ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

EXECUTIVE SUMMARY

SUBMITTED TO
TENKE FUNGURUME MINING S.A.R.L. (TFM)
DEMOCRATIC REPUBLIC OF THE CONGO

TABLE OF CONTENTS

INTRODUCTION

This executive summary provides an overview of the environmental and social impact assessment (ESIA) for the Tenke Fungurume Mining S.A.R.L. (TFM) copper-cobalt mining project in the Democratic Republic of the Congo (DRC). It summarizes the five ESIA volumes, which include the Introduction and Project Description (Volume A), Baseline (Volume B), Impacts and Cumulative Effects Assessments (Volume C), Environmental and Social Management System (Volume D) and Appendices (Volume E). An ESIA and a feasibility study have been prepared to determine whether it is environmentally, socially, technically and economically feasible to complete the project.

PROJECT INTRODUCTION

TFM, a company incorporated under the laws of the DRC was formed for the purpose of developing the deposits of copper, cobalt and associated minerals under mining concession nº 198[1] and mining concession nº 199[2] granted to TFM in 1996 at Tenke and Fungurume in the Katanga Province. Currently, TFM's shareholders are the state-owned Congolese company, La Générale des Carrières et des Mines ("Gécamines"), which owns 17.5 percent of TFM, and TF Holdings Limited (TFHL) (formerly Lundin Holdings Ltd.), a Bermuda company, which owns 82.5 percent of TFM. Phelps Dodge Corporation (PD) indirectly holds a 70 percent interest in TFHL and is accordingly the majority shareholder in TFM. Tenke Mining Corp., a Canadian company, holds the remaining minority interest in TFHL.

The concession is located approximately 180 kilometers northwest of the provincial capital of Lubumbashi and includes the towns of Tenke and Fungurume. The Tenke Fungurume copper and cobalt deposits are part of the Central African Copperbelt. The ore comes to the surface in a series of hills within the concession. TFM proposes to mine the Kwatebala, Goma and Kavifwafwaulu (Fwaulu) ore bodies over more than an initial 20-year period, and to process ore for more than 40 years, during which up to 115,000 tonnes of copper cathode and 8,000 tonnes of cobalt cathode/cobalt hydroxide (with some flexibility to produce an additional 2,000 tonnes of cobalt as hydroxide intermediate) will be produced each year. The ore has an average grade of over 2 percent copper and near 0.3 percent cobalt. Only development of the Kwatebala ore body is assessed in detail in this ESIA. A preliminary assessment of the Goma and Fwaulu ore bodies is presented in the cumulative effects sections of the ESIA. An addendum to the ESIA that will assess Goma and Fwaulu will be prepared prior to development of these ore bodies. There is a strong possibility that the project will expand at a future date to mine other mineralized areas on the concession, including the Fungurume ore bodies. Expansion could achieve a copper production rate of 400,000 tonnes or more per year.

---

1 Renumbered nº 123 by the Cadastre Minier Certificat d'Exploitation nº CAMI/CE/940/2004 dated November 3, 2004; renewed by Ministerial Decree dated October 10, 2006, pending division and renumbering by the *Ministère des Mines*.

2 Renumbered nº 159 by the Cadastre Minier Certificat d'Exploitation nº CAMI/CE/941/2004 dated November 3, 2004; subsequently divided and renumbered nº 159, nº 4728, and nº 4729 by the Ministère des Mines through Ministerial Decree dated July 7, 2006.

PROJECT HISTORY

Mining activity has occurred in the Tenke Fungurume region for thousands of years. Archaeological evidence indicates that mining occurred over 200,000 years ago and that smelting of copper was practiced on the concession several thousand years before present. During the Iron Age, between 500 and 2,000 years ago, much mining and smelting activity took place in the Katanga Province.

