savanna of low ecosystemic and socio-economic value that is crossed by a national road and is subject to annual brush fires.

Some specimens of an endangered plant species (*Vitex doniana*) have been observed in shrub-form at the site of the airstrip. This species, used for food, medicine and tinctures, appears on the list of endangered species of the Monographie Nationale of Guinea. Since it involves a species observed in abundance throughout Guinea, occupying several areas, and the specimens concerned are doomed to be destroyed every year by brush fires, the impact is low.

The work is also likely to involve the risk of introducing invasive foreign species. In order to avoid the spread of such species and other undesirable contaminants, the machinery on site must be cleaned before being transported to the work zone.

In order to protect a small wooded zone of ecological interest (located southwest of the airstrip (Figure 5.2)), it is recommended that the total footprint required for the planned work be marked with stakes and ribbons in order to limit the clearing of land in the required areas. It is a very humid talweg with a wide range of forest and plant species (banana and avocado trees).

The application of the prescribed mitigation measures will make it possible to reduce the residual impact on the biodiversity to a level considered very low.

### 5.3.3 Human Environment

Construction and operation of the airstrip and its associated infrastructure and re-routing of a section of Route N-1 will primarily affect vulnerable groups, women, induced migration, health and safety, land use, utility infrastructures, employment and economic spin-offs and landscape. The impacts on certain components of the human environment such as women, induced migration, employment and economic spin-offs will essentially be similar in nature to those described in the chapter discussing the Canga East Camp (see section 4.4.3).

#### □ Vulnerable Groups

The impacts on vulnerable groups and individuals associated with the airstrip will be the same as those described in section 4.4.3 (Canga East Camp).

Given that the airstrip and the section of Route N-1 to be relocated crosses paths used by the farmers to reach their fields, special attention will be given to the safety of the vulnerable persons during the construction work. During aerodrome operation, it is recommended that community liaison officers follow-up with vulnerable persons in the villages surrounding the airstrip and assist individuals who may suffer from stress from low-flying aircraft, as needed.

The socio-economic value associated with vulnerable groups is considered high. During construction and operation, the impact is considered low. Given the mitigation measures proposed, the residual impact is deemed negligible.

## □ Gender

The general set of problems associated with women within the context of the preparatory works was presented in section 4.4.3.

In the construction period, the factors likely to directly affect women are related to safety issues (see “Safety”, below). The construction work will mainly require site preparation, for which an unspecialized workforce will be required. Rio Tinto has agreed to favour access by women to certain tasks and activities adapted to them.

The socio-economic value associated to women is high. During the construction and operation periods, the (positive) impact is considered medium and the residual impact (positive) is also considered medium.

## □ Induced Migration

Public consultation conducted during development of the compensation plan revealed that there were currently no migrants at Kéoulendou.

The impacts of induced migration and the mitigation measures identified in section 4.4.3 are also applicable to the airstrip. As for the camp, it is necessary to establish a management plan in order to control the potential influx of migrants seeking employment opportunities. The residual impact of induced migration during the preparatory works is considered low, given the implementation of the proposed mitigation measures.

## □ Human Health

Human health risks during airstrip construction and road relocation are mainly linked to a potential increase in contagious illnesses (see section 4.4.3 of the Canga East Camp), which requires the implementation of a health awareness program for workers and implementation of Rio Tinto's strategy for HIV/AIDS. Accordingly, the residual risk on health in the construction period is considered low.

During aerodrome operation, the main anticipated impacts involve the risk of increased stress levels in the communities caused by low-flying aircrafts over the villages and hamlets, as well as disturbances from dust emissions, noise and lighting (in case of medical emergencies at night).

It is recommended that during the construction of the airstrip, the surface material be selected in order to minimize dust emissions (based on grain size distribution) during aircraft landing and take-off. In order to reduce the disturbance to neighbouring populations, it is also suggested that the use of the airstrip be limited to the daytime, from 7:00 to 20:00 and the emergency lighting be aimed at the airstrip and the ground. As for dust emission during the passenger transport between the Canga East Camp and the aerodrome, the 40 km/h speed limit for vehicles in the villages will enable reducing the disturbance.

In order to better manage the risk of stress or disturbances associated with the aerodrome's operation, it is recommended that Community Liaison Officers monitor the impacts in the villages near to the airstrip, especially the villages of Morisangarédou, Kéoulendou and Piyaro. Special attention will be given to more vulnerable persons (see “vulnerable groups”). Should monitoring indicate that the

use of the airstrip constitutes a dust nuisance, a dust control substance will be spread over the airstrip and the possibility of covering the airstrip will be evaluated as part of the overall Simandou project.

Given the application of these measures, the impact on the health of coastal populations will be low during both the construction and operation.

#### □ **Safety**

The safety risks during construction are related to the local population and their herds crossing the construction site to reach their fields. The construction site will have to be fenced and new paths marked and cleared in order to enable the local residents to travel with their livestock. The relocation of the section of Route N-1 is also likely to involve risks for the road users. Maintenance of this section until the new section is opened, in addition to the installation of road signs, will make it possible to reduce the risks for users. Given the integration of these measures in the project, the residual impact during construction is considered low.

During construction, the presence of machinery or temporary storage facilities for hydrocarbons will be a fire hazard that may present a risk for the safety of the workers and communities. Given that the hydrocarbons will be stored and handled safely (in accordance with Rio Tinto's *Operational Guideline – Hydrocarbon Management*) and that fire-fighting equipment (extinguishers, etc.) will be available on the site, this risk is considered low.

The construction and operation of the aerodrome will result in an increase in traffic through the villages (passenger and service vehicles). The airstrip will be built to accommodate the small turboprop aircraft with a 40 to 50-person capacity. Flights will take place at a frequency of approximately once per week, with a maximum of once per day. The transportation of passengers between the Canga East Camp and the aerodrome will be accompanied by an increased risk of accidents. To reduce these risks, the project will implement a speed limit of 40 km/h for vehicles traveling through the villages and safety training for drivers.

Based on the low frequency of flights (maximum of one per day), it is estimated that a maximum of forty people will arrive at the aerodrome each day. The passengers will go to the Canga East Camp using the existing road that crosses several villages. A estimated maximum of ten vehicles (likely in a group), will travel through these villages, once per day (round trip). Considering the low frequency of travel over a short period of time, at this stage of the project, it does not seem justified to recommend the construction of a more direct access road between the aerodrome and the Canga East Camp. Furthermore, the construction of a new road would have a potentially significant effect on the current land use of the area.

During the operation of the aerodrome, monitoring of possible risks and complaints will be carried out in the villages traversed by the vehicles transporting the passengers who use the aerodrome. Based on the results of the follow-up, the possibility of building a bypass road around the villages will be studied as part of the overall Simandou project.

There is also a risk of accidents should people or animals trespass the airstrip during take-off or landing procedures, as well as the risk of theft and vandalism at the

aerodrome facilities. These risks will be managed by a security fence surrounding the entire airstrip and its facilities and a security guard.

The facilities will not be equipped to refuel aircrafts, however, a diesel tank will be in place in order to supply the generating unit. For that reason, there is a risk of spill or fire with the diesel tank or during transportation to the aerodrome. In order to reduce these risks, a firewall zone will be maintained inside the fenced-in area and around the tanks, and fire-fighting equipment will be available on the site. It should be noted that the emergency procedures plan developed for the Simandou project will also cover the accidents that may occur at the aerodrome.

Finally, one of the risks to be considered is an airplane crash or accident. The risks of an aircraft crash are generally higher in the landing and take-off zones. For small aircraft such as those authorized for that airstrip, the zone corresponds to a circle of approximately 4 km around the center of the airstrip. The closest villages to the aerodrome, such as Kéoulendou, Piyaro and Morisangarédou, are located in this zone. However, the low frequency of flights will ensure that this risk will be very low for the residents of these villages.

All risks analyzed for aerodrome operation are considered moderate after implementation of the mitigation measures.

#### □ **Land Use**

The construction of the airstrip (including shoulders, drainage ditches, service area, and fencing-in of the area) as well as the relocation of a section of Route N-1, will result in the loss of approximately 56 ha of grassland savanna. Located on Kéoulendou village territory, the savanna is likely to be used for its natural resources (e.g., grazing or gathering medicinal plants or other vegetation).

More specifically, the total footprint required for the aerodrome and the right-of-way for the section of Route N-1 to be relocated were optimized during the field visit made in December 2006 as part of the preparation of the compensation plan, in order to spare the avocado plants located on the southwest side of the airstrip and a field used for growing rice located north of the airstrip.

The compensation plan developed for the Simandou project (see compensation framework, section 7.3.2) provides community compensation for the loss of natural resources. This compensation will be in kind or in the form of materials or goods that can be used by the community.

The value allocated to natural resources is high in terms of its use by local populations. Given the surplus of grazing areas in the region for herds and the community compensation that will be granted to Kéoulendou, the residual impact is considered low.

#### □ **Public Utility Infrastructures**

Relocation of National Route N-1 will cause a temporary disturbance of traffic on the road during construction. It is recommended that traffic be maintained on the National Route, and that adequate traffic control signals be provided during construction.

Some of the trails are currently used by farmers and their animals. These trails will be relocated before airstrip construction begins, to preserve the farmers' access to their fields.

In addition, the airstrip will be used to serve the needs of the community for travelling long distances and could also be used for the evacuation of patients in case of emergency.

The transportation of passengers between the aerodrome and the Canga East Camp will result in an increased volume of traffic in the villages. It is recommended that a follow-up of the traffic volume in the villages crossed by the road be carried out and if necessary, the possibility of building a bypass road around the village be analyzed as part of the overall Simandou project.

Taking these mitigation measures into account, the significance of the residual impact is estimated to be very low.

#### ❑ **Cultural Heritage**

No impact on cultural heritage is anticipated, as there are no resources of cultural, historical, religious, archaeological or other value on the site planned for the airstrip and bypass road. It should be noted that the remains of the old colonial runway building will not be affected by the construction work.

#### ❑ **Employment**

The construction of the airstrip and bypass road will have a positive effect on job creation, which is greatly valued by the local population. As specified in section 4.4.3 (Canga East Camp), Rio Tinto agrees to offer a safe work environment and implement a labour management, training and work plan.

Due to the great value ascribed by the population to employment and labour conditions, the mitigation measures suggested will result in a moderate (positive) residual impact during both construction and operation.

#### ❑ **Economic Benefits**

Investments for the airstrip, associated infrastructure, and national road relocation total approximately US \$1.5 million. These investments will contribute to job creation and produce economic benefits, provided the recommendations in subsection 4.4.3 are followed in order to maximize regional and local economic benefits.

Economic growth seems to be an essential condition to reducing poverty. The presence of new transportation infrastructure – an airstrip in the region of Beyla – will have some impact, although it is difficult to quantify, on economic development potential and opportunities for the region. This new infrastructure will facilitate the movement of persons and exchange of goods with the rest of the country in an area that is currently only accessible via the road network. In this context, the residual impact is deemed to be of medium significance.

## □ Landscape

The airstrip location is only slightly visible from the villages and hamlets located in the vicinity; only Kéoulendou has a line of sight to the plateau where the airstrip will be built. Given the height of the herbaceous plants (up to 2 m in height) and the low slope of the area, only the buildings are likely to be visible. The buildings are small, and will only contribute to minor alteration of the visual landscape. The harmonization of the infrastructures into the landscape will allow further reduction of the visual impact of the proposed works. Blending the infrastructure into the landscape will make the visual impact very low.



## CHAPTER 6

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### Access Road



## **6. ACCESS ROAD**

### **6.1 ACCESS ROAD JUSTIFICATION**

Currently, the only way to access the drilling sites on Mount Ouéléba from Canga East is via a dirt trail between Moribadou and Nionsomoridou, up to National Route N-1. From there, the trail forks and branches off in a southwest direction towards Traoréla, then along the crest of the mountain chain (see Figure 3.1). The poor condition of the trail between Moribadou and Nionsomoridou means that it takes around two hours to reach the summit, which is located less than 10 km from the Canga East Camp.

To facilitate additional exploratory drilling, Rio Tinto has proposed the construction of a more direct access road between the Canga East Camp and the drilling sites on Mount Ouéléba. The access road will be used to transport the workers and heavy equipment needed for the drilling campaign. The new access road would facilitate movement of the workforce, transportation of equipment and materials, and shipment of the samples collected for laboratory analysis.

### **6.2 ANALYSIS OF ALTERNATE ROUTES**

Four alternatives were considered to provide vehicular access routes to the Ouéléba drilling sites (see Figure 6.1). There are truly only two alternatives, each with two different starting points from the Pic de Fon access road. The Canga East-1 and –2 options start from the camp area, and the Moribadou-1 and –2 options from the Moribadou area.

#### **6.2.1 Canga East-1 Option**

The Canga East-1 option is 8.0 km long in total, and starts northwest of the Pic de Fon access road and approximately 1.2 km northeast of the camp (Figure 6.1). Its tortuous trajectory runs to the edge of the foothills, then rises from 820 m in elevation to 900 m over approximately 2.5 km, crossing numerous springs at the beginning of the foothills. From there, it crosses some very steep areas as it approaches the summit of Simandou chain. This option lies completely within the Pic de Fon classified forest and Rio Tinto mining concession. It avoids most of the gallery forests in the ravine areas.

#### **6.2.2 Canga East-2 Option**

The Canga East-2 option is 8.7 km long in total. Its trajectory is very similar to the preceding option, except that its starting point from the Pic de Fon access road is located approximately 300 m southwest of the camp (Figure 6.1). Because this route leads directly into the foothills instead of following their edge, it has more hairpin turns in order to avoid excessively steep slopes. Its lower section also crosses several gallery forest-lined streams. It then follows the section common to the Canga East-1 option. Like the preceding option, Canga East-2 lies entirely within the Pic de Fon classified forest and Rio Tinto mining concession.

#### **6.2.3 Moribadou-1 Option**

The Moribadou-1 option is 6.2 km long and, from its starting point at the Pic de Fon access road, follows a pedestrian trail used by Moribadou farmers to get to their fields (Figure 6.1). Over the first 2.3 km, it runs along plateaus occupied by grassland

savanna, sometimes crossing through lowlands used for submerged rice cultivation and crop fields. The remainder of the trajectory runs over land that is slightly more undulating along the hillside, avoiding existing gallery forests. This option only traverses 1.2 km of the Pic de Fon classified forest, and crosses nine streams.

#### **6.2.4 Moribadou-2 Option**

This option is similar in length (6.3 km) to Moribadou-1, and also starts from the Pic de Fon access road, but 2.5 km southwest of Moribadou (Figure 6.1). The first half of the segment, between the road and the junction with the Moribadou-1 option, crosses plateaus and no lowlands, but the second part (running northward), crosses a number of lowlands with soil of low load-bearing capacity. From the junction point, the route is the same as for the Moribadou-1 option. Moribadou-2 also only traverses 1.2 km of the Pic de Fon classified forest, and seven streams.

### **6.3 ROUTE SELECTION**

The route options were analyzed in terms of technical and economic criteria as well as the routes' territorial, environmental, and visual integration. Table 6.1 summarizes each of the proposed options; shaded items indicate an advantage associated with the access road layout.

The comparative analysis clearly shows the advantages of the Moribadou-1 and – 2 options, from a technical and economic standpoint, with a bias toward the Moribadou-1 option because of its shorter length.

From a territorial integration point of view, the Moribadou options provide a considerable advantage since their routes through the Pic de Fon classified forest are shorter than the Canga East options, although the latter lie wholly within the Rio Tinto mining concession.

The environmental integration criterion favours the Moribadou options, with a preference for Moribadou-1. The Moribadou options are preferred to the Canga East options because they cross fewer streams and have a shorter length through mountain habitats of high ecological value (grasslands and forests). They also take advantage of the low-ecological-value grassland savannas and are less disruptive of tree and bush savannas. Social integration favours the Canga East options since they avoid cultivated fields. On the other hand, the Moribadou-1 option takes advantage of the trail used by Moribadou farmers to get to their fields. This will improve accessibility to the fields and facilitate harvest transportation.

The Canga East-1 option is preferable in terms of visual aspects, since it would be built into a wooded landscape with a very high absorption capacity, and this over a greater distance than the other options (approximately 80% forest coverage). All four options will be partially visible from the Canga East Camp because of its elevation, but the wooded screens around Moribadou will prevent any line of sight from the road.

The route option comparative analysis shows that the Moribadou-1 route is the most advantageous layout for the Ouéléba access road. Project consultations in Moribadou village also confirmed that this option is the solution favoured by the local community.


**Figure 6.1**                      **Proposed Access Roads Alternatives to Ouéléba**

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**Table 6.1 Comparative Analysis of Ouéléba Access Road Options**

Comparison Criterion	Route Option			
	Canga East-1	Canga East-2	Moribadou-1	Moribadou-2
<b>Technical / Economic Aspect</b>				
Total length of route (km)	8.0	8.7	6.2	6.3
<b>Territorial Integration</b>				
Length in Pic de Fon classified forest (km)	7.7	8.4	1.2	1.2
Length in Rio Tinto mining concessions (km)	8.0	8.7	5.7	4.0
<b>Environmental &amp; Social Integration</b>				
Number of streams crossed	13	15	9	7
Number of existing trails crossed	1 (Lamadou trail)	1 (Lamadou trail)	Benefits by using the path the people of Moribadou use to reach their fields	Crosses two existing paths, including the Lamadou trail
Length through farmland (cultivated, fallow) (m)	0	0	320	110
Length through montane grassland (km)	1.6	2.6	0.1	0.1
Length through montane forest and gallery forest (m)	0.7	0.7	0	0
Length through tree and shrub savannas (km); mosaic of degraded savannas (km)	5.6	5.1	3.8	4.3
Length through grassland savannas (km)	0	0.2	1.8	1.6
<b>Visual Integration</b>				
Landscape absorption capacity	79% of the route is in a closed setting (forest cover)	67% of the route is in a closed setting (forest cover)	61% of the route is in a closed setting (forest cover)	68% of the route is in a closed setting (forest cover)

 Shaded items indicate access road layout advantages.

## 6.4 COMPONENT DESCRIPTION

The access road to be built from the Canga East Camp to Ouéléba will be designed to handle 4 x 4 exploration vehicles, trailer trucks for the transport of drilling equipment, 10-tonne tanker trucks, and Ouéléba camp supply trucks (under 10 tonnes). In general, fewer than 20 exploration vehicle displacements will occur per day. The road will be used by drilling equipment only during mobilization and demobilization (about four trailer trucks will be used per drilling campaign). Tanker trucks will use the road twice a day, and supply trucks, an average of twice a week.

The total length and width of the right-of-way will be 6.2 km and 15 m, respectively. The overall width includes two 5 m lanes, and 2.5 m-wide drainage ditches to control stormwater runoff. The access road will not be paved but will be serviceable year-round. The maximum slope of the road will be between 6 and 10 degrees.

Infrastructure for crossing water bodies (bridges, culverts, submersible rafts, or rip-rap for fording) will be chosen based on the water body characteristics, and the structure will be sized to take flood flows into account.

## 6.5 CONSTRUCTION PHASE

Considering the length of the road to be cut into the mountainside as it approaches the crest of Simandou range (about 1.2 km), there will be enough cut material available to construct the road sections requiring fill material. It will therefore not be necessary to open and operate a borrow pit. Surplus cut material will be used to surface the existing road on the crest of Mount Ouéléba. Only construction debris (non-reusable materials) and topsoil will be disposed of in four areas (about 1 ha each) provided for that purpose (Figure 6.2). The materials stored in these areas will be divided into one pile for topsoil and one for other construction debris. The topsoil (including vegetation less than 15 cm high) and construction debris will be reused to rehabilitate disturbed areas.

Except in areas where blasting may be required to level the road bed, the road surface will be constructed by scraping and compacting the surface using the weight of the bulldozer blade. The planned Project access road construction sequence is as follows:

- Clearing and grubbing of right-of-way: clearing and grubbing will be limited to the access road. A total of approximately 9.0 ha will be cleared. The trees located in the access road right-of-way will be felled, and the timber will be moved to the roadside for recovery by the local population.
- Topsoil stockpiling: significant deposits of topsoil from disturbed areas will be set aside for future use.
- Blasting: Blasting will be required where the route traverses rocky substrata in which conventional grading is not possible. Blasting operations will be carried out in accordance with strict safety rules and regulations, and a communications program will be provided to inform the local population about blasting operations. The minimum-security perimeter for the use of explosives is generally 200 m for workers involved with the explosives, 400 m for other workers, and 600 m for civilian safety.



**Figure 6.2**                      **Land Use in the Ouéléba Access Road Study Area**

A3



- Excavating, filling and compacting: Road construction will not require borrow pit fill material. The cut materials produced during construction of the road will be the only fill materials used.
- Water drainage system: a drainage system will be constructed to prevent erosion of the road bed and adjacent areas. Drainage ditches will be protected with rip-rap except in places where the natural material is not subject to erosion (e.g. rock).

## 6.6 CONSTRUCTION SCHEDULE

The period of construction planned for the access road is from March to September, 2007.

## 6.7 DESCRIPTION OF THE ENVIRONMENT

### 6.7.1 Study Area

The selected access road study area is located in the Beyla Prefecture, Nionsomoridou Sub-prefecture, in the N'Zérékoré administrative region (see Figure 3.1). This area lies within Moribadou village farmland. The total study area is approximately 5.5 by 5.5 km, or 30 km<sup>2</sup> (see Figure 6.2).

### 6.7.2 Physical Environment

#### □ Climate

The meteorological station closest to the future access road is in Mafindou, approximately 7 km east of Moribadou. The data recorded at this station was analyzed in subsection 5.2.2 (the Airstrip chapter). Note that weather conditions are not a determining factor for the Ouéléba access road route.