Modern drilling first took place in 1918 by the Union Minière de Haut Katanga, but no mining took place. In 1970, the Société Minière de Tenke Fungurume (SMTF) and Gécamines were awarded the concessions and began to study the feasibility of constructing a mine. A fair amount of infrastructure including access roads was constructed. This effort, however, was abandoned because of economic and political issues.

TFM initiated a feasibility study and impact assessment in the late 1990s but had to postpone activities in 1999 due to civil war. Studies resumed in 2004 and the work accelerated after the signing of the Amended and Restated Mining Convention (ARMC) with the DRC government in September 2005.

Artisanal[3] mining has occurred on the concession for many years. This activity increased substantially in recent years due to the rise in copper and cobalt prices. As many as 3,000 workers mined the Kwatebala, Goma, Fungurume and other hills for heterogenite ore containing cobalt, as well as malachite ore containing copper. All digging was done by pick and shovel, employing potentially unsafe work practices and little evident regard for the environmental impact. TFM discouraged artisanal mining on the concessions in October 2005, following signing of the ARMC. This was done through control of entry and exit of ore from the concession along the national highway, which was the truck route used to transport ore from the area.

LEGAL AND POLICY FRAMEWORK

Laws of the DRC as well as the policies and guidelines of the Equator Principles (EP) and the Performance Standards of the International Finance Corporation (IFC) on Social and Environmental Sustainability will apply to the construction, operation and closure of the TFM project. The EP policies and guidelines are internationally accepted environmental and social standards for major mining projects, and are derived from the policies and guidelines of the World Bank Group, which includes the IFC. The DRC civil code applies to the project as limited by the Amended and Restated Mining Convention (ARMC), issued on September 28, 2005. Additionally, the Mining Law of 1981 continues to apply to the project rather than the New Mining Code of 2002 (NMC).

Under the ARMC, TFM has committed to undertake its activities in compliance with environmental standards internationally accepted as good mining practice as far as these may be applied in the DRC. TFM also commits to design, build and operate the facilities aligned with a Quest for Zero philosophy. Quest for Zero is a philosophy embraced by Phelps Dodge Corporation, embodying the

[3] The term 'artisanal' is widely used to distinguish between non-mechanized and mechanized production techniques. All artisanal mining conducted in the Tenke Fungurume concession area is unauthorized and illegal.

goals of designing and operating its facilities with the goal of having zero safety/environmental incidents or illnesses. TFM also commits to obtain all necessary permits and authorization to proceed with the project and to comply with applicable international treaties and agreements that the DRC is signatory to. The latter include treaties that protect biodiversity, endangered species, various ecosystems and monitoring of greenhouse gas emissions.

A community development plan is being developed by TFM to ensure that social development occurs in a sustainable manner that reflects the needs and desires of the local population. A "road map" for the plan has been developed as part of the ESIA. The strategy behind the road map is to make the communities in the Fungurume and Tenke region independent from the mining operations within a 20-year time frame. In order to reach this level of economic sustainability, the strategy will focus on:

- Basic needs of the communities.
- Income generation and livelihoods.
- Social and community infrastructures.
- Good governance.

TFM recognizes the importance of building its social license to operate, and is committed to investing with local government for the benefit of the surrounding communities above and beyond the statutory royalties. Accordingly, an additional amount that will be equivalent to 0.3 percent of net sales revenue from mine production will be contributed to a social development fund. TFM also is investing a dedicated amount ahead of production during the development phase to assure a sustainable start-up to social development and is investing in a positive relationship with communities and the government of the DRC. Investments made in community development during both of these periods will be guided by the basic concepts set forth in the 'road map' strategy.

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT APPROACH

This ESIA follows the Terms of Reference (ToR) issued in May 2006 as well as the requirements of the IFC Performance Standards. Work on the ESIA started in October 2004, and benefited from studies from 1997 to 1998 conducted by TFM.