#### □ Ambient Air Quality

Just as for the camp and airstrip sector, the ambient air quality in the Moribadou area is deemed to be good, except for the slash burning period in the dry season; burning can reach the summit of Simandou chain.

#### □ Initial Noise Environment

Sound readings were taken to characterize the initial sound environment near Moribadou on September 18<sup>th</sup>, 2006, during both the day and night (see methodology in Appendix B). The noise measurement point locations are shown on Figure 3.2.

The equivalent continuous noise level ( $L_{Aeq,T}$ ) representing the average noise level in Moribadou is 38 dBA during the day and 45 dBA at night; the background noise level ( $L_{AF95}$ ) exceeded 95% of the time is 30 dBA during the day and 40 dBA at night (see Table 6.2 and the glossary in Appendix B). For comparison, the table also shows noise levels at the Canga East Camp. The ambient noise profile at Moribadou (taken in five-second intervals over a 24-hour period) is shown in Figure 6.3.

The main sources of noise identified are insects and birds chirping, thunder, rainfall, and human activities. The background noise level and average noise level are generally higher at night than the day due to the continuous chirping of insects.

**Table 6.2 Initial Noise Level Measured in Calm Period with No Rainfall**

Measurement Point	Start Date & Time (hh:mm)	Duration (hh)	Day		Night	
			L <sub>Aeq, 1h</sub> (dBA)	L <sub>A95, 1h</sub> (dBA)	L <sub>Aeq, 1h</sub> (dBA)	L <sub>A95, 1h</sub> (dBA)
Moribadou	September 18 <sup>th</sup> , 2006 9:00 am	24	38	30	45	40
Canga-East camp	September 17 <sup>th</sup> , 2006 5:00 pm	36	41	33	45	41

#### □ Physical Geography, Geology and Nature of Soil

The access road study area has a high-contrast terrain, in that it includes a mountain range, big hills, and plateaus interspersed with lowlands. In the area of interest, the elevation of the Simandou range (oriented north-south) is between 1,130 and 1,270 m, culminating in the Pic de Ouéléba at 1,335 m. This high point is approximately 4 km from the new road's point of arrival at the summit (Figure 3.1). It has a very steep upper crest (rock ledge in some places), interspersed with deep east-west-oriented ravines. The mountain range overlooks 800 to 900 m-altitude rolling hills, which form a ridge between 2.3 and 3.7 km long. From the hills to the existing road, the access road right-of-way traverses plateaus separated by lowlands used for farming.

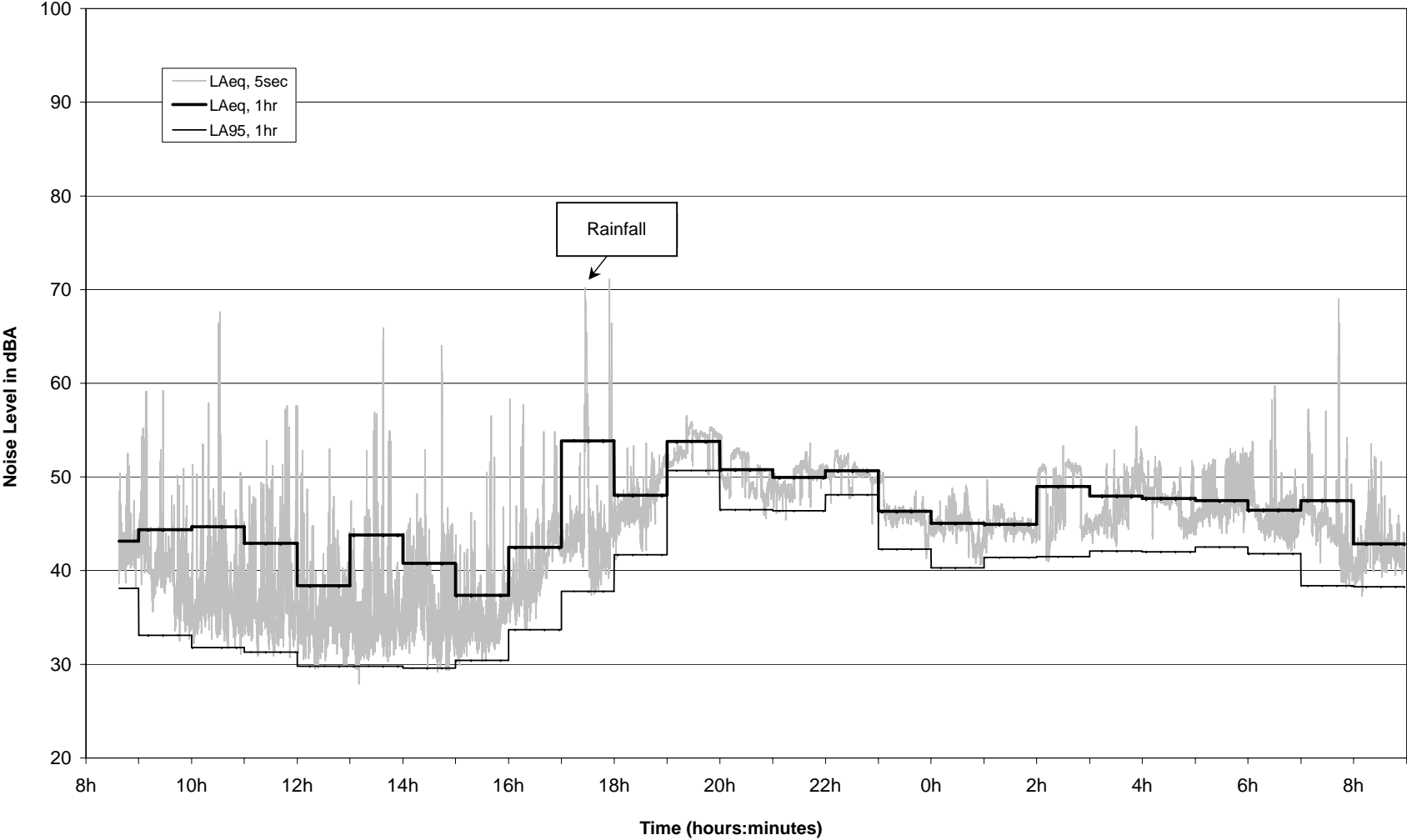
The Guinean Forest bedrock consists primarily of an igneous rock shield of the granite family plus metamorphic rocks (gneiss, quartzite, mica schist) dating from the Precambrian period. Batholiths or granitic stocks make up the significant iron ore deposits found in Simandou range (IRAG, 2006). The soil in the hills and edges of the lowlands are generally classified as ferrallitic soil. Depending on the degree of ferrallitization and plant cover thickness, ferruginous and brown forest soil can also be found (IRAG, 2006). The latter are subject to erosion when stripped of their vegetation.

#### □ Hydrology and Hydrogeology

The Simandou mountain chain extends over approximately 110 km, and includes the second highest peak in Guinea (the Pic de Fon at 1,656 m; second only to Mount Nimba), and is a source of hydrous recharge for the area. The cool wet air from the south-west, as it meets the hot and dry air of the north-east, contributes to cloud formation along the mountain chain and significant precipitation levels, in particular on the western slope (RTI International, 2006). Humidity is generally high year-round, with an average of 80% (IRAG, 2006). A great number of rivers begin in the Simandou mountain chain.

The first (lower) half of the access road is located in the Loffa River watershed; the second half, up to the summit of the crest, runs along the edges of the Loffa and Dion River watersheds (Figure 6.2).

**Figure 6.3**      **Noise Level as a Function of Time – Moribadou, September 18<sup>th</sup>-19<sup>th</sup>, 2006**



According to the findings of Water Management Consultants (WMC) and our own on-site observations, there appears to be very little surface water runoff in the foothills and steeply-sloped areas approaching the crest. The presence of dense montane grassland and coarsely-textured, fractured substrate in these areas limits runoff and is conducive to rainwater infiltration. There is no visible running water in the ravine areas, even during the rainy season. Infiltrated water generally resurfaces at the lower edge of the foothills. The first surface water observed along the future access road right-of-way appears at kilometre 3.7, measured from the summit (Figure 6.2).

The Ouéléba access road route runs through the heads of four generally dry (underground flow) ravines and five streams located in the lowlands (Figure 6.2). The water table elevation in the lowlands, combined with groundwater resurgence, contributes to the large flow rate variations in the valleys during heavy rainfall events. According to Beyla Prefecture specialists, despite a large decline in flow rates during the dry season, about 80% of the streams are perennial. Resurfacing of groundwater rich in iron contributes to the presence of iron oxides in lowland waterways.

#### □ **Surface and Groundwater Quality**

The quality of the surface and groundwater on the eastern slope of Simandou range was largely addressed in subsection 4.3.2 (Camp). This water is generally of good quality, but its metal concentrations (iron, aluminum, copper, nickel, lead), typical of iron ore deposits, frequently exceed the limits set by the WHO.

### **6.7.3 Biological Environment**

#### □ **Biodiversity in the Pic de Fon Classified Forest**

Only 1.2 km (or 19%) of the planned road route lies within the boundaries of the Pic de Fon classified forest (Figure 6.2). Subsection 4.3.3 (Camp) details the reasons for classifying this forest, the rights granted to the riparian communities, and the preliminary studies that have already been done there. It is important to remember that despite the acknowledged biological wealth of the Pic de Fon classified forest, the area to be affected is occupied by grassland savanna and a mosaic of degraded tree and shrub savannas that are annually subjected to uncontrolled brush fires (traces of slash burning are visible up to the summit of the mountain range).

#### □ **Vegetation**

Because of its geographical location and physical characteristics, the Guinean Forest region is part of the African geo-botanical “dense and wet forest” subdivision (IRAG, 2006).

In 2005, Royal Botanic Gardens, Kew mapped out the plant communities in the Simandou Project area and created a basic plant inventory (RBG Kew, 2006). The classification adopted by RBG Kew is based on that of White (1983), which identifies two major types of vegetation: the first type below an altitude of 800 m, and the second type above. RBG Kew claims, however, that the lowland vegetation exhibits no spectral signature distinct from that of the highlands, and is only guided by the altitude. An altitude of 900 m was used in this study, however, because the change of vegetation seemed to occur at that altitude instead, according to on-site

observations and satellite image spectral analysis (see plant group mapping in Figure 6.2).

The Ouéléba access road study area is thus occupied by highland plant formations (montane grassland, montane forest) found above 900 m altitude and lowland formations below that level (gallery forest, tree and bush savanna, disturbed savannas and grassland savanna mosaic). According to RBG Kew, the annual burning seems to affect the development of the various plant groups. During our inventories, traces of slash burning were observed up to the crest, even in the gallery forests.

### Montane Grassland

The highest summits (over 900 m in altitude) are home to montane grassland – a habitat that is rare in West Africa (McCullough, 2004). Montane grassland is formed by factors associated with geology, altitude, and climate. The path of the future road crosses 130 m of such vegetation as it approaches the ridge.

Plant cover is generally 100% except for rock outcropping sites. The height of the grassland stratum is generally 1 to 1.5 m. *Loudetia simplex*, a grass, comprises about 50% of the plant cover, along with the legume *Kotschya lutea*, which makes up another 45% (RBG Kew, 2006). The two species are accompanied by a mix of small amounts of grasses and other species (see Table 6.3 and Figure 3.2 for the location of inventory parcel M-31).

**Table 6.3 Plant Species Inventoried in the Montane Grassland**

Latin Name	Family	Coverage
<i>Loudetia simplex</i>	Graminae	50%
<i>Kotschya lutea</i>	Papilionoideae	45%
<i>Hyparrhenia smithiana</i>	Graminae	5%
<i>Andropogon schirensis</i>	Graminae	
<i>Panicum praealtum</i>	Graminae	
<i>Hyparrhenia sp.</i>	Graminae	
<i>Bidens asperata</i>	Compositae	
<i>Pandiaka heudelotii</i>	Amaranthaceae	
<i>Nephrolepsis undulata</i>	Oleandraceae	
<i>Cyanotis longifolia</i> var. <i>longifolia</i>	Commelinaceae	
<i>Hypoestes cancellata</i>	Acanthaceae	
<i>Psorospermum altrenifolium</i>	Guttiferae	
<i>Hibiscus asper</i>	Malvaceae	

Source: RBG Kew, 2006 (Parcel M31; GPS coordinates: 8° 36' 54.9" North; 8° 53' 35.3" West; altitude 1,160 m).

Some of the plant species in the inventory of the montane grassland have limited distribution at such an altitude and are of greater conservation interest than those found in grassland savannas. This is the case in particular for *Kotschya lutea* (a legume with a yellow flower) and *Bidens asperata*, which appear to be limited to Simandou range and Mounts Loma and Nimba. They do not seem to grow in the grassland savannas at low altitudes (RBG Kew, 2006). On the other hand, *Pandiaka*

*heudelotii* and *Hypoestes cancellata* are not generally found in montane grasslands such as those at Ouéléba.

Although these species are of conservation interest, they are not included on IUCN's list of vulnerable or threatened species, CITES or in the Guinean *Monographie Nationale*.

### Montane Forest

Primary and secondary<sup>1</sup> montane forests are found on Simandou range, mainly in the southern portion of the western slope. This type of forest only subsists discontinuously on the eastern slope, in ravine areas and valleys. The plant cover distribution seems to be closely associated with existing topsoil deposit areas and water resources. Unlike the semi-deciduous tree and bush savannas, montane forests remain perennially green because of the high rate of rainfall and humidity produced by the cloud mass.

The proposed path of the access road has been designed to avoid the montane forests. In this area, canopy cover generally varies from 65 to 90% with heights up to about 30 m, and some specimens reaching nearly 1 m in diameter. Table 6.4 shows the main species inventoried by RBG Kew in a parcel located close to the planned route (see location of parcel M32 in Figure 3.1). The dominant tree species is *Ficus exasperata* (RBG Kew, 2006). None of the species are on the IUCN's vulnerable or threatened species list, CITES or in the Guinean *Monographie Nationale*.

The main tree species inventoried during the August 2006 site visit to the ravine areas through which the road will run are: *Erythrophleum guineense*, *Lannea velutina*, *Sterculia tragacantha*, *Piptadeniastrum africanum*, *Schefflera barteri*, *Uapaca heudelotii*, *Canarium schweinfurthii*, *Phyllanthus discoideus*, *Vitex doniana*, and *Markhamia tomentosa* (see inventories in Appendix E). The only identified at-risk species is *Vitex doniana*, recognized as threatened in the Guinean *Monographie Nationale*. It has a strong presence throughout Guinean territory.

### Gallery Forest

Streams located in the lowlands of the Simandou foothills area and the valleys surrounding the plateaus on the approach to Moribadou are occupied either by a thin strip of gallery forest in the relic stage, or by cultivated fields (mainly rice paddies). The principal tree species found along the study area streams are: *Mitragina stipulosa*, *Rafia soudanica*, *Uapaca heudelotii* and *Newboutonia diaguescens* (see Appendix E). The proposed access road right-of-way does not traverse any gallery forests (Figure 6.2).

Among the species listed in the inventory of the forest galleries, only *Mitragina stipulosa* is listed as a threatened species in the Guinean *Monographie Nationale*.

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<sup>1</sup> A primary forest is an intact (or original) forest that has not been directly exploited or influenced by man. A secondary forest is a forest regenerating largely through natural processes after significant disturbance (human and/or natural) of the original forest vegetation, and displays a major difference in forest structure and/or canopy species composition with respect to nearby primary forests on similar sites (FAO, 2002).



**Table 6.4 Plant Species in the Inventory of the Montane Forest**

Plant Species	Latin Name	Family
Wooded Stratum (20-30 m height)	<i>Ficus exasperata</i>	Moraceae
	<i>Balanites wilsoniana</i>	Zygophyllaceae
	<i>Sterculia tragacantha</i>	Sterculiaceae
	<i>Pentaclethra macrophylla</i>	Mimosoideae
Wooded Substratum (10-20 m height)	<i>Synsepalum cerasiferum</i>	Sapotaceae
	<i>Anthonothea macrophylla</i>	Caesalpinoideae
	<i>Garcinia sp.</i>	Guttiferae
	<i>Diospyrus heudelotii</i>	Ebenaceae
Shrub Stratum (1-8 m height)	<i>Carapa sp.</i>	Meliaceae
	<i>Parinari excelsa</i>	Chrysobalanaceae
	<i>Morus mesozygia</i>	Moraceae
	<i>Piptadeniastrum africanum</i>	Mimosoideae
	<i>Antiaris toxicaria</i>	Moraceae
Grassland Stratum (1-2 m height)	<i>Psychotria peduncularis</i>	Rubiaceae
	<i>Chassalia kolly</i>	Rubiaceae
	<i>Rytigynia canthoides</i>	Rubiaceae
	<i>Rhaphiostylis beninensis</i>	Icacaceae
	<i>Rourea coccinea</i>	Connaraceae

Source: RBG Kew, 2006 (Parcel M32; GPS coordinates: 8° 35' 39.1" North; 8° 53' 39.1" West; altitude 1,100 m).

### Tree and Bush Savannas

A major portion of the route (approximately 62%) traverses a sparse mosaic of tree and bush savannas (Figure 6.2). The main species in these formations along the future road route are: *Pterocarpus erinaceus*, *Lophira lanceolata*, *Schefflera barteri*, *Terminalia glaucescens*, *Afrormosia laxiflora*, *Parkia biglobosa*, *Entada africana* and *Hymenocardia acida* (see Appendix E). The only species at risk is *Vitex doniana*, recognized as threatened in the Guinean *Monographie Nationale*. This species is, however, common throughout Guinea and in various types of habitats.

### Grassland Savanna

The plateaus on the approach to Moribadou, traversed over a total distance of 1.8 km (approximately 30% of the route), consist of grassland savannas. The species present are similar to those inventoried in the Canga East Camp (see subsection 4.3.3). These savannas are potential pastureland.

## ❑ Fauna

The inventories carried out as part of the Rapid Biological Assessment Program (RAP) (McCullough, 2004) indicate that the Pic de Fon classified forest hosts a wide variety of fauna. We should note, however, that both RAP inventory sites are located on the western slope of Pic de Fon, in the primary forest area, while the future access road is on the eastern side, in an area highly degraded by human activity. Only relics of montane forest subsist in ravine areas. Furthermore, the eastern slope

is annually subject to uncontrolled brush fires (traces of slash burning are visible up to the summit of the mountain range).

The Pic de Fon classified forest is an Important Bird Area (IBA) as defined by BirdLife International as (Ekstrom, 2006). Again, this status is assigned to the classified forest as a whole, although some areas (such as the one in which the road will be constructed) are of smaller significance.

Despite low faunal usage of the area, some species – or indications of their presence – were observed during preparatory works inventories and subsequent monitoring. Several indicators show that the area is used by the African buffalo (*Syncerus caffer*). Grazing traces were observed for a specimen of *Schefflera barteri*, as were fresh and dried excrement, and two buffalo traps (see location in Figure 6.2 and photos in Appendix D). An aulacode (*Thryonomys swinderianus*) trap was also seen in a lowland occupied by a rice paddy (see photo in Appendix D). The soil at the Kew Garden (2006) plant inventory parcel M-32 location (see location in Figure 3.2) was heavily worked by warthogs (*Phacochoerus aethiopicus*) in search of insects.

No chimpanzee nests or indications of primates (excrement, fruit waste, etc.) were observed in the Ouéléba access road area, even in the montane forests located in the ravine area. Note that the inventories carried out as part of the RAP did not reveal the presence of any chimpanzee nests at altitudes below 900 m (McCullough, 2004).

With regard to aquatic fauna, the streams traversed by the future road have a low potential since they run underground or are used to irrigate rice paddies.

#### **6.7.4 Human Environment**

##### **6.7.4.1 General Framework Common to all Preparatory Works Components**

The socio-economic context common to all three preparatory works study areas is covered in subsection 4.3.4.1 (Camp) and will not be repeated in this section. Only those human environment elements specific to the Ouéléba access road study area are described herein.

##### **6.7.4.2 Specific Framework for Ouéléba Access Road**

###### **□ Administrative Organization**

The selected Ouéléba access route is located entirely on the eastern slope of Simandou range, in the Nionsomoridou Sub-prefecture of the Beyla Prefecture (Figure 3.1). Except for the last kilometre of the route on the crest of Simandou range (which lies within the boundary of the Pic de Fon classified forest), the route passes through Moribadou village farmlands (Figure 6.2). Only the lower third of the access road is located outside the Rio Tinto mining concession.

###### **□ Socio-Economic Profile**

Mafindou, Wataférédou and Moribadou are the closest villages to the planned access road, Moribadou being the closest of the three. It is located approximately 1 km east of the start of the trail leading to the Pic de Fon.

The village consists of four neighbourhoods. There are two mosques, an operational recreational centre, and a soccer field. Most of the houses are traditional huts with plant-material roofs. The new dwellings are rectangular and have sheet metal roofs.

Moribadou was founded in 1919 by a hunter from the Macenta region. His arrival was followed by a newcomer named Moriba Traoré and his extended family, who quickly populated the area and gave the village its name. Village population growth may have benefited from the closing of Mamouroudou in 1920.

In the 1930s, colonial infrastructure work employed a large labour force that decimated a significant portion of the village (Synergy, 2003). During the 1940s and until independence in 1958, substantial war taxes and other taxes were collected from harvest sales. From 1971 to 1984, new taxes – payable in kind – were imposed on the population, who were having difficulty even feeding themselves. A number of villagers then began leaving the region. The exodus reached its peak in 1975 when a fire destroyed the village and the harvests. The village was progressively rebuilt and repopulated until 1990. The return of Guinean expatriates from Liberia contributed to this population increase.