As required by the ToR, the ESIA process included the following steps:

- Identify the environmental and socio-economic resources potentially affected by the project.
- Predict positive and negative effects and the extent to which positive effects can be enhanced and negative effects mitigated.
- Quantify and assess the significance of effects where possible.
- Consider the need to compensate for any significant residual negative effects.
- Identify methods to mitigate and monitor resources that may be affected by the project.

SUSTAINABILITY

An important component of the assessment is its vision to move the project towards sustainability. TFM recognizes the needs of society and the value of economic prosperity, national security and a healthy environment. TFM is committed to integrating social, environmental and economic principles in its mining operations and in facilities associated with preparing products for further use.

TFM aims to be a catalyst for development beyond its own operations. It is working to ensure that the project will operate in such a way that does not deter other development and that will contribute to a net positive impact to the host communities where it operates. This net impact embraces social, economic and environmental conditions and builds capacities necessary to provide for the needs of current and future generations.

The ESIA addresses many disciplines in each of the physical, biological and social realms. The ESIA is structured to assess two aspects for each discipline:

- How can the project be designed to reduce or eliminate negative effects?
- How can the project have a positive effect that will last beyond the life of the mine? This is the main goal of a sustainability approach.

PUBLIC PARTICIPATION

Ongoing consultation has been and continues to be an important part of the ESIA process. More than 200 disclosure and consultation meetings took place from November 2005 to December 2006 with a variety of stakeholders, including:

- Individual members of the general public.
- Non-governmental organizations (NGOs).
- Special interest groups.
- Regional government representatives.
- National government representatives.

Stakeholder consultation has included:

- Announcement of opportunity to comment, through meetings held by the socio-economic baseline team, meetings held by TFM, distribution of letters of invitation and a background information document, radio announcements, newspaper advertisements, websites and distribution of sets of posters. Over 4,000 copies of the background information document (BID) were distributed.
- Distribution of an Issues and Response Report providing an ongoing record of all stakeholder issues raised and TFM's comments.
- Distribution of a draft Scoping Report that described the proposed TFM project and defined the proposed scope of the ESIA.
- Open houses to enable comment on the draft scoping report.

- Focus group discussions, village meetings and key informant interviews conducted as part of the socio-economic baseline study.

Many issues were raised during consultation and these have been discussed throughout the ESIA. Some key issues include:

- The need to optimize employment and economic benefits for Congolese people.
- Concern over the loss of farmland and residences and the need to resettle people.
- Concern over possible health and safety effects on people, including HIV/AIDS linked to migrant workers.
- Concern that changes to water quantity and quality downstream of the mine and tailings storage facility could damage the environment and affect people and agriculture.
- Concern over the level of impact the mine will have on biodiversity of flora.

Stakeholder consultation will continue during the construction and operation phases.

PROJECT DESCRIPTION

The ore bodies within the TFM concession are rich in copper and cobalt. The project is expected to bring significant benefits to the local population, the Katanga Province, the DRC and TFM shareholders. The processing operation is projected to last over 40 years.

Significant investment will be made in local and regional infrastructure to include power generation and transmission systems, major improvement to national and regional roads, improved border-crossings, clinics, schools and agricultural programs. Associated sustainable development projects include small business initiatives in brick and fence manufacturing, aggregate quarries, waste management and lodging facilities.

Direct benefits of the project to the DRC are expected to contribute to alleviating local poverty and large-scale unemployment during operation and include provincial and municipality royalty shares, workforce earnings, local procurement, corporate income tax, withholding tax, export and import duties, transportation and a local agriculture and social investment fund.

During construction, the project will employ approximately 2,000 people, the majority of which are anticipated to be for local people recruited in the Katanga area. During plant operation, TFM expects to employ approximately 1,100 people, the majority of which are expected to come from local communities, with the number increasing over time as the local workforce increases its capacity. Each direct job should create roughly four indirect jobs in the DRC, significantly increasing local employment opportunities. As well as these regional financial benefits, the project will be focused on improving transport infrastructure and will be committed to investment in training its employees. At the national level, TFM is expected to pay taxes, duties, a royalty and dividends to the DRC and Gécamines in the amounts set forth in the ARMC.