The population of Moribadou was listed as 768 in the 1996 census. Estimates by village dignitaries indicated that the population was approximately 1,700 in 2003 (Synergy, 2003). Because of its proximity to the mining exploration sites, the village houses several migrants in search of work. Currently, it is estimated that at Moribadou there are 186 people looking for work, 64 of which are considered locals (Jay and Giovannetti, 2006).

The people of Moribadou were originally entirely Malinké (Synergy 2003). In 2003, of a population of 1,700, 140 people were Malinké immigrants, 85 were non-Malinké (Susu, Guerzé, Toma, Peul, Lélé, Kissian), and 157 were “original villagers” who came back to live in Moribadou.

#### ❑ **Socio-Economic Activities**

The lowlands on the first few kilometres of the road (about 3.5 km) starting from the trail are used for cultivation by Moribadou farmers. Rice paddies can be found in the valleys, and fields of manioc, beans, corn, sorghum, okra, and other crops on the hillsides (Figure 6.2). Some banana and mango plantations also exist in some of the lowlands.

The farmers are not landowners, but all have access to them (even migrants). The land is currently lent, and not rented. Since 2003, it has been noted that there has been pressure on these lands, as those in the classified forest can not be used (Jay and Giovannetti, 2006).

There are few herders around Moribadou (Synergy, 2003).

According to local dignitaries, hunting is in decline in the region of Moribadou. The region was very rich in game when the village was founded, and hunters were the first to settle on the present site of the village. Farmland development and intensive hunting decimated a major part of the game, and today this activity has become marginal.

Gathering (fruit, roots, traditional medicinal plants) and fishing are also practiced, but are also marginal activities.

Trades in the district of Moribadou such as basket weaving and woodworking, etc. are focused mainly on village needs, and production does not meet demand. A number of merchants sell their products on a daily basis in addition to their normal weekly market activities.

#### ❑ **Infrastructure and Public Services**

The Ouéléba access road study area is traversed by a rural trail built by Rio Tinto for access to the Canga East Camp and Pic de Fon. According to information collected during consultations and data from the 2003 baseline study produced by Synergy, road infrastructure development contributed to Moribadou's growth by bringing the area out of isolation (Synergy, 2003).

Networks of trails start from this road and Moribadou village to access the fields and the village of Lamadou on the west slope of the mountain. From about 650 m from the starting point on the Pic de Fon road to the site of the old village of Mamouroudou, the selected route follows the trail used by the farmers.

In Moribadou, there are two mosques, a public school with three classrooms for approximately 100 children, and a private French and Arabic school. Water supply (by two wells) is insufficient and poor quality.

A VHF radio is used to communicate between the village and the Canga East Camp in case of medical or other emergencies.

#### ❑ **Cultural Heritage**

The Ouéléba access road route runs near the old village of Mamouroudou (Figure 6.2) that was abandoned in the 1920's. According to Moribadou villagers, the Mamouroudou village operated an iron mine and produced worked pieces in its smelter. The population settled in the mountain to protect itself against the conflicts of the time. Mining activities in that era may have left behind some remains of potential historical interest.

#### ❑ **Landscape**

The Ouéléba access road will cross three landscape units: a mountain landscape unit on the crest, a foothill unit at the base, and plateaus on the approach to the village of Moribadou. The crest of Simandou chain running north-south has an average elevation of over 1,100 m in this area, is a focal point in the regional landscape, and offers a panoramic view of the surrounding foothills and plateaus. The Pic de Fon, at 1,656 m, is an important visual landmark in the regional landscape for both the Beyla and Macenta Prefectures. There is no line of sight to the road from the village of Moribadou because of the wooded screens surrounding the village.

## 6.8 ASSESSMENT OF RISKS AND ENVIRONMENTAL AND SOCIAL IMPACTS AND PROPOSED MITIGATION MEASURES

In keeping with the method for a simplified impact study, this section summarizes the risks and potential impacts associated with the construction of the new Ouéléba access road and its operation, maintenance, and permanent presence in the environment. Table 6.5 provides a detailed description of the risks and anticipated impacts, their assessed significance level, and the associated mitigation/improvement measures and residual impacts (after implementation of mitigation measures), for each environmental element affected by the project.

The following text summarizes the risks and potential impacts by the type of environment affected (physical, biological, human, or landscape).

### 6.8.1 Physical Environment

#### □ Surface Water and Groundwater

During the construction of the access road to Ouéléba, there are risks of surface water quality deterioration from the deposition of sediments during excavation and filling work, the deposition of construction debris and the risks associated with accidental spills from the machinery and the temporary hydrocarbon storage facilities. In compliance with IFC *Performance Standard 3 – Pollution Prevention and Abatement*, mitigation measures will be implemented to reduce the risk of water quality deterioration to very low. Work will preferably be done during the dry season, and when necessary, runoff will be intercepted and decanted before being returned to the watercourse. The deposition of construction debris and vehicles and construction machinery will be refuelled at least 50 m away from watercourses or wetlands.

Implementation of the Rio Tinto *Operational Guideline – Hydrocarbon Management* will specifically ensure safe storage and handling of hydrocarbons at the job site. Given these measures, the risk of water contamination from hydrocarbons will be very low. Moreover, spill kits will be available on-site in case of accidental spills.

The path of the road crosses nine watercourses with underground flow, including those on the crest. Infrastructures will be installed to avoid the need to ford these watercourses. To avoid interference with surface water flow, the infrastructures will be designed to reflect peak flows. The foundations of the structures will be stabilized with riprap to prevent erosion.

During operation, the aforementioned mitigation measures will also be used to reduce the risks surface water quality deterioration during road maintenance and in case of accidental spills occurring during fuel transport to the Ouéléba camp. The Rio Tinto radio-satellite communication system assures the safe transport of dangerous materials. Moreover, all vehicles are equipped with spill kits. The risk of water quality deterioration while the road is in use is also considered very low.

#### □ Soil

Construction works for the access road to Ouéléba are likely to result in risks of erosion of the stripped soil, especially during the rainy season. The main sources of erosion risk are from deforestation, clearing the right-of-way, and earthworks

(excavation and filling). The presence of dense montane grasslands and tree and bush savannas effectively limits surface water runoff, and is conducive to rainwater infiltration. However, removal of the vegetation in the steeply-sloped areas will likely concentrate and accelerate runoff in the rainy season, leading to soil erosion and sediment transport into the streams. This is the case in particular for those roadside ditches that will be excavated in unconsolidated deposit areas. In order to reduce this risk, it is recommended that the works be done during the dry season; if this is not possible, the runoff must be intercepted and diverted to vegetated zones. Restoration of the disturbed areas likely to experience erosion and the ballasting or installation of riprap on the foundations of the water-crossing infrastructures will make it possible to reduce this risk to a very low residual level.

The presence of machinery and temporary hydrocarbon storage facilities at the site and fuel transport to the Ouéléba camp when the road is in use, also constitute risks for soil contamination in case of accidental hydrocarbon spills. The application of Rio Tinto's *Operational Guideline – Hydrocarbon Management* will reduce these risks to a negligible level.

#### □ **Air Quality**

The impacts on air quality associated with the stirring-up of dust caused by earthwork and traffic during construction will be very low or negligible because water will be spread to minimize dust emissions. A very low residual impact associated with equipment and vehicle traffic on air quality is anticipated during the road usage period, taking into account the imposed speed limit.

#### □ **Noise Environment**

The anticipated noise levels during construction of the Ouéléba access road will be very low to the right of the village of Moribadou taking into account the distance from the construction work (approximately 1 km from the village) and the vegetative screen around the village. In addition, construction activities will be limited to the day-time (7:00- 20:00). Similar impacts are anticipated during the operation period as the speed of traffic will be restricted, and vehicles will no longer need to cross Moribadou to reach Ouéléba (via Nionsomoridou).

### **6.8.2 Biological Environment**

#### □ **Vegetation**

Clearing and grubbing of the access road right-of-way and of the areas for material deposition will result in the loss of 15 ha of tree and shrub savanna mosaic, grassland savanna. Because clear-cutting will be limited to the minimum area required, the areas involved are small, local people shall be allowed to recover the timber, and the restoration of the site after construction work is completed, the residual impact associated with plant loss is considered low. It is also recommended that the construction works be monitored to avoid disturbing the gallery forests located near the right-of-way on the crest of the Simandou chain.

**Table 6.5**                      **Summary of Risks and Residual Impacts and Mitigation Measures – Ouéléba Access Road**

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The presence of machinery and temporary hydrocarbon storage facilities at the construction site as well as the transport of fuel to the Ouéléba camp can generate risks of fire spreading to the vegetation. Since the *Operational Guideline – Hydrocarbon Management* will be applied and fire-fighting equipment will be available at the site, the risk level will be very low.

The presence of the new access road promoting accessibility to a territory previously difficult to reach could increase the pressure on the sector's forest resources, in particular those of the classified forest of Pic de Fon. In order to mitigate this potential impact, Rio Tinto will prohibit any removal of forest resources by the workers and will continue to reinforce the protection of the classified Pic de Fon forest (forest rangers).

#### □ **Fauna**

Considering that the *eastern* slope of the Simandou chain presents a low wildlife potential (because of human factors), the poverty of the faunal habitat, and the brush fires that annually destroy vegetation, potentially low and very low impacts are anticipated for the fauna.

The impacts related to habitat loss, the risk of brush fires, and the proposed mitigation measures for the construction period have been discussed (see Vegetation). The additional impacts on fauna involve disturbing the peace of the area during construction, and the erosion of sediments along the roads possibly affecting the aquatic communities. In order to mitigate these impacts, the works will be carried out in the dry season to the greatest extent possible, and runoff will be decanted before being returned to watercourses. Moreover, the structures crossing over water will be designed to not impede the movement of aquatic communities.

While the road is in use, the same measures as those prescribed for vegetation (with respect to the increased pressure on the sector's resources and risks of fire, likely to destroy the habitats) will be applied. The residual impact during operation of the road will accordingly, be very low.

#### □ **Biodiversity**

The right-of-way of the Ouéléba access road crosses the grassland savannas for a total area of 5 ha, a mosaic of tree and bush savannas for some 10 ha, and mountane grasslands for 0.2 ha. Prior to being built<sup>2</sup>, the route of the road will be subject to optimization designed to preserve certain trees used by local populations (measures requested by residents of Moribadou during consultation).

According to the IUCN categorization criteria, these habitats are not essential habitats in terms of biodiversity. Some specimens of *Vitex doniana*, included in the *Monographie Nationale*, were identified near the right-of-way of the future road. However, since this species is well represented throughout Guinea in several habitats, it is not a habitat necessary for the survival of the species. In fact, the

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<sup>2</sup> The other two components of the project were already optimized in the field during December 2006 and January 2007.

species was included in the *Monographie* not because it is threatened, but rather because of its use by inhabitants<sup>3</sup>.

The habitats crossed by the road are part of the habitats described as modified by IFC *Performance Standard 6 – Biodiversity Conservation and Sustainable Resource Management*. Some of them have been transformed into agricultural zones. Moreover, the annual burning by farmers which reaches the crest of the Simandou chain seems to affect the development of various plant groupings. These habitats are rated with moderate value.

Although the habitats involved are modified, the montane grasslands occupying the peaks (more than 900 m high) are relatively rare in Guinea and West Africa. Mountane grasslands are a habitat with great intrinsic value in terms of flora because they are rare, but have low value in both socio-economic or wildlife terms.

Without having any special protective status (IUCN, CITES, *Monographie Nationale*), some species identified in habitats on the *eastern* slope of the Simandou chain (see section 6.7.3) likely to be located in the right-of-way of the future road are considered species with a restricted geographic distribution on the high peaks (more than 900 m high). Accordingly, they offer some conservation interest.

The following mitigation measures will be applied in order to reduce the impacts on biodiversity and pressure on natural resources:

- The construction machinery will be cleaned before being transported to the Simandou zone to avoid the propagation of invasive alien species and other undesirable contaminants;
- The right-of-way of the road will be optimized in order to protect the trees that are part of the *Monographie Nationale* and the species used by the local populations;
- Encroachment on and disturbance of the host environment will be limited to the minimum area required;
- Disturbance of the gallery forests near the right-of-way on the crest of the Simandou chain will be avoided;
- Reforestation will be conducted using species indigenous to the temporary construction areas and the areas disturbed by the construction works;
- The workers will be prohibited from exploiting the natural resources or depending on them for food or for other purposes through an awareness campaign.

With the application of these mitigation measures and the small area of high value habitats (0.2 ha of mountain grasslands) affected by road construction, the residual impact on biodiversity is considered moderate for this component. For the other

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<sup>3</sup> One of the objectives of the *Monographie Nationale* was to identify the components of Guinea's biological diversity which are important for its conservation and sustainable use. In most cases, the monograph species are not necessary threatened with extinction but in fact constitute socio-economic resources requiring protection for future generations. It should be noted that the *Monographie Nationale* does not indicate any standard or justification for the choice of threatened species. It became clear from conversations with some of the authors of the *Monographie Nationale* that the first edition has some shortcomings and a second edition would be useful (personal communication, Dr. Keita, August 2006).

habitats whose value is considered moderate, the residual impact on biodiversity is considered low.

As part of the overall Simandou project, Rio Tinto will implement its Biodiversity Action Plan (see section 7.3.3) seeking a positive overall result for biodiversity.

### **6.8.3 Human Environment**

Construction of the access route will generate impacts mainly on vulnerable groups, women, induced migration, health and safety, land use, cultural heritage, employment and the economy and finally, landscape.

#### **❑ Vulnerable Groups**

The problems associated with vulnerable groups and individuals is discussed in detail in section 4.4.3 (Canga East Camp) and will not be repeated in this section, as the same assistance and mitigation measures have been proposed. However, special attention will be paid to vulnerable groups before any dynamiting (in particular those hard of hearing).

The socio-economic value associated with the vulnerable groups is considered high. During construction and operation, the size of the impact is considered small. Given the mitigation measures proposed, the residual impact is considered negligible.

#### **❑ Women**

Generally, the problems related to women are treated in section 4.4.3 (Canga East Camp) and will not be repeated in this section as the same assistance and mitigation measures have been proposed.

The socio-economic value associated with women is considered high. During construction and operation, the (positive) impact is considered medium and the (positive) residual impact is considered medium.

#### **❑ Induced Migration**

Like the other two components of the preparatory works, the activities linked to construction of the access road to Ouéléba are likely to induce the migration of people seeking job opportunities in the Beyla prefecture. As part of the preparatory works, some measures will be implemented by Rio Tinto in order to reduce the migration potential in the zone. The mitigation measures identified in section 4.4.3 result in anticipated residual impacts estimated to be low.

#### **❑ Health**

Similar to the other two components of the project, the temporary inflow of the manpower necessary for the construction of the road is likely to increase the risk of disease transmission among workers and in the communities (STD, HIV/AIDS, malaria, etc.). The same measures proposed for the Canga East Camp will be applied to the construction of the access road (see section 4.4.3), which will make it possible to reduce the risk to low.

## □ Safety

There are several types of risk for accidents occurring during construction of the access road to Ouéléba:

- Risk of accidents linked to the increased traffic on the access road leading to the Canga East Camp;
- Risk of accidents to farmers crossing the work zone to reach fields (disruption of pedestrian paths);
- Risk to the safety of workers and population during dynamiting (projection of debris);
- Risk of fire at the construction site.

The heavy traffic and increased movement that will be generated on the access road to the Canga East Camp and the new access road to Ouéléba constitute risk of accidents for farmers (and livestock) crossing the road or works zone to reach their fields or the village of Moribadou, both during construction and operation. It should be noted that the future route of the road follows sections of existing pedestrian paths and crosses others. In order to ensure the safety of the community, the work areas located near the fields and existing paths will be secured by safety fences and adequate signs and surveillance.

Appropriate signs will also be installed at the pedestrian crossing zones. In accordance with the *Rio Tinto Operational Guideline – Vehicles and Driving*, the speed of the vehicles will be limited to 40 km/h in pedestrian crossing zones and sectors with reduced visibility (especially in bends in the road). It should be noted that the new access road to Ouéléba will make it possible to reduce the volume of vehicles crossing through the Moribadou, Wataférédou and Nionsomoridou to reach the Ouéléba exploration zone.

With regard to dynamiting the rocky substrate (which is likely to risk projecting debris on workers and residents), the *Operational Guideline – Explosives* and the following measures will be implemented in order to mitigate the risk to a low residual level:

- The employment of personnel who are competent and highly skilled in dynamiting operations;
- The implementation of a communication and warning program intended to inform local residents of dynamiting operations (or any other danger) while paying special attention to vulnerable individuals;
- The establishment of a safety perimeter around the dynamiting zone and the deployment of security guards to ensure that it is free of intruders. The minimum safety perimeter when explosives are used is usually 200 m for explosives workers, 400 m for other workers, 600 m for civil protection and the protection of homes;
- The issuing of audible warnings prior to dynamiting operations.

The risks associated with transport and handling of hydrocarbons during both construction and operation (fuel transport to the Ouéléba camp) will be managed in accordance with the *Operational Guidelines – Hydrocarbon Management*. The



access road will also be covered by the emergency plan during construction and operation phases.

The implementation of all of these mitigation measures will allow reduction of the risks to a low level during construction, and a medium level during operation (given the longer term of the impact).

#### □ Land use

The route of the future Ouéléba access road crosses a number of fields either in production or lying fallow, a small fruit plantation and two flats used for growing irrigated rice. It also crosses wooded grasslands and a mosaic of tree and bush grasslands.

The current right of way affects twelve farmers and a total area of 5,640 m<sup>2</sup> (see Table 6.6). The properties belong to the village of Moribadou. Eight farmers practicing hill farming, three who farm flats and one growing fruit are potentially affected. Some of the affected parcels are fallow, while others have already been harvested and still others are under production.

Prior to its construction<sup>4</sup>, the route will be optimized in order to reduce the farm areas affected and the number of farmers involved as well as to preserve certain trees used by local populations (measures desired by the residents of Moribadou, expressed during consultation).

**Table 6.6 Characteristics of Farming Operations Affected by the Preliminary Route of the Access Road to Ouéléba**

Farmer	Hillsides	Flats	Plantations	Area	Comments
Lonceny Traore	X			40 m <sup>2</sup>	3-year fallow
Mousa Camara	X			500 m <sup>2</sup>	4-year fallow
Kewoule Camara	X			500 m <sup>2</sup>	3-year fallow
Abdoulaye Keita		X		600 m <sup>2</sup>	Rice harvested
Adama Traore	X		X	600 m <sup>2</sup>	2-3 year old cashew trees and 2-4 year old mango trees Fallow planned for fonio
Kewoule Camara		X		400 m <sup>2</sup>	Rice not harvested and 1 2-year old mango tree and possibly a raffia palm and a papaya tree
Frebory Keita	X			900 m <sup>2</sup>	Fertile hillside, rice, timothy, hibiscus, cassava harvested
Mamady Bamba	X			600 m <sup>2</sup>	Cassava crop
Abdoulaye Keita	X			350 m <sup>2</sup>	Cassava under cultivation
Abdoulaye Keita	X			600 m <sup>2</sup>	Field prepared for growing rice
Lancei Camara				400 m <sup>2</sup>	Field prepared
Abdoulaye Keita		X		150 m <sup>2</sup>	Harvested rice plus a small raffia palm
<b>12 farmers</b>	<b>8</b>	<b>3</b>	<b>1</b>	<b>5, 640 m<sup>2</sup></b>	

Source: Jay and Giovannetti, 2006.

<sup>4</sup> The other two project components were already optimized in the field during December 2006 and January 2007.

A compensation plan will be implemented to manage the compensation of individuals that experience a loss of source of income or subsistence. In accordance with IFC Performance Standard 5 – *Land Acquisition and Involuntary Resettlement*, compensation will be provided fairly and equitably at the full replacement cost, in order not to cause the impoverishment of individuals and communities affected and to improve, or at least restore, the means of subsistence and standard of living of the individuals affected.

The compensation plan will enable the those affected to develop areas equivalent to those lost and compensate for losses of agricultural products. During public consultation, the affected communities noted that there is sufficient replacement land and indicated that they were willing to move some of their activities to accommodate the proposed works. Compensation will be provided according to the principles of the Compensation Framework explained in 7.3.2.

Construction of the road will also result in the loss of some 5 ha of grassland savanna and 20 ha of tree and bush savanna likely to be used for gathering activities by the village communities (collecting of medical plants and edible products, cutting of timber and firewood, hunting, etc.) as well as for grazing. These natural resources will be the subject of community compensation in kind (in the form of materials or goods) in accordance with the Compensation Framework presented in section 7.3.2. Moreover, the trees cut in the right of way will be made available to local residents.

The compensation activities will be accompanied by appropriate communication with the residents concerned, as described in 7.3.2.

In consideration of the compensation plan for replacing farming areas and compensating for losses, the residual impact is estimated to be medium.

A positive impact of medium size will be generated by the presence of the new road, which will improve accessibility to the fields and facilitate the transport of harvests.

#### □ **Cultural Heritage**

During public consultation in the village of Moribadou, the presence of the old village of Mamouroudou site in the access road sector was pointed out (Figure 6.2).

A study is currently underway to determine the location of the old village and the heritage value of the remains of the Mamouroudou foundry. The route will be optimized as much as possible to avoid damaging anything of heritage value. If it is impossible to protect the site or if there are chance discoveries of artifacts made during construction, Rio Tinto will define measures to apply in consultation with the affected residents, in accordance with the Cultural Heritage Management Plan (see 7.3.6).

Based on the fragmented information available, the impact is considered indeterminate.

#### □ **Employment**

The jobs created by construction of the access road will have a positive effect on employment, a subject highly valued by local residents. As indicated in 4.4.3 (Canga East Camp), Rio Tinto undertakes to offer a safe working environment which

exceeds the requirements of the *Guinean Labor Code* and to implement a manpower management, training and work plan.

Because of the importance of work and working conditions to the residents, the improvement measures suggested will induce a moderate residual impact (positive) during both construction and operation.

#### □ **Economic Benefits**

The access road runs near Moribadou. People expect the socio-economic spin-offs associated with access road construction activities (a US\$5 million investment) and maintenance to be maximized for the benefit of the village population. The measures proposed to maximize the economic benefits of preparatory works were described in subsection 4.4.3. The (positive) residual impact is considered high for the construction period, and medium for the operation periods.

#### □ **Landscape**

Given the low degree of visibility the road will have from mobile observer sites including the village of Moribadou, a low impact is anticipated in terms of alteration of the visual aspect of the local landscape.

### **6.9 CUMULATIVE IMPACTS**

The concept of cumulative impact recognizes that the environmental and social impacts of a project may combine with those of other activities or prior, current or future projects in the same territory, and result in interactions that ultimately produce cumulative impacts, whose nature and scale may differ from those of the impacts of each of the projects considered individually. To assess them, the following elements must be considered:

- The temporal and spatial limits of the environmental and social study;
- The interactions between the environmental impacts of the project and those of prior, current and future projects and activities.

#### □ **Past and Present Activities/Projects**

Figure 3.1 illustrates the study zone for the preparatory works which essentially covers the western portion of the Beyla prefecture and the sub-prefectures of Beyla-Centre, Nionsomoridou and Boola.

Present land use in the study zone consists of mining activities that are mainly concentrated on the crest of Simandou range, in the Ouéléla and Pic de Fon sectors. Besides the mining activities taking place in part in the classified forest of Pic du Fon, the natural resources of the latter are in certain areas exploited by the local population for their subsistence.

As for the lands in the piedmont plain and the plains surrounding Simandou range, they are used by the local communities for agropastoral activities. Aside from the town of Beyla, population density in the study zone is low. Hence, pressure on cultivable land and natural resources is presently low.

## □ **Foreseeable Future Activities/Projects**

Besides the intensification of mining activities projected by Rio Tinto in the coming years, the Simandou mining project, including its related infrastructure for mineral treatment and transport, is the only known large-scale project in the preparatory works study zone. The mining exploration and operation activities will generate additional impacts in the receiving environment to those of the preparatory works that are very minor in scale. The global Simandou project will induce population migration in the zone, which will likely create a synergistic effect on land use, cultivable land, natural resources, infrastructure and others.

Despite that the Simandou project is not entirely defined, it is possible to foresee the following cumulative impacts in the receiving environment.

## □ **Expected Cumulative Impacts**

### *Social and Economic Development*

When the Simandou project will be fully operational, the receiving environment will benefit from employment, training, capacity reinforcement and general improvement of public utility infrastructure for a period of up to 50 years.

This will create a largely sufficient framework to enable long-lasting social and economic development that will outlast the closing of the mine.

### *Biodiversity*

For the preparatory works, only the camp and a section of nearly 1.2 km of the access road are in the Pic du Fon classified forest.

In general, the overall Simandou project is likely to generate potentially negative impacts on the biodiversity of the receiving environment, notably regarding deforestation and its effects on erosion, loss of habitat and wetlands. Pressure following population increase will amplify these impacts. Thus, it is important to implement a biodiversity action plan that will take into consideration all the threats on the resources to ensure that the biodiversity of the Simandou region is protected. The specific actions must aim to minimise the impact on the biodiversity, restore disturbed areas, compensate loss by in situ conservation, increase the level of protection for critical habitats and finally to obtain the commitment of the bordering communities to protect the biodiversity.

### *Water Management*

Little information regarding groundwater flow and quality of ground and surface water is available for the study area. To compensate this lack of data, Water Management Consultants has been conducting since 2005 a hydraulic follow-up programme of the Simandou project area.

In terms of potential cumulative impacts on water supply in the study area, the removal of the Pic du Fon crest could induce changes in the pluviometry and consequently, on a local scale, on the groundwater recharge. The operation of an open mine can also modify the pattern of surface water flow and create erosion and surface water contamination.

### Land Use

The mine and its operations will potentially lead to a significant increase of migratory populations in the villages of the study zone. The expected cumulative impacts are: land access concern, increased pressure on cultivable land, insufficient public infrastructure if there is a lack of adequate planning and increased pressure on natural resources.

To contain the expected impacts on the population, it is important to develop as of now a management plan for the newcomers that integrate these elements.

### Cultural Resources

No archaeological site was observed nor mentioned by the communities in the study zone of the preparatory works. However, there is a certain number of sites of heritage and cultural interest, such as the site of the former village of Mamouroudou. The future mining plan could perturb sites of cultural value that are not yet known. Rio Tinto recognizes this and hence in the scope of the preparatory works, a complementary study will determine if the former village of Mamouroudou necessitates protective works. Moreover, the complementary characterization studies of the global project will include a characterization of the cultural heritage.

### Noise and Vibrations

Considering the relative distance of the villages from the components of the preparatory works, that is, the camp, access road and airstrip, the impact on the acoustic environment is estimated to be very low. The operation of an open mine and the operation of a railroad will considerably increase the level of noise and vibrations in the study area, notably for the villages near the perimeter of the mining concession. The choice of the railroad course, which is under study, is key in order to minimise the cumulative impacts related to noise and vibrations.

### Landscape

The development of the mining and related infrastructure plan will lead to important landscape changes. However, inventories of viewpoints from different observation stations are required beforehand.



**Environmental and Social Management Program (ESMP)**





## **7. ENVIRONMENTAL AND SOCIAL MANAGEMENT PROGRAM (ESMP)**

### **7.1 INTRODUCTION**

The Environmental and Social Management Program (ESMP) provides a structured framework for appropriately and proactively managing the social and environmental risks and impacts identified during evaluation of the preparatory works project, in order to reduce adverse effects on the host environment. The management program is designed as a dynamic process that will be implemented and updated throughout the overall Simandou project, from the planning phase through to facilities shutdown. It involves communication between Rio Tinto, its employees, local communities and the various interested parties.

For the purposes of this study, and as specified in International Finance Corporation (IFC) *Performance Standard 1*, the precision and complexity of this ESMP is proportionate to the risks and impacts of the preparatory works; consequently it will be developed further as the overall Simandou project becomes more clearly defined.

Measures and actions proposed in this ESMP will be undertaken within the framework of Rio Tinto *Policies, Strategies, Operational Guidelines and Work Procedures*, in compliance with IFC *Performance Standards* and the applicable Guinean laws and regulations.

The five sections below deal with the following topics: framework for implementation of environmental and social management; action plan, including plans for mitigating and improving the positive impacts and the specific plans; public consultation process and strategy for disclosing information; environmental and social surveillance and monitoring program; procedure for managing changes.

### **7.2 IMPLEMENTATION FRAMEWORK FOR ENVIRONMENTAL AND SOCIAL MANAGEMENT**

The structure for implementing the ESMP and the system for managing Health, Safety, Environment and Community (HSEC) are already in place as part of the Rio Tinto management structure. They will therefore be fully operational for managing activities connected with preparatory works for the Simandou project.

#### **7.2.1 Environmental and Social Management Unit (ESMU)**

Rio Tinto has set up an Environmental and Social Management Unit (ESMU) to manage the development and implementation of the Simandou project. This ESMU will enable environmental and social considerations to be integrated with all Rio Tinto activities, thereby ensuring coherent coordination of all measures optimizing or mitigating potential risks and impacts, specific action plans and the environmental and social surveillance and monitoring program.

The organizational structure of the ESMU is shown in Figure 7.1. Rio Tinto will work closely with national agencies, decentralized bodies and local organizations. To facilitate this collaboration, two monitoring committees have been set up at the local and national levels.

The National Environmental Impact Assessment Monitoring Committee, set up recently, will involve high-level Guinean executives from ministries, organizations and institutions

connected with the Simandou project (see Figure 7.1) in coordinating and carrying out the impact study. The local committee is currently being created. The objectives of the National Monitoring Committee are to:

- Support Rio Tinto in coordinating and carrying out the SEIA;
- Forge an effective, regular link with the administrative and political authorities involved to guarantee that the study is transparent and respects local laws, cultures, traditions, customs and practices;
- Help Rio Tinto to identify the necessary national expertise;
- Approve information and circulate it to the decentralized authorities concerned;
- Sensitize ministries about the issues and opportunities associated with the project;
- Build the committee members' capacity to handle impact studies.

The National Committee will meet at least twice a year and continue to operate until the SEIA has been accepted. If necessary, sub-commissions or secondary workgroups can be created to introduce other government departments not represented on the committee, for example the Ministry of Transport. Rio Tinto will call the meetings, provide secretarial services and circulate information to committee members. A Local Environmental and Social Monitoring Committee will be set up for the Simandou project, involving the Prefect and Prefectural Directors concerned as well as community liaison officers. This committee will monitor the application of the proposed mitigation measures, action plans and monitoring program, and act as interface between the local population and Rio Tinto.

The Director of HSEC (or HSEC Assistant) is Rio Tinto's representative on the ESMU. Assisting the HSEC Director are four coordinators, each covering a particular area of expertise: environment, community, regional development, and health and safety. Their job will be to coordinate activities in their respective field with local authorities and communities, and report back to the HSEC Director.

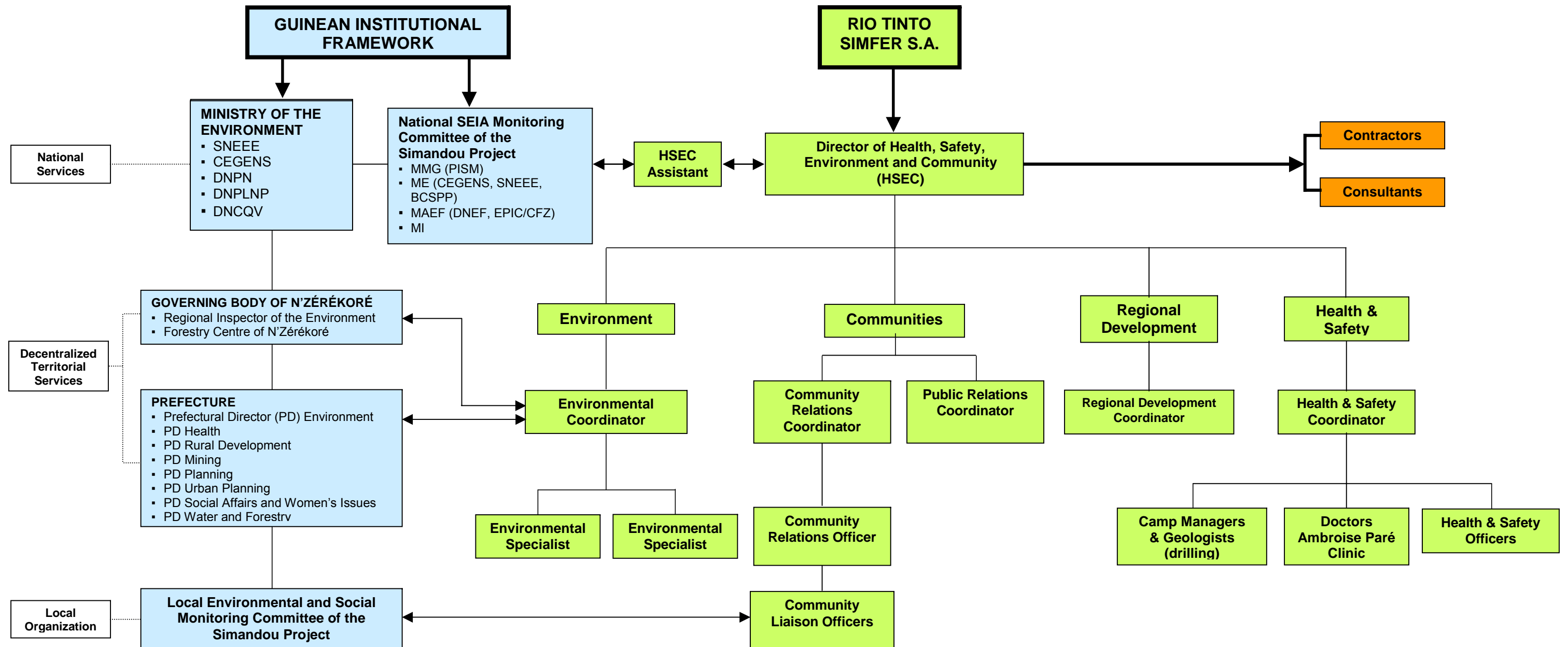
The coordinators will be assisted by environmental specialists, community relations or liaison officers as well as health and safety officers. These are the people who will ensure that ESMP actions are implemented.

Hiring and managing of contractors are governed by the *Operational Guideline – Contractor Management*. Rio Tinto is responsible for ensuring that its contractors have the necessary qualifications to execute the contract. All contractors are responsible for carrying out the work in compliance with the Simandou HSEC Management System. To ensure compliance, the contractor has to appoint an officer responsible for health and safety issues. Agreements with the contractor will include clauses ensuring compliance with the Rio Tinto HSEC Management System.

Responsibility for implementing the ESMP rests, initially, with the Director of HSEC. The roles, responsibilities and powers of each member of the ESMU will be clearly defined. Adequate support in terms of human and financial resources will be constantly available to ensure the proper standard of environmental and social performance.

Rio Tinto will provide the necessary financing for the operation of the local and national environmental and social monitoring committees of the Simandou Project.

Figure 7.1 Proposed Flowchart of the Social and Environmental Management Unit for the Simandou Project





### 7.2.2 Building Organizational Capacity

Rio Tinto will verify, with internal audits among others, how well its personnel discharge their responsibilities as regards health, safety, environment and community. If necessary, training will be provided to ensure personnel and contractors perform to the required standard.

Before taking up their duties, all new Rio Tinto employees, contractors and contractors' employees will undergo orientation and induction training in accordance with the *Operational Guideline – Visitor, New Employee and Contractor Induction Procedure*, introducing them to the Simandou HSEC Management System. This introduction, which is site-specific, addresses topics such as existing infrastructures, means of communication, safety, emergency procedures, medical services and risk management. The induction process for new employees and contractors also includes management of key risks for HSEC. This training is updated at least every four years.

All new employees and contractors receive a copy of the *HSEC Management System Preparatory Manual* before starting work. Rio Tinto has developed the Simandou Discovery System for circulating HSEC documents to employees and contractors; these documents include *Operational Guidelines and Work Procedures*.

Rio Tinto will also analyze the specific training needs of its personnel and contractors for implementation of the HSEC Management System, based on performance. Each employee's HSEC performance is tracked using the *Operational Guideline - Personal Improvement Plan (PIP)* and the *Operational Guideline - Short Term Incentive Plan Programs (STIP)*. These programs link HSEC performance directly with employee remuneration. HSEC performance monitoring of contractors is subject to the *Operational Guideline – Contractor Management*.

Training needs are determined according to people's individual roles and their exposure to risk. Rio Tinto will develop and apply the necessary HSEC modules/programs. If Rio Tinto does not already have the necessary expertise to develop a particular training program, HSEC personnel will hire an appropriate external resource. Training and teaching materials will be in the appropriate language, to ensure they are fully understood by employees. Records will be kept of training programs and participant lists. Project training needs will be periodically updated.

In order to ensure transparent and effective collaboration on the environmental and social management of the Simandou Project, Rio Tinto will also take into account the training requirements of the prefectural and national technicians, as well as those of the members of the national and local monitoring committees of the project.

### 7.2.3 Simandou HSEC Management System

Rio Tinto has put in place a specific health, safety, environment and community (HSEC) management system for the Simandou project. This system is ISO 14001 certified. It comprises a combination of *Policies, Strategies, Operational Guidelines and Work Procedures* applying both to Rio Tinto personnel and its contractors, and provides the framework for implementing the ESMP for the Simandou project. The system is designed to ensure responsible, effective and dynamic management of risks and impacts associated with Health, Safety, the Environment and the Community.

## □ Operational Guidelines – Simandou HSEC Management System

Environmental and social management will be a central concern for Rio Tinto throughout the Simandou project, involving the planning, construction, exploitation, monitoring and improvement phases. The *Operational Guideline – Simandou HSEC Management System* is designed to adapt to the nature and scale of the various components of the project and is proportional to the degree of social and environmental risks and impact associated with the various aspects of the project.

The Simandou HSEC management system is subject to a procedure undergoing continuing performance improvement. Development of the Environmental and Social Management Program, which comprises specific action plans and the surveillance and monitoring program, is based on assessing potential social and environmental risks and achieving objectives and targets that are regularly reviewed. Rio Tinto has a process of continuous performance improvement that is updated annually.

Applying its *Operational Guideline – Document Control Approval*, Rio Tinto systematically manages all documentation connected with the Simandou HSEC Management System.

## □ Specific Operational Guidelines

Rio Tinto has also developed a series of specific *Operational Guidelines* covering the responsibilities involved in planning each work activity and *Work Procedures* describing in detail the context in which employees or contractors should specifically perform a task or activity in order to manage and control HSEC hazards. *Operational Guidelines* and *Work Procedures* will be periodically updated.

Table 7.1 sets out the elements in the *Operational Guidelines* that apply to the preparatory works, both during construction and operation.

**Table 7.1 Elements of Rio Tinto Operational Guidelines Applicable to Preparatory Works**

Rio Tinto Operational Guideline	Activity	Elements
<b>Earthmoving equipment (HSEC-SIM-PRO-040)</b>	Applicable to construction of all three project components	<ul style="list-style-type: none"> <li>Clean-up procedures for fuel and oil spillage will be put in place.</li> </ul>
<b>Explosives (HSEC-SIM-PRO-046)</b>	Construction of access road	<ul style="list-style-type: none"> <li>Ensure compliance with relevant regulations.</li> <li>To prevent people from penetrating hazardous zones during blasting operations, lookouts must be posted around the area of operations, warning flags must be flown and conspicuous notices must be posted at points around the area.</li> </ul>
<b>Ground disturbance (HSEC-SIM-PRO-086) cont'd</b>	Applicable to construction of all three components	<ul style="list-style-type: none"> <li>Stockpiled topsoil and plant material should be used in rehabilitation.</li> <li>When clearing, the machine blade should be left above ground level to minimise soil disturbance.</li> <li>Avoid using creek floors as tracks, although in extremely steep rocky terrain a creek bed may be the best option.</li> <li>Where public access is a risk, warning signs should be erected near excavations greater than 1 meter deep.</li> </ul>

Rio Tinto Operational Guideline	Activity	Elements
<b>Ground disturbance (HSEC-SIM-PRO-086)</b>		<ul style="list-style-type: none"> <li>Sloping trenches need drainage or soil stabilisation to prevent soil erosion at the lower end of the trench.</li> <li>Construction should be across, rather than down, slopes to minimise erosion.</li> <li>Rehabilitation of disturbed ground should commence as soon as possible.</li> </ul>
<b>Aviation (HSEC-SIM-PRO-028)</b>	Operation of the airstrip	<ul style="list-style-type: none"> <li>Flight times must be planned to avoid disturbing local communities as much as possible.</li> <li>If excessive dust is generated during take off and landing, consider suppressing dust with water if practicable.</li> <li>Fly at an elevation that will least disturb the local population and avoid flying directly over populated areas.</li> <li>Avoid activities close to sites of human activity.</li> <li>Fly at an elevation that will not disturb sensitive animal species (avoid low flights over densely forested areas and bodies of water).</li> </ul>
<b>Camp management (HSEC-SIM-PRO-082)</b>	Applicable to construction and operation of the camp	<ul style="list-style-type: none"> <li>Minimise the amount of ground disturbance carried out during camp construction.</li> <li>No living fauna or flora species (including viable seeds) will be intentionally brought or relocated to camps or worksites where they may be alien to the receiving environment.</li> <li>Sewers and wastewater from sanitation facilities must be disposed of in a location and manner that will minimise health risks to camp occupants and others, and also minimise the extent of pollution of surrounding surface and ground water.</li> </ul>
<b>Hydrocarbon management (HSEC-SIM-PRO-051)</b>	Construction of all three project components and operation of the camp and airstrip	<p><b>Transportation of Hydrocarbons</b></p> <p>a) When transporting over 1,000 litres of gas oil / diesel fuel in jerry can-type drums or other approved containers on public roads:</p> <ul style="list-style-type: none"> <li>vehicles must be roadworthy and licensed. Must also be fitted with gates and sides adequate for storing drums and other approved fuel containers;</li> <li>drum stacks must be secured against vertical and horizontal movement;</li> <li>vehicles must carry the appropriate type and size of fire extinguishers;</li> <li>Emergency Procedure Guidelines and detailed shipping documents must be on-board and clearly visible;</li> <li>vehicle must have appropriate signage for substances carried.</li> </ul> <p>b) When transporting between 200 and 1000 litres of unleaded gasoline or diesel:</p> <ul style="list-style-type: none"> <li>drum stacks must be secured against vertical and horizontal movement;</li> <li>vehicle must carry a foam fire extinguisher;</li> <li>vehicle must carry a copy of the Incident Management Plan;</li> <li>vehicle must have appropriate signage for the substance carried;</li> <li>All staff and contractors while travelling on any road will follow these guidelines. This includes both official roads and all exploration and private tracks/roads.</li> </ul>