The Kwatebala, Goma and Fwaulu hills will be mined using an open pit method. Following a planned construction period in 2007 and 2008, mining will begin at Kwatebala as early as late 2008. The Goma ore body is expected to be developed beginning in 2017 and the Fwaulu ore body in 2021. The project will mine ore until at least 2027. Thereafter, processing of stockpiled low-grade ore will occur for about 20 additional years.

Waste rock will be blasted with explosives so that it can be broken up and removed. Rock overlying the ore will be excavated by mechanized equipment and transported by truck to waste rock facility areas.

A surface miner, which is a track-mounted machine with a large rotating drum and hardened steel picks that break the rock in situ, will be used to mine ore. The ore will be broken to minus 150 millimeters in size and will be loaded into 45-tonne haul trucks with front-end loaders. High-grade ore will be delivered to stockpiles near the mill feed chute where a loader will be used to produce an ore blend from these stockpiles that maximizes plant production. The lower-grade ore, totaling approximately 54 million tonnes by Year 20, will be stored at stockpiles for later processing.

The processing plant, located near the Kwatebala pit, will be designed using modern equipment and technologies and will meet or exceed the applicable environmental standards.

Following milling, the ore will be leached using acid in large tanks. This is a simple, well-proven technology. The solids will be separated from the liquids by counter-current decantation thickeners. Next, solution extraction and electrowinning methods will be used to produce copper cathode. This technology is also very well understood and carried out extensively in the copper belt in neighboring Zambia.

A sulfuric acid plant will be built for the generation of sulfuric acid and sulfur dioxide (SO_2). The sulfuric acid is used to leach copper and maintain spent electrolyte acid concentration for the solution extraction stripping section. SO_2 is used in the leaching circuit for the recovery of cobalt. SO_2 is also diluted with air and used to precipitate manganese dioxide (MnO_2) in the manganese removal tanks. Waste heat from the acid plant is used to produce steam for various operations throughout the plant.

The processing plant will use water, electricity and other raw materials such as lime, magnesium hydroxide and limestone to extract the copper and cobalt from the ore and to produce the final products. Power will be supplied by the state-owned utility. The main wastes and emissions from the processing plant will be tailings and air emissions. Most water used in the processing plant will be recycled.

Tailings from the processing plant will be deposited in a lined tailings storage facility. This facility will be formed by damming a small valley north of the Kwatebala pit and depositing tailings in it. A water reservoir also will be constructed to store excess water during portions of the year. The dam wall will be fortified by placing waste rock on the downslope side. This will prevent any accidental breaching or failure of the dam. If required, a second tailings storage facility will be constructed north of Fungurume.

TFM will build a construction village north of Fungurume that will later be converted to a permanent village for operation staff. It is also expected that the mine operations may attract others to move into the local area. TFM will provide assistance to local authorities specifically to plan for this additional population. With support from the social development fund, TFM will also help provide some of the basic infrastructure needed, such as water and power. Growth centers will be built near both Tenke and Fungurume to allow for controlled growth of support services, such as market gardens and small businesses.

ANALYSIS OF ALTERNATIVES

Analysis of alternatives was conducted for:

- Operations configuration (where to mine first and where to build the plant).
- Tailings storage facility location.
- Waste rock facility location.
- Processing plant locations.
- Process type.
- Product type.
- Construction village location.
- Growth center location.
- Main access road locations within concession.
- Water and power source.
- Transport of raw materials and products.
- No project alternative.