Rio Tinto Operational Guideline	Activity	Elements
Hydrocarbon management (HSEC-SIM-PRO-051) cont'd		<p><b>Storage</b></p> <ul style="list-style-type: none"> <li>Storage areas at camps will be located a safe distance from accommodation facilities and sensitive environments such as bodies of water.</li> <li>Drums should be laid on their sides with plugs in horizontal position.</li> <li>Bunding of long-term storage areas will require that bunds have the capacity of 25% of the total volume stored at any time, or 110% of the largest container, whichever is greater.</li> <li>MSDS sheets must be on site and stored in a designated area (safety folder) and available for all hazardous materials on site.</li> <li>Spill kits must be available at all fuel storage areas and should be used in the event of a spill</li> </ul> <p><b>Use</b></p> <ul style="list-style-type: none"> <li>When refuelling service vehicles and generators outside of designated bunded or concrete pads, permanent drip trays must be used where possible.</li> </ul> <p><b>Management of Waste Oil</b></p> <ul style="list-style-type: none"> <li>At campsites, waste oil drums or containers must be located in a bunded area clearly designated "Waste Oil Only". These drums are to be used for the disposal/storage of any waste oils.</li> <li>Funnels must always be used to prevent spillage when transferring waste oil into the drums. Oil filters should also be emptied into the waste oil drums.</li> <li>When nearly full, the drums should be disposed of at approved waste oil disposal sites.</li> <li>All empty fuel and oil drums must be re-used or delivered to the nearest authorised land fill.</li> </ul> <p><b>Hydrocarbon Spill Response</b></p> <ul style="list-style-type: none"> <li>All spills must be reported.</li> <li>For spills greater than 1 litre, an Incident Report must be completed.</li> <li>Basic response and remedial action is Control, Contain and Clean up.</li> <li>For minor spills (less than 100 litres) follow guidelines defined in the operational guidelines.</li> <li>For major spills (over 100 litres), follow procedures outlined in the Incident Management Plan.</li> <li>Periodically review the Incident Management Plan to determine its effectiveness and relevance.</li> </ul>



Rio Tinto Operational Guideline	Activity	Elements
<b>Waste Management (HSEC-SIM-PRO-064)</b>	Construction and operation of the three project components	<p><b>General</b></p> <ul style="list-style-type: none"> <li>• Develop, document and maintain a characterisation of the environmental hazards and risks associated with non-mineral wastes.</li> <li>• Develop and maintain a documented inventory of non-mineral wastes generated or received and disposed on or off-site.</li> <li>• Develop and implement a Non-Mineral Waste Management Plan.</li> <li>• Ensure that non-mineral wastes are segregated upon generation and that wastes awaiting further treatment, transport or disposal are securely contained and monitored.</li> <li>• Maintain operational procedures and effective controls for safe handling, on- and off-site transportation, storage and disposal of non-mineral wastes commensurate with their degree of hazard and compatibility.</li> <li>• Maintain records of all wastes sent off-site, and a documented inventory and location of on-site waste landfills and storage areas.</li> </ul> <p><b>Camps</b></p> <ul style="list-style-type: none"> <li>• No waste should be left in the field; it must all be brought back for appropriate disposal at camp.</li> <li>• Non-biodegradable waste (plastic, metal, batteries, glass) is to be collected, stored and transported to an authorized site for disposal or recycling.</li> <li>• Non-biodegradable waste must not be burned or buried.</li> <li>• Burning waste must only be carried out under tightly controlled conditions.</li> <li>• Hydrocarbon waste will be stored and disposed of separately from other wastes.</li> <li>• When transporting waste, ensure it is bagged and properly sealed to ensure that no waste or litter escapes the vehicle during transit.</li> </ul>

### 7.3 ACTION PLAN

The Action Plan is designed to ensure optimal management of the environmental and social risks and impacts identified in the social and environmental impact assessment of the preparatory works. It comprises the impact and risk mitigation and improvement plan targetting compliance with the applicable laws and regulations, and IFC Performance Standards, as well as the Rio Tinto HSEC reference framework for the project. The Action Plan also includes a series of specific plans targetting among others compliance with the provisions of the IFC Performance Standards.

Information about the impact and risk mitigation and improvement plan was communicated to the communities affected, at the impact assessment workshop held in Beyla on December 19, 2006. The measures and actions in this plan address the concerns expressed during this consultation.

Periodic progress reports or newsletters on the implementation of the action plans will be given to the communities, in a form accessible to them.

Note that a number of the elements in the action plan below deal with the overall management framework, which applies not only to preparatory works but to the Simandou project as a whole.

### **7.3.1 Risk and Impact Mitigation and Improvement Plan**

In view of the fact that the preparatory works may increase potential exposure of local communities to risks and impacts resulting from equipment failures or pollutant emissions, and may affect the natural resources necessary for these communities' subsistence, or increase their exposure to disease, Rio Tinto has developed a Mitigation Plan to ensure proper management of the negative impacts and risks associated with the project (see Table 7.2). Optimization or improvement measures are also proposed within the framework of this plan, to enhance the environmental and social performance of the project.

In accordance with IFC *Performance Standard 4 – Community Health, Safety and Security* and *Performance Standard 3 – Pollution Prevention and Abatement*, the plan will seek to prevent or reduce risks and impacts as regards the health, safety and protection of the community and its environment, arising from the preparatory works. This action plan promotes first and foremost the prevention and avoidance of risks or impacts. Where they are unavoidable, measures will be applied to minimize or reduce them.

The various measures proposed in sections 4.4 (camp), 5.3 (landing strip) and 6.8 (Ouélabá access road) are summarized in Table 7.2, comprising the Mitigation Plan and improvement measures for the risks and impacts. Responsibility for implementing the measures and estimating the costs (where they are not included in Rio Tinto construction and operation budgets) are shown for each measure.

The surveillance and monitoring program (see section 7.5) will enable us to gauge the effectiveness of the mitigation and improvement measures and if necessary, modify, suspend or replace some of them.

### **7.3.2 Compensation Framework**

In order to reduce, compensate for and mitigate the impacts on people affected by the Simandou project, Rio Tinto will implement a Compensation Plan. This plan sets out measures to be taken to indemnify individuals whose property and land will be utilized by the project or whose property is no longer economically viable. It also describes the measures for compensating individuals who lose assets and as a result are deprived of a source of income or means of subsistence, following land acquisition associated with the project.

An evaluation mission in December 2006 enabled the footprints of planned infrastructures to be optimized and a compensation framework to be developed for the Simandou project preparatory works. This initial phase provided the opportunity to establish compensation scales, visit the parcels of agricultural land that will be affected, and hold consultations about the compensation strategy with the affected population.

**Table 7.2**                      **Responsibility for Executing and Estimating Cost of Mitigation Plans and Improvement Measures for Risks and Impacts of the Preparatory Works**

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This compensation framework was developed in accordance with IFC *Performance Standard 5 – Land Acquisition and Involuntary Resettlement*, World Bank *Operational Policy 4.12 - Involuntary Resettlement* and the IFC *Handbook for Preparing a Resettlement Action Plan*. It will serve as a basis for the overall Simandou project.

Throughout the Simandou project, Rio Tinto will endeavour to minimize involuntary resettlement and land acquisition wherever possible, by exploring alternative solutions or optimizing footprints. Where resettlement or acquisition proves unavoidable, Rio Tinto will mitigate the negative social and economic impacts by providing compensation for loss of assets at full replacement value, and by improving, or at the very least restoring, the means of subsistence and standard of living of the people involved. Before undertaking any resettlement or compensation, Rio Tinto will consult with the populations involved.

### 7.3.2.1 Property Evaluation Principles and Compensation Scales

The principles shown below stem from the preliminary study on compensation for preparatory works (Jay & Giovannetti, 2006).

#### □ Cultivable Land

As in most rural areas, land required for the preparatory works has no ownership title, and will therefore not be compensated for or evaluated.

Compensation will be paid for land that has been developed for agricultural purposes (cleared and/or ploughed), to the recognized user, for the clearing and/or ploughing work, on a flat-fee basis per hectare. This compensation was determined using information supplied by Mr. Sangaré of the Beyla Agricultural Department and based on the number of days required for the work concerned and minimum daily wages (Table 7.3).

**Table 7.3 Compensation Scales for Land Development Work in Beyla Region (2006)**

Type of crop	Number of person-days/ha	Cost of one day's work in GNF	Cost/ha in GNF	Cost/ha in US\$
Hill fields	20	15,000	300,000	50
Flat fields	30	25,000	750,000	125

Source: Jay & Giovannetti, 2006.

Works or infrastructures other than buildings located on the land (canals, small dikes, wells) will be assessed case by case, at the full replacement value determined by consulting local companies that carry out this type of work.

Compensation will not be paid for fallow land. This comes under the following category (natural resources and bush).

## □ Natural Resources and Bush

Uncultivated land, including fallow land, will be compensated for on a purely communal basis. There will be no individual compensation for this land, including fallow land, even if it is held individually. Compensation will be in kind, in the form of materials or assets usable at the community level (e.g. sacks of cement, metal sheets).

Compensation rates for the area occupied or acquired by Rio Tinto will be determined in the following manner:

- Ascertain the average yield of bush zones (construction wood, charcoal, medicinal plants, hunting, etc.) and the resulting income;
- Apply this annual average income per hectare to the duration for which the zone will be occupied (if occupation is temporary) before it is rehabilitated and restored to the community; if occupation is permanent, the average annual income per hectare is applied to the time taken to reconstitute such vegetation in another bush zone (5 years seems an appropriate standard).

Forest trees used for cultivating wood, e.g. *Mitragina stipulosa* (Popo) and Yoroko, will be compensated for, based on the actual volume of wood, with a minimum volume of 2 m<sup>3</sup>. Based on preliminary consultation with affected villages, the price per m<sup>3</sup> of wood is estimated as follows (Jay & Giovannetti, 2006):

- *Mitragina stipulosa* (Popo): 40,000 GNF
- Yoroko: 60,000 GNF

Evaluating trees in the bush belonging to the community and used for firewood, medicines or other purposes is a complex matter. This usually has to be negotiated with the population, using compensation in kind (e.g. sacks of cement for a cereal bank, assistance with drinking water supply).

## □ Buildings and Commercial or Artisanal Activities

The preparatory works is not expected to involve demolition of homes or to affect commercial activities. However, the compensation scales for the overall project are as follows:

- All types of buildings: these will be assessed case by case by a professional evaluator, based on a price schedule and on-site measurements. No age-related depreciation coefficient will be applied to meet the "full replacement value" requirement;
- Moving: moving costs will be covered by Rio Tinto, preferably in kind with the provision of suitable vehicles allowing residents to transport their personal effects and any materials recovered from their former homes;
- Commercial and artisanal activities: commercial and artisanal activities affected will be the object of monetary compensation to offset loss of income during the period required to re-establish the activity at a new location. Income from each activity will be evaluated case by case. Because these are informal activities unlikely to have accounting records, income will be determined by interviewing the operator directly and asking them to provide proof (cost of supplies, average price of items purchased and sold, etc.). Employees will receive compensation

based on a month's salary, except in special cases where the period taken into consideration may be longer.

#### □ Annual Crops

Annual crops will be compensated for as follows: the yield observed in the zone as speculated for a good farming year, and the market price for the lost harvest, will be applied to the area involved. Market price will be doubled to cover year-to-year fluctuations and compensate for a potentially smaller harvest on the new land.

Table 7.4 shows the 2006 compensation scale for annual crops, based on yields discussed with the people in charge of the agriculture and forestry departments and the prices quoted by them and verified on the Beyla market. In view of the frequent depreciation of the Guinean franc, these scales must be updated at least twice a year. Yields shown are for single crops, although mixed crops are fairly common (e.g. corn or millet with cowpea).

#### □ Perennial Crops

In calculating the full replacement value for perennial crops, we have to take into account not only the crop yield for one year, but also the cost of re-establishing the plantation (seedlings, labour, fertilizer and other items), as well as income lost during the years it takes to re-establish the crop.

**Table 7.4 Compensation Scales for Annual Crops, Beyla Region (2006)**

	Yield (tonnes/ha)	Market price (GNF/kg)	Compensation (GNF/m <sup>2</sup> )	Compensation (US\$/m <sup>2</sup> )
Paddy rice	4 (flat field)	2,300	920	0.15
	2 (hill field)	2,300	460	0.07
Corn	3	1,800	540	0.09
Pearl millet	1	2,250	225	0.04
Fonio	1.5	1,400	210	0.03
Cowpea	1.5	5,000	750	0.12
Peanut	1	2,250	225	0.04
Cassava	5	2,000	1,000	0.17
Taro (cocoyam)	5 (small taro)	2,500	1,250	0.21
	8 (large taro)	2,500	2,000	0.34
Yam	10	3,000	3,000	0.5
Sweet potato	4	2,000	800	0.13
Okra	12	4,000	4,800	0.8
Eggplant	20	1,500	3,000	0.5
Pepper	5	8,000	4,000	0.68
Tomato	10	2,500	2,500	0.42

(GNF = Guinean Franc) Source: Jay & Giovannetti, 2006.

Compensation rates were calculated on the basis of full replacement value, using the following formula:

$$C = V \times D + CP + CL$$

where

- C is compensation amount;
- V is average commercial value of yield from one tree in GNF/year;
- D is average duration in years for re-establishing tree at adult yield level;
- CP is cost of planting (seedling, soil work, initial fertilization);
- CL is labour cost for planting and maintenance while plantation is being re-established.

For the main fruit crops observed during the December 2006 site mission, compensation amounts were determined as indicated above. The results are shown in Tables 7.5 and 7.6.

### 7.3.2.2 Compensation for Preparatory Works

The preparatory works does not require resettlement of homes; only land acquisition is involved. The strategy for compensation and the compensation scales described above were discussed during a preliminary consultation with villagers affected by the Ouéléba (Moribadou) access road and the landing strip (Kéoulendou). They appeared to agree with the strategy but will have to be consulted again once a precise evaluation of the land and trees affected by the preparatory works has been completed.

Briefly, the proposed compensation in connection with the preparatory works is as follows:

- For uncultivated fallow hillside land: no compensation, since there is no development and other land is available;
- For uncultivated fertile fallow flat land: payment for the required work to clear and develop a new flat area;
- For prepared fallow land: payment for the work done;
- For hill fields under cultivation: payment for work done and crops;
- For flat fields under cultivation where the harvest is underway: payment for the yield and the work required to clear and develop a new flat field. If it is impossible to replace the flat field within the same zone, it is suggested that alternative solutions be sought. If this is not possible, we suggest paying the equivalent of 5 to 6 years' yield, so that people are able to intensify production (purchase ploughs, improved seeding) or invest in other economic activities (purchase livestock, processing of products);
- For fruit trees: payment according to the scale shown;
- For useful bush trees: payment in kind to the community, if village leaders agree.

**Table 7.5 Compensation Scales for Perennial Crops, Beyla Region (2006)**

Type of plantation	Average yield from mature tree (kg, litre or quantity/ tree)	Period with no yield (years)	Period from start of production to full maturity (years)	Market price (GNF per kg, per litre or per unit)	Income lost during period with no yield (GNF)	Income lost from start of production to full maturity (GNF)	Total income lost for fully mature tree (GNF)	Cost of seedling (GNF/ plant)	Value of labour required to re-establish tree until full maturity (GNF)	Age of fully mature tree (years)	Compensation rate - Seedling (GNF)	Compensation rate - Young unproductive tree (GNF)	Compensation rate - Young productive tree (GNF)	Compensation rate - Fully mature tree (GNF)
Grafted mango	80	4	3	1,500	480,000	180,000	660,000	7,000	15,000	7	7,000	262,000	622,000	682,000
Ungrafted mango (1)	200	4	3	700	560,000	210,000	770,000	6,000	15,000	7	6,000	291,000	721,000	791,000
Selected palm	10 litres	4	2	6,000	240,000	60,000	300,000	6,500	10,000	6	6,500	136,500	286,500	316,500
Wild palm	8 litres	6	3	6000	288,000	72,000	360,000	5,000	10,000	9	5,000	159,000	323,000	375,000
Raffia palm (2)	15 props	7	3	2,000	245,000	45,000	290,000	0	0	10	0	90,000	225,000	290,000
	fruits			20,000	140,000	30,000	170,000					60,000	150,000	170,000
	200 litres of wine			400	560,000	120,000	680,000					240,000	600,000	680,000
Cola nut	400 nuts	6	6	300	720,000	360,000	1,080,000	6,000	15,000	12	6,000	561,000	861,000	1,101,000
Orange	60	3	3	800	144,000	72,000	216,000	7,000	15,000	6	7,000	118,000	166,000	223,800
Banana	15	1,5	-	1,000	22,500	-	22,500	7,000	4,000	2	7,000	26,000	33,500	33,500
Plantain	20	1,5	-	1,500	45,000	-	45,000	7,000	4,000	2	7,000	41,000	56,000	56,000
Avocado	60	3	3	1,500	210,000	105,000	315,000	7,000	10,000	6	7,000	157,000	227,000	332,000
Cashew	10 kg	3	3	6,000	180,000	90,000	270,000	6,000	15,000	6	6,000	141,000	201,000	291,000
Coffee	3	3	3	5,000	45,000	22,500	67,500	7000	10,000	6	7,000	47,000	62,000	84,500
Locust bean	60 kg	5	15	2,000	600,000	900,000	1,500,000	5,000	-	20	5,000	365,000	1,205,000	1,505,000

Source: Jay &amp; Giovannetti, 2006.

- 1) Yield from an ungrafted mango tree may be larger, but only part of it is assumed to be collected.
- 2) For religious reasons, raffia wine is not usually harvested here.

**Table 7.6 Compensation Scales for Perennial Crops, Beyla Region – Summary Chart**

	Compensation rates per unit in Guinean francs (2006)				Compensation rates in US dollars (2006)			
	Seedling	Young unproductive tree	Young productive tree	Fully mature tree	Seedling	Young unproductive tree	Young productive tree	Fully mature tree
Grafted mango	7,000	252,000	602,000	682,000	1.17	42.00	100.33	113.67
Ungrafted mango	6,000	291,000	721,000	791,000	1.00	48.50	120.17	131.83
Selected palm	6,500	136,500	286,500	316,500	1.08	22.75	47.75	52.75
Wild palm	5,000	159,000	323,000	375,000	0.83	26.50	53.83	62.50
Raffia palm	0	(props) 90,000	225,000	290,000	0.00	15.00	37.50	48.33
		(fruits) 60,000	150,000	170,000	0.00	10.00	25.00	28.33
		(wine) 240,000	600,000	680,000	0.00	40.00	100.00	113.33
Cola nut	6,000	561,000	861,000	1,101,000	1.00	93.50	143.50	183.50
Orange	7,000	118,000	166,000	223,800	1.17	19.67	27.67	37.30
Banana	7,000	26,000	33,500	33,500	1.17	4.33	5.58	5.58
Plantain	7,000	41,000	56,000	56,000	1.17	6.83	9.33	9.33
Avocado	7,000	157,000	227,000	332,000	1.17	26.17	37.83	55.33
Cashew	6,000	141,000	201,000	291,000	1.00	23.50	33.50	48.50
Coffee	7,000	47,000	62,000	84,500	1.17	7.83	10.33	14.08
Locus bean	5,000	365,000	1,205,000	1,505,000	0.83	60.83	200.83	250.83

Source: Jay &amp; Giovannetti, 2006.

1 US dollar = 6,000 GNF

### 7.3.2.3 Other Steps in Implementing the Compensation Plan for Preparatory Works

The next steps for implementing compensation by Rio Tinto for the preparatory works are as follows:

- Define the boundaries of areas affected by the preparatory works, identify the owners and calculate the exact compensation amounts. This will be undertaken by Mr. Sangaré, head of the Beyla agricultural department, accompanied by two people from Rio Tinto (community development officer and civil engineer), and villagers.
- Report to the population about the defining of boundaries and discuss compensation.
- Set up the Compensation Validation Commission, comprising the prefect of Beyla, who will act as chair, a representative from Rio Tinto, representatives from the villages concerned and a civil representative (NGO or religious).
- This commission will validate the surveys and compensation amounts.
- The commission will travel to sites and villages.
- A Rio Tinto official and Mr. Sangaré will make a presentation to each entity affected (household or village) about the compensation planned, case by case, in the presence of the Commission.
- Compensation agreements will be signed in the presence of the Commission or one of its representatives.
- Rio Tinto will implement compensation prior to the start of the preparatory works.

Throughout the compensation process, the communities concerned will be able to use the grievance process, as described in section 7.3.9.

### 7.3.3 Biodiversity Action Plan

Rio Tinto is well aware that the Simandou project lies in a zone of significant biodiversity<sup>1</sup> and that conservation of this zone is paramount for the region's sustainable development. The company therefore intends to employ its strategy for a positive overall outcome in terms of biodiversity, in accordance with IFC *Performance Standard 6 – Biodiversity Conservation and Sustainable Natural Resource Management*, which reflect the objectives of the *Convention on Biological Diversity*.

Any mining operation can involve potential risks and negative impacts for the biodiversity of the host environment. Adding to these impacts are the effects resulting from the pressure associated with population growth. To ensure effective protection for the biodiversity of the Simandou region, the Biodiversity Action Plan must as far as possible take into consideration all threats to resources.

Rio Tinto intends to evaluate and closely monitor all of the project's risks and impacts for biodiversity. The company will initially try to avoid or minimize any impact on biodiversity. If some impact is unavoidable, Rio Tinto will provide compensation for persisting residual damage.

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<sup>1</sup> Components of biodiversity as defined in the *Convention on Biological Diversity* include ecosystems and habitats, species and communities, and genes and the genome, all of which are socially, economically, culturally and scientifically significant.