The analysis of alternatives concluded that resettlement of the three most proximate villages to the mine site, Mulumbu, Kiboko and Amoni, with an estimated combined population of 1,600 individuals, represents the lowest overall risk to both the residents of these communities as well as to the future viability of the TFM mining operation. A 'best practice' management principle holds that the life-of-project social risk for a given investment is reduced if key issues are addressed during project design rather than once operations have begun. Though it is nominally more challenging to compensate and move villagers during the capital investment and construction phase, the resettlement decision relative to Mulumbu, Amoni and Kiboko is consistent with the broad principle identified above. The quality of life for residents in these three villages will be arguably better if resettled appropriately (i.e., consistent with the IFC Performance Standards and DRC law) than it would be if they were left in their current location, to be eventually surrounded by industrial development and overwhelmed by population influx.

BASELINE CONDITIONS

Most baseline data was collected from late 2005 to May 2006, although groundwater drilling continued to December 2006. Water flow and climate monitoring are ongoing. This data supplements that collected by TFM in 1997 and 1998.

PHYSICAL CONTEXT

Regionally, the topography is dominated by the north and south limbs of the Dipeta syncline, forming a long valley, extending between the towns of Tenke and Fungurume. The local topography is characterized by a series of steep-sided prominent hills and ridges rising to an elevation of 1,500 meters above sea level and up to 170 meters above adjacent valleys. The Dipeta River flows through the valley from west to east. The landscape in the area of the TFM project includes a mixture of existing human-modified areas such as villages, agricultural lands, fallow lands, roads and power line rights-of-way, and natural habitats such as copper-cobalt hills and miombo woodland.

The project region is part of the Lufilian Arc, a geologic formation with extensive high-grade copper-cobalt mineralization extending about 500 kilometers through central Africa. Locally, the dominant rock types are sedimentary in origin, including dolomites, limestones and shales. The major copper mineral is malachite.

The geochemistry studies built upon studies conducted in 1998 and characterized the waste rock, ore and tailings for the Kwatebala ore body. The upper ore materials are composed predominantly of oxide minerals, grading to sulfide mineralization at depth. Only oxide materials are proposed to be mined in the proposed project scope and none of these are acid-generating. In addition to the copper and cobalt mineralization, quartz and muscovite are the primary components of the ore. However, there is some potential for the oxide waste rock to leach out some metals such as copper, cobalt, magnesium, manganese and other elements. The leaching potential for arsenic is low. There is also a potential for copper, cobalt, aluminum, molybdenum, manganese and other elements to leach from the tailings and ore.

Soils in the project region are typical of highly weathered, tropical soils. Soils are generally low in nutrients due to high rainfall which promotes leaching of minerals through the soil profile. Warm soil temperatures and high moisture conditions promote high levels of biological activity capable of rapidly degrading organic matter.

The climate is typical of tropical Africa locations, existing at relatively high altitude near the equator. The first rains fall, on average, around the first two weeks of October and the rainy season lasts, on average, 195 days. Average annual rainfall is 1,183 millimeters, with a range over a 40-year period of 800 to 1,400 millimeters. Average temperature varies little from month to month (near 20 degrees Celsius), however the daily temperature extremes are greater during the dry season. Relative humidity is high throughout the year. The prevailing wind directions in the concession are from the southwest and northeast. The most common wind speeds in the concession are between one and two meters per second.

Air quality varies with the season, reflecting variations in atmospheric stability, ambient air temperatures and rainfall. The main emission sources in the study area include domestic fuel burning (mainly firewood and charcoal), bush fires, burning of stubble, vehicle emissions (tailpipe exhaust gas and fugitive dust), agricultural activities (tilling, plowing, etc.) and wind erosion of exposed areas. Volumes of motorized traffic along local roadways are very low. Bicycle and pedestrian traffic remain the primary modes of transportation and account for most road traffic. The general condition of local

roads is poor. No significant industry occurs within the immediate vicinity of the project. The nearest active mine is 21 kilometers to the southeast.

Noise within the project area is typical for a rural African setting. Daytime noise levels near villages ranged from 42 to 53 decibels. Nighttime noise levels ranged from 39 to 52 decibels. There may be some existing ground vibrations near the local roads and rail lines due to motorized vehicles passing by.

Groundwater in the Regional Study Area (RSA) is associated with moderately to highly permeable limestone and dolomite aquifers. These aquifers have formed as a result of the dissolution of limestone and/or dolomite along fractures by infiltrating rainwater. This results in a highly transmissive aquifer capable of supplying large well yields. The total aquifer thickness is about 600 meters.

Two main surface water systems exist in the region: the Mofia River catchment to the north of Kwatebala Hill and the Dipeta River catchment to the south. The proposed mine and plant sites straddle the hydrologic divide between these two surface water systems, with surface waters from the mine area flowing toward the Dipeta River and surface waters from the areas of the plant site, tailings area, and waste rock piles flowing toward the Mofia River.

Water quality sampling indicated that both *E. coli* and total coliform bacteria were high throughout the region in both groundwater and surface water. Some metals concentrations were high in some of the samples, specifically for arsenic, copper and manganese. High concentrations of nitrate and ammonia were also observed in some of the samples.

BIOLOGICAL CONTEXT

The project region is within the miombo woodland belt of central Africa. Regionally, 634 species have been firmly identified, including 475 higher plants, 144 terrestrial vertebrates and 15 fish. Based on the literature, many more species have the potential to exist in the region. However, the local area is relatively fragmented and modified by man, reducing the numbers of species that presently exist.

The local habitat types ranked from most to least in terms of total species level biodiversity follow:

- Gallery forest.
- Intact miombo woodland.
- Copper-cobalt steppe-savannah.
- Copper-cobalt rock outcrop.
- Degraded miombo woodland.
- Wetland.
- Agricultural mosaic (not a “natural habitat”).

All habitat types support numerous species of flora and fauna and are of some value regardless of the state of disturbance. However, it is notable that three of the most biologically valuable habitat types

(gallery forest and the two copper-cobalt habitats) are rare and already under threat in baseline conditions.

Of all vegetation types, the miombo woodland has the greatest flora species diversity. Miombo woodland is under pressure from human activities. Clearing for agricultural purposes, charcoal and fuelwood collection, urbanization, infrastructure and industrial development are all reducing the size of the miombo woodland community. The copper-cobalt habitat types also have high flora species diversity. Many of the species have a restricted distribution. Habitat potentially classifiable as 'critical' under the guidelines of the World Conservation Union (IUCN) was identifies on Kwatebala Hill. In the past, artisanal mining impacted these habitat types.

Shifting agricultural practices are common and result in abandoning of sections of the land, likely due to the soil becoming too impoverished or perhaps because weed infestation was too high. Natural revegetation is generally reestablishing in these highly disturbed areas.

The fauna in the study area is diverse but densities are low. Hunting and habitat loss are realities in the area and have had a significant influence on the local fauna. A field survey during the wet season (2006) found 14 frog species, nine reptile species, 109 bird species and 12 mammal species in the Local Study Area (LSA). Three endemic fauna species (one frog and two birds) are expected to occur locally, but were not found during the studies. Four Red-listed bird species are expected to occur locally, according to the IUCN, but were not observed during the study. The short-eared trident bat (Vulnerable) of the woodlands and the otter shrew (Endangered) of the riparian environment are the only possible Red-listed mammals that could occur in the study area. Neither were observed during the field survey.

The rivers in both the Mofia and Dipeta catchments are generally regarded as degraded. This is mainly due to the extent of deforestation in the catchments as well as poor cropping activities into riparian zones. Both of these activities cause extensive sedimentation in the rivers. The effect of the sedimentation is evident in the generally low diversities collected for both macro invertebrates as well as fish for all the sites on the Dipeta River. However, a few riverine reaches (Shimpidi, upper Kazakenene) still exist where the riparian forests are intact. No Red-listed fish species were collected during the surveys.