Among the specific actions possible are implementation of an impact mitigation program, a compensation program, and a support program, as well as a monitoring program for the Biodiversity Action Plan. These actions will aim to minimize the effects on biodiversity, restore disturbed areas, compensate for losses through on-site conservation, increase the actual level of protection of essential habitats in the Simandou region and secure a commitment from local communities regarding biodiversity protection. The objective will be to transform the negative outcome potential impacts into a positive overall outcome for the region's biodiversity in the short, medium and long term. The actions will be undertaken at every phase of development of the Simandou project, from the exploratory activities through to mine site closure.

These measures will be analyzed and developed in conjunction with a Simandou Biodiversity Management Committee (in the planning stage) comprising national organizations dedicated to protecting biodiversity (CEGENS, Forestry Centre of N'Zérékoré) and working in partnership with national organizations such as Guinée Écologie, Conservation International, Fauna and Flora International, Birdlife International, Royal Botanic Gardens Kew, Earthwatch, Conservation Volunteers Australia, etc.

Rio Tinto will also consider working in partnership with the Business and Biodiversity Offset Program (BBOP). Supported by Forest Trends and Conservation International, the BBOP comprises an advisory committee with delegates from 18 international organizations, including experts in the natural sciences, sociology and economics. It is building up a portfolio of development projects (private or public) demonstrating that zero net loss in biodiversity is achievable, developing guidelines for setting up compensation mechanisms, and helping to develop compensation policies. BBOP participants benefit from the experience and knowledge of the advisory committee and pilot projects to offset biodiversity losses effectively, at both the economic and biological levels.

#### □ Knowledge Acquisition Program

##### Additional studies of habitats and fauna and flora resources

The few studies carried out for the preliminary project (Rapid Biological Assessment of the Pic de Fon Classified Forest, Rapid Biological Assessment of Mounts Béro, Diéké and the Déré Classified Forest, Vegetation Study by RBG Kew, etc.), have given us better baseline knowledge of the biodiversity of the Simandou region for selected taxonomic groups. We are now more familiar with the region's biodiversity, the endemism of certain species and the special features of the ecosystems there.

However, these studies must be regarded as prospective, because they give a preliminary picture of the region's biodiversity. They will also enable basic maps of animal and plant habitats and species to be drafted, with special reference to rare (particularly endemic) or endangered species, and allow a database of the region's biological resources to be compiled. These studies enable an initial assessment of species-rich locations and unique, endangered or critical habitats.

As part of the overall Simandou project, these preliminary studies will be followed up with detailed studies of the sites contemplated for mining operations, the route of the future railway and the location of the deepwater port. Studies of the Pic de Fon classified forest will continue and broaden in scope to include potentially rich locations such as primary forests, groups of organisms not covered by the preliminary studies, such as fish, and endangered species such as primates,



especially chimpanzees. There will be a special focus on species used by local populations and the degree of disturbance to forests. Additional studies that will be carried out in the classified forest of Pic de Fon will be done in collaboration with the Forestry Centre of N'Zérékoré.

In the port zone and along the railway route, vegetation and fauna, especially in mangrove forests and sensitive zones, will be characterized at the outset using satellite images and existing information, particularly that provided by the *Centre National des Sciences Halieutiques de Boussoira*, the *Centre de Recherche Scientifique Conakry-Rogbané*, the *Projet d'Observatoire de la Guinée Maritime* and information from the fishing population. If necessary, this information will be augmented with other field studies.

Rio Tinto will ensure that the additional studies allow the provisions of IFC *Performance Standard 6 - Biodiversity Conservation and Sustainable Natural Resource Management* to be addressed.

#### Inventory of resource use by local communities

No biodiversity protection measure is effective unless the local population is directly involved. We therefore need to ascertain the practices associated with natural resource use in the zone concerned and above all, what pressures the local communities exert on the environment. This information will be key for preparing a development and management plan for the Pic de Fon classified forest, the aim being to promote sustainable management and use of natural resources through approaches that integrate conservation needs and development priorities.

This means that activities engaged in (crops, planting, wood cutting, gathering, etc.) within the Pic de Fon classified forest have to be identified and quantified.

The use of resources from the classified forest of Pic de Fon discussed in the Socio-economic study carried out by Winrock International (2005a) in collaboration with the Forestry Centre of N'Zérékoré (CFZ) will be made profitable. The complementary studies will be carried out with the CFZ and CEGENS. Upon completion of the inventories and consultation with communities, a land-use map of the classified forest of Pic de Fon and the village land plots will be produced.

#### □ **Impact Mitigation Program**

As described in the Impact Mitigation and Improvement Program, mitigation measures for reducing risks and impacts on biodiversity and pressure on natural resources will be as follows:

- The commitment of Rio Tinto to minimize encroachment upon and disruption of the host environment;
- Restricting of deforestation to the minimum areas required;
- Reforestation with indigenous species in areas of temporary construction and areas disturbed by construction work;
- Prohibiting workers from exploiting natural resources or depending upon them for food or other purposes, through a worker awareness campaign.

Through its Environmental and Social Management Unit, Rio Tinto will ensure these measures are implemented during construction and operations on the Simandou project. The measures shown apply to the preparatory works.

#### □ **Compensation Program**

In accordance with IFC *Performance Standard 6*, Rio Tinto will implement a compensation program designed to achieve zero net loss of biodiversity. This program can be applied on a local or regional scale.

The field of compensatory habitats in biodiversity (biodiversity offsets) is still relatively unknown because it was introduced relatively recently. What we do know is that positive effects are not necessarily immediate but may materialize over a longer period. Rio Tinto therefore plans to work in partnership with national and international organizations devoted to biodiversity protection, in order to benefit from their expertise and know-how.

In terms of compensatory measures for loss of habitats and to ensure the Simandou project has a positive outcome for the region's biodiversity, Rio Tinto will consider means such as post-operational restoration of habitats, creation of compensatory habitats of ecologically equivalent biodiversity and compensation of direct users of biodiversity.

Rio Tinto will undertake progressive rehabilitation of the environment once mining exploitation has been completed, to enable vegetation to regenerate and restore the value of disturbed zones. A Rehabilitation Plan for mine exploitation areas will be developed in conjunction with the Biodiversity Management Committee and the authorities concerned, namely, the Forestry Centre of N'Zérékoré. This plan will contain details about land preparation, installation of topsoil, and seeding and planting with indigenous species, as well as monitoring of rehabilitated sectors.

In terms of compensatory measures for the overall Simandou project, Rio Tinto will develop habitats whose biodiversity is ecologically equivalent to that of the disturbed habitats, to ensure zero net loss. This may mean developing existing habitats or creating wooded corridors for communication or migration between the different essential habitats identified in the Pic de Fon classified forest and the surrounding or other areas. Rio Tinto will continue its collaboration with the Forestry Centre of N'Zérékoré in order to ensure that the mitigation program and management of the classified forest allow the use of these resources by local communities in a fashion which respects biodiversity.

Creating corridors is an ecoregional approach that offers a useful alternative where the fragmentation of forests has resulted in areas that are too small for the flourishing and survival of certain animal species that require wide open spaces. It also allows for movement of species and genetic exchanges. Involving the local population in managing natural resources along the developed corridors is an important factor in assuring the perennial nature of the corridors.

To compensate for and mitigate the impact on local communities affected by the loss of natural resources associated with the Simandou project, Rio Tinto will implement a Compensation Plan for direct users. The compensation framework (see section 7.3.2) deals with the principles and scales of compensation for natural resources (firewood, lumber, food, medicines, etc.). This is purely community

compensation paid in kind, in the form of materials or assets usable at the community level (e.g. sacks of cement, sheets of metal). This compensation will be approved by the Compensation Validation Commission.

#### □ **Support Program**

##### *Creation of a Regional Committee on Biodiversity Management*

For the biodiversity Action Plan to succeed, actions need to be implemented in a concerted manner by the various organizational entities involved in developing the Simandou zone and protecting biodiversity.

A committee to manage biodiversity on a regional scale is required, to ensure that representation of the organization responsible for each aspect of biodiversity to be addressed. This committee should be under the aegis of the *Centre de Gestion de l'Environnement des monts Nimba et Simandou* (CEGENS), which in Forest Guinea plays a central role in environment matters at the regional level. In addition to the CEGENS, this Committee should include representatives from the Forestry Centre of N'Zérékoré (CFZ), the offices of the Prefectural Director, Environment and Water and Forestry, NGOs working in biodiversity and representatives of the local population.

The goals and functioning of the committee will be defined at a biodiversity workshop planned for the second quarter of 2007.

##### *Building institutional capacities*

Since the Convention on Biological Diversity was introduced in 1993, it has become clear that there are major gaps in the knowledge of biodiversity among experts working at National Focal Points, especially in developing countries. Guinea is no exception; there are significant shortcoming in terms of identifying the components of biodiversity and biodiversity management. This is true at all levels of the government agencies applying the Convention as well as in private organizations providing external assistance.

The priority should be to ensure that organizations like the *Centre de Gestion de l'Environnement des monts Nimba et Simandou* (CEGENS), which acts as the Regional Focal Point for the biodiversity of Forest Guinea, and the Forestry Centre of N'Zérékoré, can benefit from a program to strengthen their competencies in:

- Preparing inventories of natural resources;
- Undertaking database management on a regional scale;
- Managing biodiversity and protected areas;
- Undertaking surveillance and monitoring of biodiversity and protected areas;
- Circulating information at the regional and national levels.

Strengthening of capacities should subsequently extend to NGOs in the region that are concerned about biodiversity. Eventually it should be possible for Guineans to train their own biodiversity specialists; this implies strengthening relations with universities such as the Centre d'Études et de Recherches en Environnement (CÉRE) at Université de Conakry, the department of biology at Université de Kankan, where a French organization (Appui à la Modernisation de l'Enseignement Supérieur

(AMES)) is currently setting up a master's program in biodiversity, and the Centre Universitaire de N'Zérékoré.

#### Preparation of a development and management plan for the Pic de Fon classified forest

To ensure sustainable development of the Pic de Fon and Pic de Tibé classified forests, a development and management plan will be prepared in conjunction with all the parties concerned through the Forest Resources Management Program (FRMP).

This plan will include:

- A zoning map of the classified forest (priority conservation zone, sustainable development zone, zone of connectivity between natural spaces, exploitation zone, etc.);
- Authorized or prohibited uses in each zone (cultivation, harvesting of wood and other resources, hunting, bush fires, ecotourism, etc.);
- Development or actions planned in the short, medium and long term, to foster maintenance and restoration of endangered resources (reforestation, clearing of firebreak zones, reintroducing indigenous species, etc.);
- Management procedures for the various zones;
- Surveillance and monitoring.

#### Reinforcement of biodiversity protection in classified forests

The proceedings of the Convention on Biological Diversity demonstrated that it would be impossible to save biodiversity on a planet-wide scale. Specialists concluded that we should start by protecting rich, potentially rich and endangered ecosystems. The same principle could be applied to the Pic de Fon and Pic de Tibé classified forests.

In partnership with the CEGENS and Forestry Centre of N'Zérékoré, we should therefore review zonings and current legal status, and ensure that in certain sectors featuring a high degree of biodiversity, the zoning offering the best legal protection for rich or endangered ecosystems is adopted. Support in the form of human resources (surveillance brigade) and financial help would strengthen the protection of these areas.

In other sectors of the classified forests, the local population should be assured access to the necessary resources for their individual needs, particularly as regards food and traditional medicines.

#### Education and awareness program

Because managing and protecting natural resources requires the participation of those using them, an awareness, information and education program will be developed and implemented for the people concerned. Involving local communities in executing the Biodiversity Action Plan is a good way of ensuring it is sustainable and effective. And their involvement will enable further resources to be mobilized, augmenting the efforts of government and Rio Tinto.

Due to poverty and ignorance, populations utilize natural resources in a non-sustainable manner. The program will therefore focus on using key components of

biological diversity in a manner and at a pace that does not result in their impoverishment in the long term, and safeguards their potential to satisfy the needs and fulfil the aspirations of present and future generations. The program will make a point of identifying and supporting activities or practices that enable these objectives to be attained. Among the themes the program could cover are:

- Basic knowledge of biodiversity;
- The cultural and social value of biodiversity;
- The wealth of forests and protected areas;
- Threats to biodiversity;
- Protection of species and their ecosystems;
- Sustainable use of natural resources;
- Activities posing a threat to the conservation of natural resources;
- The impact of the game trade and poaching;
- Alternative solutions ensuring the well-being of communities excluded from protected zones.

The education and awareness program will be adapted to the Simandou region and the practices of local communities as regards exploitation of natural resources and the protection of the ecosystems upon which they depend.

Similar awareness campaigns have been developed in recent years, for example the program developed by the Institut de l'Énergie et de l'Environnement de la Francophonie in conjunction with Université du Québec à Montréal (2002), which was tested in the Niger Republic and Vietnam, or the programs developed by BirdLife International and the Forest Resources Management Program (FRMP).

In general, the program could target all the local communities of the Pic de Fon classified forest, but specifically women and children, since they are the main parties who exploit the resources for food, medicines, dyes, firewood, and so on, as well as hunters and groups of hunters. In the longer term, student awareness programs can also be introduced at primary schools in villages across the Simandou region.

Graphic teaching materials (brochures, posters, videos or other items) will be used to facilitate identification of endangered species and cover the main reasons for their decline (burning, land reclamation, harvesting, etc.) and ways of protecting these species and their habitats.

Potential partners for this education and awareness program include local NGOs, Guinée-Écologie and the Centre de Conservation des Chimanzés (CCC) de la Guinée (chimpanzee conservation centre).

### Support for sustainable development

One of the objectives of IFC *Performance Standard 6* is to promote the management and sustainable use of natural resources by adopting approaches that integrate conservation needs and development priorities.

The sustainable benefits obtainable from nature depend on maintaining the balance between economic needs and preserving the ecological stability of ecosystems. That is why collective and individual measures for conservation and use of biological resources have to be reinforced, and support has to be provided for alternative solutions ensuring the well-being of communities excluded from protected zones.

One solution to investigate would be developing ecotourism in the protected areas, by involving local communities in setting up ecotourism projects, and protecting and managing them. Ecotourism sightseeing (viewing fauna, flora and landscapes) can generate substantial income for local populations and for the management of protected areas.

#### □ **Monitoring Program for the Biodiversity Action Plan**

Periodic monitoring will be undertaken to track the evolution of biodiversity in the Simandou region. This monitoring program will be defined by the Biodiversity Management Committee.

To enable the results to be compared and allow for tracking of biodiversity within the zone, the same inventory method will be used from one year to another. A database will be compiled of the results and serve as a tool for orientation and planning of the measures in the proposed Action Plan. An annual monitoring report will be produced and submitted to the authorities concerned upon request.

If necessary, additional assistance will be provided with scientific monitoring of species and ecosystems as well as census methods, to enhance local and regional competencies.

### **7.3.4 Community Development Plan**

The Simandou project will generate substantial advantages for local communities, particularly as regards opportunities for economic and social development. Rio Tinto intends to create openings allowing the local population to become involved and derive benefit from the project, in order to fulfil their aspirations for sustainable economic and social development.

The community development approach is regarded as an effective way of reducing rural poverty through decentralization, community empowerment, improved access to services and increased income for poor rural inhabitants.

Mining projects in developing countries or remote regions tend to create community dependency on the operator. Throughout the project, Rio Tinto will endeavour to alleviate this dependency in such a way that community development continues even after operations have ended. The company plans to support the affected communities throughout the project development cycle so that they are able to find alternative means of subsistence after the mine closes.

To achieve this, Rio Tinto will develop, in partnership with the authorities and communities concerned, a regional Community Development Plan (regional CDP) that identifies the needs and aspirations of communities in the context of sustainable development. From the initial stages of the Simandou project, the baseline studies carried out by Synergy among local communities have allowed development priorities to be identified. These will be further examined in the Simandou project feasibility study

(2007-2009). The Simandou CDP will also be integrated with the national CDP associated with mining activities in Guinea and funded by the World Bank. The national CDP is currently being executed.

When the Simandou preliminary Community Development Plan has been completed, a workshop will be held with all the parties concerned (including representatives of development initiative groups, youth and women's groups, vulnerable or marginal individuals, etc.) to discuss and validate the CDP. The final version, incorporating remarks and comments from the workshop will then be publicly submitted to them.

Because sustainable community development depends largely on the sustainable use of natural resources by local communities, this plan will have to reflect the Development and Management Plan for the Pic de Fon Classified Forest, which will be developed within the framework of the Biodiversity Action Plan (see section 7.3.3). Similarly, there is a close link between the Simandou CDP and the plan for managing new arrivals in the project zone (see section 7.3.5).

To contribute to sustainable development in the Simandou region, Rio Tinto will pursue its partnership with national and international actors as well as NGOs working for social development and the protection of the environment. The partnership with NGOs will enable the concrete implementation of community development activities.

Under the Mining Agreement between Rio Tinto/Simfer S.A. and the Government of Guinea, Rio Tinto is committed to contributing 0.25% of its annual sales to a community development fund.

#### □ **Social Investment**

With the aim of supporting sustainable community development in the Simandou region, since 1997, Rio Tinto has been undertaking social investment initiatives, providing support for communities and community groups, both financial and in kind. To formalize this procedure, in 2005 Rio Tinto developed the *Operational Guideline – Social Investment* providing a decision-making framework for social investments and assuring a transparent, efficient system for the selection, funding and tracking of projects.

In accordance with the standard, any group of beneficiaries operating in local communities affected by the Simandou project is eligible for a social investment project: community-based organizations, NGOs, worker groups, credit unions, social enterprises, small and medium businesses, etc. No social investments will be awarded to individuals.

Priority will be given to projects identified as a priority in the community and regional development plans or during public consultations conducted as part of the Simandou project. The project must demonstrably improve the means of existence of the population and support sustainable development. Special emphasis will be placed on projects benefitting poor and vulnerable groups.

Among the criteria considered during project selection is achievement of the Millennium Development Goals, namely:

- Reduce the proportion of people living on less than a dollar a day;
- Reduce the number of people suffering from hunger and malnutrition;

- Ensure that all boys and girls complete a full course of primary education;
- Eliminate gender disparity in primary and secondary education;
- Reduce the mortality rate among children under five;
- Halt the spread and begin to reverse the impact of HIV;
- Improve people's access to drinking water and basic hygiene;
- Develop and implement strategies for decent and sustainable employment for youth.

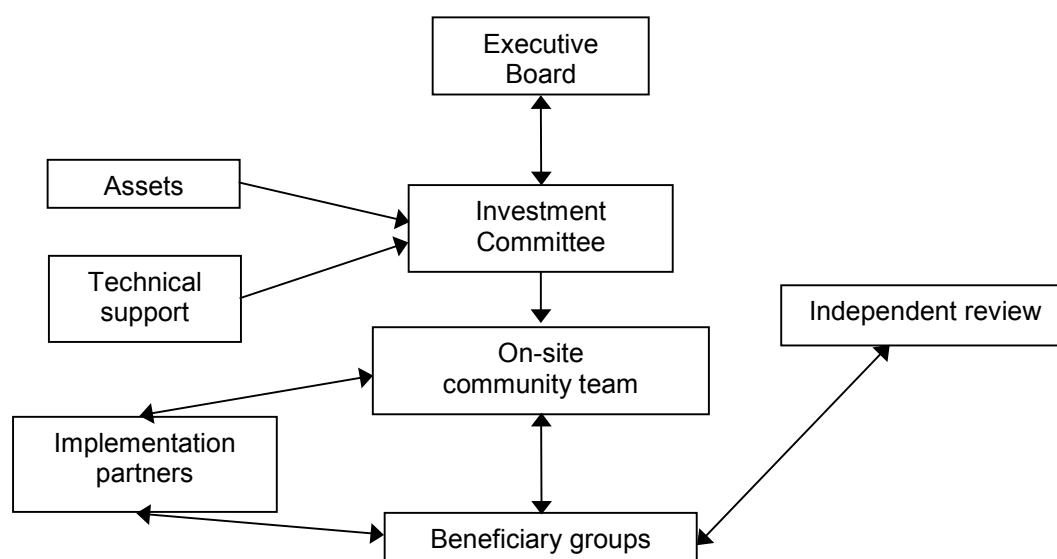
A detailed description must be provided of the project's objectives, beneficiaries, and location, with details of the activities or tasks to be accomplished, project planning, responsibilities for implementation, calendar and budget. The plan and financing have to address how the project will be funded in the future.

If the groups are not capable of developing their project properly, Rio Tinto can provide them with support (e.g. with obtaining formal status, training in project management and finance, registration with the competent authorities).

A formal structure has been set up at Rio Tinto (see figure 7.2) for managing social investments. This includes the Investment Committee, which will analyze funding requests to ensure they meet the criteria for social investments and project-related risks. Projects extending over a long period will be encouraged, and funding for the investment in the community is renewed for a number of years.

The Committee's decision will be announced to the beneficiary groups and the people implementing the project. If the project has not been granted funding, communities will be provided with a brief explanation to help them understand what activities could be funded in the future.

**Figure 7.2 Management Structure for Social Investment**





Funding of a project by Rio Tinto is conditional upon the obtaining of contributions from the community and/or the government. These contributions may be in the form of funds, materials, labour, etc., and must account for more than 10% of the funding and 25% of the labour. Recipients may be assisted with raising additional funds and developing means of generating income.

During the phase in which Rio Tinto generates no income, the company invests approximately US\$90,000 per year in social projects in Guinea communities potentially affected by the project.

A quarterly progress report will be produced about the social investment on the Simandou project. This report will highlight the link between investments during the previous quarter and related commitments to communities, as well as the effectiveness and/or adaptation of priorities.

### **7.3.5 Management Plan for New Arrivals**

The management plan for new arrivals is currently being prepared. The guiding principles underlying its preparation are presented below.

The preparatory works and eventually the overall Simandou project will create employment opportunities in the immediate Simandou region and therefore a migratory inflow of workers looking for jobs.

Migrations are often perceived in a negative light, but host regions and migrants alike stand to gain, even if the benefits are not always easily measurable (Ammassari, 2004). When properly managed, there is a clear correlation between migration and a region's socio-economic development.

The action framework proposed in this preliminary management plan for new arrivals is designed to restrict the number of migrants coming in and limit the related adverse effects such as the land access problem, increased pressure on natural resources, farmland and public utilities, health problems, an increase in conflict and the transformation of traditional social and cultural structures, while optimizing benefits for the sustainable development of the region.

Initiatives for effective management of migrations involve a participative approach by all the parties involved.

#### **□ Controlling Migratory Influx**

The first measure to implement is to set up a structured, concerted framework with the local and regional authorities in order to inform local populations about the project's development cycle and execution calendar, as well as the number and type of jobs required for the project, the hiring policy, hiring locations and hiring period.

One of the main strategies for ensuring sound management of migration and its adverse effects on the host environment is to track demographic statistics in the Simandou zone. This involves determining the rate and extent of migration (distinguishing between residents and new arrivals), the locations where people settle, and the effects on social environment and land use, by means of regular demographic surveys. The findings should provide the project with a reliable

databank, allowing better planning of interventions can be better planned based on the support capacity of the environment.

Rio Tinto will sensitize the local authorities and villagers to the harmful effects of induced migration that is not properly handled. The company will hold discussions with them about participatory measures that can be implemented to ensure the phenomenon is appropriately managed.

One of the keys to successful human migration is the creation of community organizations that can organize and mobilize local populations for development and conservation. Unless it is backed by solid organization, any planning action will not be sustainable.

#### □ **Land Access**

Jointly with communities and administrative authorities, define political, technical and judicial measures to protect the acquired rights of communities concerning the use of lands, resources and territory. Provide assistance to local populations, to ensure they are fully aware of their rights, particularly as regards modern and customary land law, so that they are able to secure access to the land.

#### □ **Land Tenure and Use**

A zoning plan of the territory together with a territorial development and planning diagram is required, in order to control anarchic development.

In view of the anticipated demographic growth in certain villages and hamlets in the Simandou zone, we recommend joining with the local authorities in targetting expansion sites, to plan development and improve living conditions by executing a remedial action plan.

### **7.3.6 Cultural Heritage Management Plan**

#### □ **Objectives**

Rio Tinto understands the importance of cultural heritage<sup>2</sup> for Aboriginal populations and will therefore implement a plan for the management of cultural heritage, in accordance with the *IFC Convention for the Protection of World, Cultural and Natural Heritage* and *Performance Standard 8 – Cultural Heritage*.

The Cultural Heritage Management Plan aims to prevent, minimize or offset the damage caused by the Simandou project to sites or elements of cultural value. Implementation of the management plan will begin with the Simandou project's design phase and continue throughout the construction, operation and shutdown of facilities.

The most important phase of the project in terms of protecting cultural heritage resources is the design phase, when resources are identified and the project is optimized.

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<sup>2</sup> Cultural heritage comprises sites with unique archeological (prehistoric), paleontologic, historical, cultural, artistic, religious or natural value.

## □ Identification of Cultural Sites and Elements

During the feasibility study and based on consultations with local communities and local and national regulatory agencies protecting cultural heritage, an exhaustive list and maps of cultural heritage resources in the Simandou region will be drawn up; these will include sites of archeological, historical, cultural, spiritual, natural and esthetic value. These sites include sacred woods, sacred springs, cemeteries and mosques, former village sites, and so on. Because local people are sometimes reluctant to disclose the location of sacred sites, their exact position is only revealed when construction is imminent. In this case, having community liaison officers who are in constant touch with the communities concerned will enable us to take the necessary steps to ensure that the sites are not damaged without prior consultation and agreement.

## □ Mitigation or Compensation Measures

Wherever possible, the project will be developed in such a way as not to damage sites or elements of heritage value. In the event that it is impossible to protect certain sites, or if elements of heritage value are discovered unexpectedly during construction or exploitation, Rio Tinto will define the measures to be taken in conjunction with the population concerned.

Rio Tinto will implement the following procedure to mitigate or offset damage:

- The presence of cultural heritage sites at or near the work location will be specified in the bid documents, so that they are taken into account by the contractor;
- Prior to construction work, information about the presence of cultural sites on the territory, the discovery of new sites and the procedure for implementing the cultural heritage management plan will be given to contractors and employees assigned to the site;
- Prior to construction work, the community liaison officer will inform the communities concerned by the activities to be carried out at the start of the work and the footprints concerned, in order to find out about any cultural resources not identified when the inventories were compiled;
- During the construction phase, if terracing work is carried out close to a site of cultural interest, the site manager will monitor the work closely, in order to detect any artifacts and ensure they are not damaged;
- In the event of unexpected discoveries during construction, activities will be halted immediately and the Director of HSEC informed;
- Work in this sector may only be resumed once an evaluation by a competent specialist has been completed and measures have been agreed upon or an agreement reached between Rio Tinto and the communities concerned or the site protection organization;
- If there is no technically or financially feasible alternative for avoiding the cultural heritage site, the possibility of moving component parts without destroying them or causing them irreparable damage will be examined and discussed with local communities;
- As a last resort and with the agreement of the communities concerned, community compensation will be envisaged for the loss of a site of cultural value

(compensation in the form of sacrifices or compensation in kind, in the form of materials or assets usable at the community level).

### Preparatory works

In the specific framework of the preparatory works, a complementary study is underway to determine the heritage value of the Mamouroudou smelter. If necessary, conservation and protection measures will be incorporated in the project.

## **7.3.7 Labour and Working Conditions Management Plan**

### **□ Objectives**

Rio Tinto recognizes that sound management of relations with workers, encouraging their commitment and loyalty, is an essential factor for ensuring the success and sustainability of the Simandou project. It is now finalizing a Human Resources Policy supporting the IFC *Performance Standard 2 – Labour and Working Conditions*, which is itself partly based on the *Declaration on Fundamental Principles and Rights at Work* of the International Labour Organization (ILO) and the United Nations (UN).

The main objectives of the Policy are as follows:

- Establish, maintain and improve relations between Rio Tinto and workers;
- Promote equal opportunities and equitable treatment for workers;
- Encourage economic growth in the Simandou region by creating local jobs;
- Promote compliance with the Republic of Guinea Labour Code.

This Labour Management Plan will be managed by the *Simandou HSEC Management System*. Rio Tinto will require its contractors to adhere this Labour Management Plan and the work conditions of the Simandou project.

### **□ Hiring Policy**

Rio Tinto will recruit employees on the basis of equal opportunity, according to the requirements of the position to be filled, without discriminating on grounds of age, ethnic or social origin, gender, sexual orientation, political opinions or religion, as stipulated in article 206 of the *Labour Code*.

In accordance with the ILO and UN Declarations, Rio Tinto will not use forced labour, bonded labour or child labour. Hiring will respect the minimum age of 18, except in the case of apprentices or trainees on government-run training programs. Article 5 of the Guinea *Labour Code* specifies that the minimum age for entering into an employment contract is 16; if the employee is aged under 18, the agreement is required of the authority upon whom they depend.

The Rio Tinto policy is also designed to protect employees against all forms of harassment.

Rio Tinto wishes to maintain a stable workforce by making sure that employees are fairly remunerated and that salaries are reviewed on a regular basis using an equitable process.

To ensure that the communities affected by the Simandou project derive the maximum benefit from it, Rio Tinto intends to provide training so that people in these communities are able to qualify for the positions available. Rio Tinto will conduct regular performance evaluations to track improvements in its personnel's expertise and competencies.

The content of this policy will be clearly intelligible for employees and explained to them at the time of hiring. Rio Tinto will supply all its employees with a code of conduct in the local language.

#### ❑ **Working Conditions and Terms of Employment**

Rio Tinto draws up a work contract for all its employees and gives it to them in writing or communicates it to them verbally if they are illiterate. This contract contains details of the work conditions and terms: remuneration, work hours, overtime, vacation and sick leave, etc. Rio Tinto work conditions comply with or exceed those in the *Republic of Guinea Labour Code* (articles 118 to 236).

#### ❑ **Hiring Priority**

Rio Tinto has a commitment to local communities to promote local employment. The company is currently preparing employment objectives and clear recruitment rules in order to honour this commitment.

Where competence is equal, all recruiting to the Simandou project will be in the following order of priority, in order to promote job creation among the populations directly affected by the project:

- Natives of villages affected by the project, including former residents of these villages;
- Natives of prefectures affected by the project, including former residents of these prefectures;
- Natives of Guinea;
- Natives of West Africa.

Rio Tinto will require its contractors to comply with the Labour and Working Conditions Management Plan for the Simandou project. Hiring conditions and priorities will be incorporated in contractual clauses for contractors.

#### ❑ **Hiring Procedures**

In the context of exploratory work for the Simandou project, an employment procedure has been developed jointly with the local communities. For this stage of the project, hiring volume is very limited. However, this procedure will be reviewed and upgraded for the overall project, to reflect more extensive hiring.

Recruitment notices will be circulated in the prefectures and villages affected by the project, or to prefects and village leaders, and posted at the Rio Tinto project information office at Beyla and on village bulletin boards. Recruitment notices will also be sent to Labour Inspectors at the prefectures concerned.

In the course of baseline studies for the overall Simandou project, employment databases will be developed when censuses are conducted in villages affected by the mine, port and railway. These databases will identify the qualifications and competencies of residents and natives of the affected villages and contain the following information: last name and first name, home village, specialty, age, gender, education, literacy level, language and experience. The databases will subsequently be passed on to contractors, in order to maximize local hiring.

#### □ **Worker Representation and Grievance Management**

Rio Tinto acknowledges that each employee may choose whether or not to join a collective agreement, as recognized by the *Labour Code* (articles 294 to 351), and respects this choice. Rio Tinto also supports the creation of unions for all its operation sites.

For the Simandou project, Rio Tinto has developed a grievance filing procedure for employees, to ensure they are able to exercise their rights with respect to work conditions and terms of employment, and an equitable, impartial system for handling grievances. This easy to understand, transparent system enables the company to respond rapidly to workers' concerns. Procedures for filing and handling grievances have to be known about and understood by employees and/or their representatives.

In addition to its grievance filing procedure, Rio Tinto has a further channel for independent, confidential communication in the Group's Speak-out Program.

### **7.3.8 Occupational Health and Safety Management Plan**

Rio Tinto recognizes that protecting employees by assuring their health and safety is key to the success of the Simandou project, and will deploy all the necessary efforts to maintain the health and well-being of its employees. Rio Tinto provides its workers with a safe, healthy workplace, going further than simply abiding by Guinea health and safety laws and regulations, including the provisions of the *Labour Code* and the *Social Security Code* of the Republic of Guinea.

The company's existing management system for worker health and safety is based on managing the risks inherent to each sector of activity and workplace; the main components are the prevention, treatment, surveillance and monitoring of worker health. Rio Tinto takes all measures for preventing workplace-related accidents, injury and disease. Worker training is the key to preventing accidents or incidents.

Rio Tinto management practices make safety central to its values and a top priority; the goal is zero accidents and occupational disease.

#### □ **Health Measures**

Rio Tinto has developed a number of strategies and operational directives for preventing and managing health and safety risks. These directives will be constantly improved in order to adapt to changes in the environment and changing conditions.

The Rio Tinto *HIV/AIDS Strategy* is based on the following principles:

1. The impact of HIV/AIDS in the workplace is a prime concern for Rio Tinto and will be dealt with separately from the medical program for workers.

2. Discrimination against employees on the grounds of HIV status is not tolerated.
3. Information regarding the condition of an employee or member of the community in connection with their HIV status is kept confidential. Management of information relating to counselling, care or treatment will respect the person's human rights.
4. HIV/AIDS is not mentioned in the employee hiring conditions.
5. All Rio Tinto medical clinics have a supply of antiretroviral drugs. Rio Tinto facilitates access for employees by appointing a partner for medical coverage.
6. Treatment protocols are in line with World Health Organization (WHO) directives.
7. Rio Tinto will develop an active partnership with local NGOs working to promote HIV/AIDS awareness and education.
8. Measures for managing HIV/AIDS will be based on:
  - \* Prevention, awareness and education;
  - \* Counselling and voluntary testing;
  - \* Counselling and treatment;
  - \* Monitoring and evaluation.

The Rio Tinto *Operational Guideline – Malaria* seeks to reduce the number of cases of malaria and assure diagnosis and effective treatment for all employees, contractors and visitors. The approach combines preventive measures (physical and chemical) with prompt, effective treatment. The presence of competent physicians and the availability of drugs at each workplace are the key to immediate, effective treatment.

To reduce the risks of disease associated with water consumption, Rio Tinto has developed the *Operational Guideline – Prevention of Water Borne Disease*, giving recommendations about installing drinking water supplies at sites, instructions for analyzing and treating water, and target values for drinking water quality.

Rio Tinto has built a medical clinic at the Canga East Camp. A doctor from the Ambroise Paré clinic is permanently assigned there. The clinic provides health services to all workers and their families.

In order to manage risks more effectively, performance standards have been established based on exposure limits to various agents. Applying the *Operational Guideline – Occupational Health Workplace Monitoring* allows us to measure a worker's exposure levels to various substances against the established exposure limits and if necessary, set in motion the risk management procedure.

## □ Safety Measures

In addition to Rio Tinto's efforts to reduce risks for workers' health, physical hazards are also managed by the *Operational Guideline – Physical Security*, which goes further than the *Guinea Social Security Code*.

Management of physical hazards is achieved by having safety officers present and controlling access to work sites and accommodation; security devices (fences, alarms, etc.) are used, individual protective equipment is worn. All employees must

wear protective equipment when their work so requires. These items include gloves, goggles, a helmet, boots, a dust mask, earplugs, etc. Emergency kits will be in place at each site and in every vehicle. At least two of the contractor's employees are required to have taken first aid courses.

Employees are given instructions regarding safety and intervention in the event of accidents, and practice drills are held using various accident scenarios. Because road accidents pose the greatest risk for Rio Tinto employees, an *Operational Guideline – Vehicles and Driving* has been developed. The main purposes of this guideline are to reduce the likelihood of automobile accidents by improving driving and vehicle maintenance, equipping each vehicle with the appropriate safety equipment, and training personnel and drivers in administering first aid.

Rio Tinto encourages employees and contractors to report all incidents, in order to improve its HSEC management system. The *Operational Guideline – Incident Reporting and Investigations* sets out the incident reporting obligations at Rio Tinto and the analysis and investigation procedure. The incident report enclosed with the standard must be filled out. Corrective and preventive steps resulting from an incident are recorded in the Simandou Database for monitoring and completion within the required time.

Rio Tinto requires its contractors and their employees to comply with the Simandou HSEC Management System. Since the contractor is responsible for site safety, a site-specific safety plan complying with HSEC standards must be included in the bid documents. Contractors must inform their employees of the health and safety rules and appoint a health and safety officer before beginning the work. Any accidents/incidents must be reported to the Rio Tinto health and safety representative. The contractor has to provide Rio Tinto with monthly statistics on the number of accidents/incidents that have occurred for the number of hours worked.

### 7.3.9 Community Grievance Management Plan

Rio Tinto has developed the *Operational Guideline – Community Grievance System* for the Simandou project, to address the concerns and claims of communities that will be affected by the project and formalize the procedure for receiving of grievance and processing of requests by Rio Tinto. This standard aims to forge good relations between Rio Tinto and local communities for the whole duration of the project, by enabling people to express their points of view, interests and concerns and allowing Rio Tinto to address them.

The procedure for receiving and processing community grievance is based on the following principles:

- The procedure must be transparent and in language applicable to the situation: communication may be verbal or in writing;
- Communication channels should remain open until the situation is resolved to the satisfaction of both parties;
- All grievance or complaints by communities and the resulting reactions or responses should be recorded and filed in registers.



To being with, communities will be formally notified by employees in charge of community relations about how to submit a grievance to Rio Tinto and the procedure whereby the claim will be processed.

Community grievance connected with the Simandou project will be subject to the following procedure:

- 1- Reception: grievance may be made verbally or in writing. All grievance will be sent to a single contact point, the community relations officer, within 24 hours of being received.
- 2- Preliminary evaluation: if the grievance is urgent and requires immediate attention, and the community relations officer is unable to respond, it is promptly forwarded either to the regional development coordinator or to the Director of HSEC.
- 3- Recording: the Community Relations Officer records all grievance and the related correspondence and actions taken in the HSEC database.
- 4- Transmission: the Community Relations Officer will convey the grievance to the Director of HSEC and Director of Community Relations.
- 5- Confirmation of reception: the Community Relations Officer sends a writing response to the applicant within a week to confirm reception of the grievance. The letter provides information about the steps to be taken and how long it is expected to take to resolve the grievance. A copy is given to the Director of HSEC and the community liaison officer if required. The content of the correspondence is also conveyed verbally to ensure it is understood by members of the community concerned.
- 6- Evaluation meeting: a meeting will be held with the person/group who submitted the grievance, to discuss and try to clarify and resolve the issue. The meeting will be attended by local person(s) in charge, a community relations staff member and a Rio Tinto manager.
- 7- Council of elders meeting: if the matter is not resolved to all parties' satisfaction at the evaluation meeting, a larger meeting involving a dispute settlement mechanism at the local level, e.g. the village Council of Elders or an equivalent conflict resolution body, will be held in the town or locality.
- 8- Meeting of local administrative authorities: if the issue is still unresolved, another broader meeting involving the local administrative authorities will be called. This meeting could record, as required, the participation of the Prefect, the Labour Inspector (if it is an employment problem), local officers and village elders.
- 9- Legal action: legal action will be taken only as a last resort, after all possible avenues of conflict resolution have been exhausted.

### **7.3.10 Incident and Emergency Measures Management Plan**

In order to respond effectively to accident and emergency situations, Rio Tinto has developed a specific Emergency Measures Plan for the Simandou project, to address hazards with consequences ranging from serious to critical according to the *Operational Guideline – Risk Assessment*. This plan takes into account the protection of employees, local communities and the environment.

The plan specifies the management structure for emergency situations, i.e. the key roles and responsibilities for the on-site organization and support group. It also provides procedures for responding to emergency situations (major accidental spill of hydrocarbons, missing persons, kidnapping, serious injury, fatality, etc.).

Rio Tinto employs reliable means of communication enabling key people to be contacted 24 hours a day. The Emergency Measures Plan contains the chain of communication and list of telephone numbers.

The Emergency Measures Plan is given to Rio Tinto personnel, contractors and their staff. Training sessions in emergency situations will be held periodically for employees. Part 1 deals with incident management, part 2 deals with first aid, and part 3 covers monitoring and evacuation. Emergency practice drills will be held annually. At the end of these exercises, a report is produced and if necessary, corrections are made to the Emergency Measures Plan.

#### 7.4 PUBLIC CONSULTATION AND DISCLOSURE STRATEGY

Rio Tinto recognizes that sound management relations at the national, regional and local level is essential for successful development of the Simandou project. The company has therefore developed for the Simandou project the *Operational Guideline – Community Engagement* which establishes a procedure for maintaining enduring relations and engaging communities affected by the project. The principles of a lasting relationship are mutual respect, active partnership and long-term commitment.

Mutual respect depends on understanding the issues of importance for the communities and ensuring they understand what is important for Rio Tinto. Regardless of the operation site, Rio Tinto promotes accommodation of the different cultures, ways of life and cultural heritage of host communities. Partnership is encouraged at the local, regional national and international levels; it is based on mutual commitment and trust, and transparency. To assure its commitment to communities, Rio Tinto seeks to support sustainable community projects that do not encourage a dependency on the company.

The program for public consultation and disclosure seeks to ensure consistent and ongoing consultation with and disclosure of information to communities, throughout the Simandou project. The results of these consultations will enable us to evaluate the project's impacts and orient the Environmental and Social Management Program.

Rio Tinto will use the following means to promote exchanges and maintain enduring relations with local communities:

1. Community forums – A forum is planned every six months with representatives from the three villages on the Canga East access road: Moribadou, Mafindou and Banankoro, as well as at Nionsomoridou, which is on Route N-1 between Kérouané and Beyla. These forums give villagers and Rio Tinto the opportunity to discuss and share information about the project. The Forums will be coordinated by staff from the Rio Tinto community relations team. When a regional matter comes up for debate, an invitation will be sent to the Prefect of Beyla and all the groups concerned.
2. Meetings with specific actors – Rio Tinto will be in regular touch with specific actors in villages close to the project. These contacts will take place through the personnel in charge of community relations, based on the following schedule:

- Monthly meetings with administrative leaders (Prefects, Heads of villages, etc.);
  - Meetings twice a month with the leaders of community groups (youth leaders, unions, Council of Elders, etc.);
  - Meetings at least once every six months with leaders of vulnerable community groups (women's groups, groups of disabled people, etc.).
3. Public meetings and focus group meetings interviews – Public meetings and focus group meetings are held while the feasibility and pre-feasibility studies are underway. These meetings serve to orient project development.
  4. Info-shop – For the last few years, Rio Tinto has been renting premises near the Beyla market for use as an Info-Shop. This is open on Saturdays (market day) and operated by Rio Tinto employees, who provide information about the Simandou project and answer people's questions.
  5. Information post in villages – Rio Tinto has set up information posts and mailboxes in the villages of Moribadou, Mafindou, Banankoro and Nionsomoridou, in order to inform the local population (about upcoming meetings, recruitment, etc.) and collect requests and comments from the communities.
  6. Community liaison officers – Community liaisons officers will be appointed for the Simandou project (potentially about 10 of them, once the program is fully operational). These officers will speak Malinké and stay in local communities. In addition to serving as interfaces between the community and Rio Tinto, they will act as community moderators. These officers will meet regularly (every two weeks or monthly) with Rio Tinto personnel in charge of community relations.
  7. Newspapers, television and radio – Rio Tinto will use print and broadcast media to convey information about the Simandou project to the people of Guinea.
  8. Internet – Information about the Simandou project will also be available to the public on the project website (currently being developed).

Any type of communication is based on providing relevant information in an intelligible form accessible to the communities, within an appropriate timeframe. The consultation process is adapted to the linguistic preferences of the communities affected, their decision-making process and the needs of vulnerable or disadvantaged groups.

All Rio Tinto employees are responsible for implementing this Operations Standard. Any formal or information meetings at which a Rio Tinto employee has received information from the community or has conveyed information to them, must be recorded in the HSEC database under the heading "Community Relations". Recording all this information is paramount for orienting social contacts, follow-up with the local population and the development of the project.

In the particular instance where a community expresses concerns or demands, the situation has to be monitored using the procedure set out in the *Operational Guideline – Community Grievance System* (see section 7.3.9).

## **7.5 ENVIRONMENTAL AND SOCIAL SURVEILLANCE AND MONITORING PROGRAM FOR PREPARATORY WORKS**

### **7.5.1 Environmental and Social Surveillance Program**

Rio Tinto will assure environmental and social surveillance throughout the construction phase of the preparatory works. This will be designed to ensure that the proposed mitigation measures are actually implemented.

Surveillance involves ensuring that the mitigation measures applying to the contractor form an integral part of the call for tender documents and the contractor's bid.

During construction work, the person responsible for the environment at Rio Tinto will ensure that all the measures listed in the impact mitigation and improvement plan are adhered to and applied (see section 7.3.1). The Rio Tinto environmental staff member in charge of site surveillance will perform the following duties:

- Take part in coordination meetings with contractors;
- Evaluate the contractor's environmental compliance and if necessary, define remedial steps;
- Ensure that all mitigation measures are applied and take corrective steps if required;
- Orient decisions relating to the environment as the work proceeds, and in unforeseen or emergency situations;
- Document the work, mitigation, and improvement measures by photographs and monitoring reports;
- Ensure the site is cleaned up and the areas rehabilitated when the work comes to an end.

### **7.5.2 Monitoring Program**

Rio Tinto will put in place a monitoring program within its environment and social management system. This program, which is applicable to the exploitation phase of the preparatory works, will have the following objectives:

- Measure and evaluate the project's residual impacts on certain environmental and social components of concern;
- Ensure compliance with the applicable laws, regulations and performance standards;
- Measure the effectiveness of the ESMP and if necessary modify it based on the results of the monitoring program;
- Verify and keep track of the need for additional investigations and further interventions when an unforeseen situation arises;
- Ensure continuous improvement of environmental management practices.

Given that the residual impacts of the Simandou project preparatory works are slight, the proposed monitoring program is on a small scale.

Table 7.7 shows the environmental and social monitoring program proposed as part of the preparatory works, with the definition of performance indicators<sup>3</sup>, monitoring objectives, sampling locations and methods, performance standards<sup>4</sup> to be attained, and the responsibilities for execution of monitoring.

Water quality analysis will be undertaken in accordance with *Operational Guideline - Water Quality Sampling & Analysis*, which defines the equipment required, sampling procedure, and sample handling and analysis. The findings will be interpreted according to the threshold values set by the *Operational Guideline – Prevention of Water Borne Disease* for surface and drinking water.

Analyses have to be performed in a laboratory using recognized international procedures. Details of the testing procedures, minimum detectable limits and quality controls must be supplied by the laboratory.

Rio Tinto will record all monitoring results in the Simandou database, to allow for tracking of trends in indicator parameters.

Monitoring devices must be calibrated on a regular basis (in accordance with the equipment specifications) and calibration data will also be recorded in the database.

### 7.5.3 Reports

When the construction work ends, Rio Tinto will produce a surveillance report on the preparatory works. During the exploitation phase, the company will produce an annual environmental and social monitoring report to enable the environmental and social management performance to be measured. The monitoring report will contain the results of the data collected, and analysis compared with the required performance standards, as well as recommendations for improving the environmental and social management plan.

The results of the environmental and social surveillance and monitoring program will be transmitted to communities and authorities involved with the Simandou project, in the form of a report or newsletter.

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<sup>3</sup> A performance indicator is a quantitative tracking parameter which when measured, shows evolving trends in a given situation over time (CIDA, 1994). It involves obtaining numerical data, preferably in chronological series, showing trends.

<sup>4</sup> Performance standards for the project correspond with the most stringent requirements.

**Table 7.7 Monitoring Program for Simandou Project Preparatory Works**

	Performance Indicator	Monitoring Objective	Sampling Location	Monitoring Frequency	Sampling/Analysis Method	Performance Standard	Estimated Cost (USD\$/year)	Responsibility for Execution
Surface water	<b>Water quality:</b> <ul style="list-style-type: none"> <li>Suspended matter</li> <li>Oils and grease</li> </ul>	Protect water quality downstream from the work (village water supply locations).	<ul style="list-style-type: none"> <li>Waterways near entrance to village of Moribadou (approx. 300 m from the road to Pic de Fon).</li> <li>Waterways near the landing strip.</li> </ul>	Quarterly	MES: Differential gravimetry (APHA, 1995). Oil and grease: Extraction and evaporation (APHA, 1995). See sampling procedure in <i>Operational Guideline – Water Quality Sampling &amp; Analysis</i> .	<ul style="list-style-type: none"> <li>MES: 25 mg/ L (Rio Tinto)</li> <li>Oil and grease: 10 mg/L (BM)</li> </ul>	5,000	Rio Tinto – Environment specialist
	<b>Water quality:</b> <ul style="list-style-type: none"> <li>DBO<sub>5</sub></li> <li>pH</li> <li>Fecal coliforms</li> <li>Nutrients</li> <li>Suspended matter</li> </ul>	Protect quality at point of discharge of effluent from wastewater treatment system.	<ul style="list-style-type: none"> <li>Effluent from wastewater treatment system at Canga East Camp.</li> </ul>	Quarterly	See <i>Operational Guideline – Prevention of Water Borne Disease</i> (appendix K).	See criteria of <i>Operational Guideline – Prevention of Water Borne Disease</i> (schedule K).	10,000	Rio Tinto – Environment specialist
Drinking water	<b>Water quality:</b> <ul style="list-style-type: none"> <li>Microbiological parameters</li> <li>Chemical parameters</li> <li>Physical parameters</li> </ul>	Prevent consumption of contaminated water.	<ul style="list-style-type: none"> <li>Water sampling site.</li> <li>Tap outlet at Canga East.</li> </ul>	Monthly	See <i>Operational Guideline – Prevention of Water Borne Disease</i> (appendix K).	See criteria of <i>Operational Guideline – Prevention of Water Borne Disease</i> (schedule K).	25,000	Rio Tinto – Environment specialist
Nuisance	<b>Number of aircraft/week</b> <ul style="list-style-type: none"> <li>Transport schedule</li> <li>Number of complaints about noise</li> <li>Number of vehicles/week</li> </ul>	Minimize impacts on residents close to landing strip and in villages between strip and camp.	In villages close to strip: <ul style="list-style-type: none"> <li>Kéoulendou</li> <li>Piyaro</li> <li>Morisangarédou</li> </ul>	Monthly	Note times when noise is generated and residents' complaints.	Compliance with <i>Operational Guideline - Aviation</i>	Included in the operation budget	Rio Tinto – Community liaison officers

	Performance Indicator	Monitoring Objective	Sampling Location	Monitoring Frequency	Sampling/Analysis Method	Performance Standard	Estimated Cost (USD\$/year)	Responsibility for Execution
Management of residual hazardous materials	<b>Solid waste</b>	Reduce impacts on environment.	<ul style="list-style-type: none"> <li>▪ Canga East camp</li> <li>▪ Aerodrome building</li> </ul>	Monthly	Visual inspection	Compliance with <i>Operational Guideline – Waste Management</i> (see Table 7.1). SFI standards: <ul style="list-style-type: none"> <li>▪ Presence of toxic lixivate</li> <li>▪ Landfill hygiene</li> </ul>	Included in the operation budget	Rio Tinto – Environment specialist
	<b>Hazardous materials</b>	Reduce impacts on environment.	<ul style="list-style-type: none"> <li>▪ Canga East camp</li> </ul>	Monthly	Visual inspection	Compliance with <i>Operational Guideline – Management of Hazardous Substances</i> .	Included in the operation budget	Rio Tinto – Environment specialist
	<b>Hydrocarbons</b>	Reduce impacts on environment.	<ul style="list-style-type: none"> <li>▪ Canga East camp</li> <li>▪ Aerodrome building</li> </ul>	Monthly	Visual inspection	Compliance with <i>Operational Guideline – Hydrocarbon Management</i> (see Table 7.1).	Included in the operation budget	Rio Tinto – Environment specialist
Economic spin-offs	<ul style="list-style-type: none"> <li>▪ Number of local jobs</li> <li>▪ % of local jobs</li> <li>▪ Number of jobs for women</li> <li>▪ Local spin-offs (\$)</li> <li>▪ Number of people who underwent training to qualify for job</li> </ul>	Maximize economic spinoffs and creation of local jobs.	<ul style="list-style-type: none"> <li>▪ Beyla Prefecture</li> </ul>	Quarterly	Monitor Rio Tinto hiring procedures and its contractors.	50% of jobs are non-specialized 15% of investment costs in local and regional spinoffs	Included in the operation budget	Rio Tinto – Contractors
Population	<ul style="list-style-type: none"> <li>▪ Total population per village</li> <li>▪ Number of new arrivals per village</li> </ul>	Monitor migration rate in zone of influence of preparatory works.	<ul style="list-style-type: none"> <li>▪ Moribadou</li> <li>▪ Mafindou</li> <li>▪ Banankoro</li> <li>▪ Beyla</li> </ul>	Quarterly	Conduct surveys in villages.	Not applicable	Included in the operation budget	Rio Tinto – Community liaison officers
Community projects	<ul style="list-style-type: none"> <li>▪ Number of social investment projects</li> <li>▪ Amount of social investment</li> <li>▪ Number of projects active 2 years after investment</li> </ul>	Support sustainable community development in Simandou region.	Villages affected by preparatory works	Annually	Consult progress reports on social investment of Simandou project, produced at each quarterly meeting.	US\$90,000 per year (exploration phase of project).	Included in the operation budget	Simandou project Investment Committee

	Performance Indicator	Monitoring Objective	Sampling Location	Monitoring Frequency	Sampling/Analysis Method	Performance Standard	Estimated Cost (USD\$/year)	Responsibility for Execution
Health & safety	<b>Prevalence of disease:</b> <ul style="list-style-type: none"> <li>▪ Malaria</li> <li>▪ Diarrheal diseases</li> <li>▪ Legionnaires' disease</li> <li>▪ STD</li> </ul>	Minimize impacts on health and safety of workers and residents.	Canga East medical clinic.	Monthly	Consult clinic health records.	Zero accidents and occupational diseases	Included in the operation budget	Doctor from Ambroise Paré clinic
	<b>Number of occupational accidents/month</b> <b>Number of incidents reported/month</b>		Canga East camp.	Monthly	Consult monthly statistics supplied by contractor about number of accidents/incidents in terms of number of hours worked		Included in the operation budget	Rio Tinto Contractors
Vegetation	<b>Reforestation:</b> <ul style="list-style-type: none"> <li>▪ Area reforested (ha)</li> <li>▪ Number of seedlings</li> <li>▪ Survival rate of plants</li> </ul>	Renaturalization of sites disturbed by work.	<ul style="list-style-type: none"> <li>▪ Camp de Canga East</li> <li>▪ Ouéléba access road</li> </ul>	Annually	Measure area Count seedlings	100% of disturbed sites will be reforested	5,000	Rio Tinto – Environment specialist



## 7.6 IMPLEMENTATION CALENDAR FOR ESMP

The calendar for implementation of the Environmental and Social Management Program is shown in Figure 7.3. This calendar applies to the first year: 1 month before construction work begins, 7 months for construction of the camp, landing strip and Ouéléba access road, and the first 4 months of infrastructure operation.

The activities to be undertaken before construction begins, i.e. during the first month, involve implementation of the compensation plan, hiring workers and giving them health and safety training, and defining the plan for management of the site of the former village of Mamouroudou.

During the 7 months' allocated to construction work, the risk and impact mitigation/improvement plan and the monitoring program for ensuring its implementation will be continuously executed.

The other specific action plans, i.e. the health and safety management plan, the public consultation program, the social investment program and the community claims management program, will be applied throughout the project, and even after construction ends.

Finally, certain activities will be intermittent, for example emergency drills, work meetings of the Regional Committee on Biodiversity Management, and surveillance and monitoring reports.

## 7.7 CHANGE MANAGEMENT PROCEDURE

In view of the fact that projects constantly evolve while being implemented and unforeseen events occur, and based on the results of the monitoring program and public consultations, the ESMP for the overall project will be continuously improved as the project unfolds, in order to adapt to changes in circumstances.

The Simandou project has put in place the *Operational Guideline – Change Management Procedure (CMP)* which guarantees that modifications to Rio Tinto operations will be properly managed. This procedure ensures ongoing improvements in project management in the areas of health, safety, environment and community.

The Environmental and Social Management Program will be adjusted on the basis of performance measurement. Rio Tinto will document monitoring results, identify and apply corrective and preventive measures, and track them to ensure they are effective.

All employees and contractors assigned to the Simandou project will undergo training in how to identify a change and launch the procedure for managing changes.

To identify the need to implement the change management procedure, all employees and contractors are encouraged to complete the CMP form supplied with the Operations Standard and submit it to their line superior. This person will then decide whether to pursue the CMP procedure. If they decide to go ahead, the person responsible or the person submitting the change completes part 2 of the form, which gives details of the proposals (current situation, purpose of change and anticipated result), evaluates these proposals in terms of the risks involved, control mechanisms and regulatory requirements.

Once this evaluation has been completed, the changes or additional risks will be added to the Simandou Project Risk Log and mechanisms for applying the changes will be developed: required communication process, revision of operations standards and work procedures, training and additional studies, obtaining of permits or approval, and methods for monitoring the results.

**Figure 7.3**                      **Schedule of the Environmental and Social Management Plan (ESMP) for the Preliminary Works of the Simandou Project**

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## CHAPTER 8

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### Conclusion



## 8. CONCLUSION

The activities associated with the construction of the three preparatory works components – the camp, airstrip and Ouéléba access road – will not have a high negative residual impact on the natural and human environment in the study area (as shown in Tables 4.9, 5.5 and 6.6). The fact that the Project component insertion environments are in relatively isolated areas with few sensitive elements, and the fact that mitigation measures and an action plan will be implemented, will contribute substantially to minimizing the impacts on the environment.

In addition, the analysis of alternatives for the camp site, airstrip, and Ouéléba access road locations resulted in options having the least impact, in conformance with Rio Tinto's commitment to minimize adverse impacts on the receiving environment.

Using the camp as an example, the option of expanding the existing camp on the present site, by maximizing the use of infrastructure and services already in place, is clearly the option with the least impact. For the airstrip, because of the undulating topography of the territory that characterizes Beyla Prefecture, only the selected site has a favourable topography that will minimize site preparation work and affected areas. Finally, of the four variants analyzed for the Ouéléba access road route, the selected variant is the most acceptable from the viewpoint of territorial integration since it traverses the Pic de Fon classified forest over a lesser distance, crosses a minimum number of rivers and streams, and passes through high ecological value montane habitats over a minimal distance.

### Canga East Camp

The anticipated negative residual impacts on the camp's physical environment (surface water and groundwater, soil, air quality, and noise environment) are of low or very low significance, and negligible in certain cases. The addition of a higher performance wastewater treatment unit, application of a waste management program that promotes recycling, of an incinerator and waste storage site in conformance with internationally recognized standards will result in positive impacts, in comparison to the existing situation; considered project benefits.

The biological environment will be relatively unaffected by the loss of approximately 6.6 hectares of grassland savanna with low faunal habitat potential. In terms of biodiversity, because the original habitat underwent numerous modifications, the camp site is not an essential habitat. Impact on the biological environment ranges from low to negligible, depending on the component (vegetation, fauna or biodiversity).

The integration of utilities (water, electricity, waste management, health services) for both the existing and new camp will help minimize the impacts.

Regarding health and safety, risks associated with storing hydrocarbons and chemicals are substantially mitigated by implementation of Rio Tinto's *Operational Guideline – Hydrocarbon Management*. The arrival of more workers in the region could contribute to the spread of the HIV/AIDS virus, and raise concerns about the safety of girls. The preventive measures specified by the Rio Tinto's strategy for HIV/AIDS will therefore be implemented. These measures also apply to the aerodrome and access road. Community Liaison Officers will meet with vulnerable groups to ensure that the safety measures in place are clearly understood. Operation of the camp (500 people) is likely to provide opportunities for women to supply fresh food, a positive impact for them.

The project is duty-bound to control the hiring of workers from outside the region and the influx of job-seeking migrants who settle near the base camp and surrounding communities. A management plan is currently being developed to ensure this major project issue is properly addressed.

Local and regional economic benefits from all of the preparatory works (including job creation) are considered significant in both the construction and operational periods as long as the identified measures for maximizing local economic benefits are integrated into the Project. The anticipated negative impacts on land use and the landscape are considered of very low significance.

### **Airstrip**

The airstrip site's environment is not very sensitive. The planned construction does not affect any streams, and the lateritic soil has good bearing capacity and resistance to erosion. Air quality will be similarly relatively unaffected by airstrip construction activities.

The airstrip's distance from the villages and hamlets of Piyaro, Morisangarédou, Kéoulendou and Beyla means that noise from airstrip activities will only be slightly perceptible by the population.

The clearing of approximately 56 ha of grassland savanna for establishment of the future infrastructure will result in a low impact due to the low ecosystem value assigned to this savanna. The low habitat potential and low faunal use of the area were confirmed during the site visit.

The footprints of the airstrip and section of Route N-1 to be relocated have been optimized (prior to construction) so that no agricultural lands are disturbed.

The impacts on health and safety will mainly be associated with an increased stress level caused by aircraft flying over the villages, and a small increase in traffic in the villages from the presence of the airstrip and transport of passengers to and from the Canga East Camp. The Community Liaison Officers will monitor the affected populations in these villages for disturbance evaluation. In general, the impacts on the vulnerable groups, women, induced migration, infrastructure and the landscape, are anticipated to be low or very low.

### **Ouéléba Access Road**

The Ouéléba access road route crosses nine small streams. Since the work will be done during the dry season, and the prescribed mitigation measures will be applied to prevent downstream sediment re-suspension and therefore risk of surface water contamination, a residual impact of very low significance is expected.

Removal of vegetation in steeply-sloped areas may contribute to soil erosion and sediment transport into streams. Restoration of the disturbed areas upon completion of construction will mitigate the impact to a very low level.



The anticipated impacts on air quality and the noise environment will be limited to those caused by earthworks and machinery traffic.

Regarding the biological environment, clearing and grubbing of the road right-of-way will result in the loss of approximately 15 ha of vegetation: 10 ha of disturbed tree and bush savanna mosaic, 5 ha of grassland savanna, and 0.2 ha of montane grassland. As requested during Moribadou community public consultations, road route optimization will take the trees used by the local population into account as much as possible. Only the loss of montane grassland causes a medium residual impact because of the high value of the habitat. There is, however, only a very small area that will be affected (0.2 ha).

The main anticipated impact on the human environment is the loss of a dozen varied farming parcels in the lowlands and slopes (irrigated rice), totalling approximately 0.6 ha. When the Ouéléba access road is constructed, the route will be optimized to minimize the farm areas and number of farmers affected. A compensation plan for the affected farmers is currently at the stage of implementation.

The loss of forest resources will mean a loss of activities associated with the harvesting of medicinal plants and foodstuffs, among others. Although it is proposed to optimize the route in order to save tree species used by local people, ensure cut timber is available and compensating the community, the residual impact is evaluated as medium.

Dynamiting operations (with the potential for flying debris) and hydrocarbon use will involve safety risks for workers and local people. To minimize the potential adverse effects, Rio Tinto will apply its *Operational Guideline – Explosives* and *Operational Guideline - Hydrocarbon Management*. Rio Tinto's HIV/AIDS strategy and the induced migration management plan (currently being prepared) also apply to activities associated with the access road. As a result, impacts on health, safety and the landscape are expected to be low or very low, while impacts on vulnerable groups and women are anticipated to be negligible and medium (positive), because of employment opportunities.

As the access road passes close to the old village de Mamouroudou, an additional study is required to locate and determine the heritage value of the remnants of the old smelter there. This study will be carried out in parallel with construction work. Should the road path intersects any sites that have potential for artifacts, it will be optimized to avoid them. Based on available information, the environmental impact is undetermined.

An Environmental and Social Management Program (ESMP) will be implemented to provide a structured framework for the appropriate management of environmental risks and impacts associated with the preparatory works.

The proposed Action Plan comprises a series of 10 sectorial plans that will be updated throughout the execution of the overall Simandou project.

On the whole, the preparatory works is on a limited scale and the host environment where it will take place is low-sensitivity, except for the stretch of access road running through the Pic de Fon classified forest.



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