SOCIAL AND CULTURAL CONTEXT

At least 41 rural villages also fall within the TFM project's LSA. With a combined population of over 52,000, the main towns of Tenke and Fungurume each serve as a primary transportation center and marketplace for the region. The population of the region is young, with 54 percent under 15 years of age. Most of the villages in the region are very recently settled. The latest population growth in the Kolwezi District is perceived to be the result of the return of war-displaced peoples to the region and the movement of miners and their families displaced by mine closures elsewhere.

Such recent social and economic change is reflected in the cultural diversity of the area. The majority of the region's residents belong to the Sanga ethnic group, the largest in the project area, along with

the Luba, Ruund, Tshokwe, Bemba and Boyo peoples of the region. A local dialect of Swahili is the most common language spoken in the area. French is spoken and understood by only a small minority.

Agriculture is the main economic activity for both rural and urban populations. Virtually all rural households engage in agriculture, as do more than 80 percent of the urban population. Rural livelihoods are based largely on a mix of subsistence and commercial agriculture, predominantly maize (corn) and beans. Secondary crops such as cassava, peanuts and soybeans are also produced. People rely on additional economic activities such as government jobs, occasional wage labor, beer brewing (a key source of income for women) and charcoal making (traditionally a male activity) to supplement farming incomes. Overall, the regional economy is characterized by multiple cash income and subsistence sources, of which agriculture is the chief component. Agriculture, however, accounts for less than 50 percent of household incomes.

TFM on average has directly or indirectly employed approximately 1,000 people since February of 2006. People, some of whom formerly engaged in artisanal mining, have been hired for road building, geotechnical fieldwork, fence construction, brick making and other tasks.

Education levels in the region are generally low. During the artisanal mining period, boys were leaving school to mine. Although current enrollment suggests no gender bias, adult education levels indicate that men typically complete more grades than women. Almost 19 percent of women in rural villages have never attended school.

In general, the rural population lacks many basic necessities. There is a general lack of education, poor housing, absence of household and farm equipment, poor access to health care, and almost no regular income. In urban centers the situation is somewhat improved. Better housing, higher educational achievement, slightly more regular income and better access to health care are characteristic of urban centers. Many more families in towns have access to protein foods in the form of dried fish. Annual median income among rural households was estimated to be 79,000 Fc (Congolese francs) (175 USD [US dollars]) and 115,000 Fc (255 USD) among urban households. The lingering effects of conflict and the slow pace of economic and infrastructure revitalization continue to present significant social and economic challenges for the region and throughout the DRC.

Archaeological and ethnographic techniques were used to locate and interpret several cultural heritage sites. These include two Palaeolithic (Stone Age) archaeological sites, at least one Iron Age site, three cemeteries, three cult sites (known as Kipanda) and five traditional sacred sites. No sacred sites are located within the actual proposed facility footprint. Sacred sites and cemeteries continue to be used by groups and villages in the area.

KEY MITIGATION AND IMPACTS

The ESIA evaluates residual impacts, or those that remain after various mitigation measures are implemented. In the context of this assessment, mitigation includes the following hierarchy:

- Avoidance.
- Minimization.

- Rehabilitation or repair.
- Compensation.

PROTECTING AND ENHANCING PHYSICAL RESOURCES

The TFM project will result in changes to existing topographic features such as hilltops and hillside slopes. The project will create new topographic features such as the tailings storage facility and waste rock facilities. Mining of the ore bodies will affect Kwatebala, Goma and Fwaulu hills, ultimately removing most or all of these prominent topographic features. Internal mine slopes (highwalls up to 155 meters high will have slopes of about 39 degrees) will be increased due to mining activities.

The project will impact approximately 2,400 hectares of soils over the mine project's life. During operation and at closure about 1,300 hectares will be fully or partially reclaimed. The reclaimed processing plant area will be able to support land uses similar to those that existed before disturbance. The open pit will be allowed to fill with water. Tailings storage and top surfaces of the waste rock facilities will be revegetated to prevent infiltration and erosion.

The introduction of a major industrial facility into this setting will contrast with the existing patterns of land use and the natural habitats. It will contribute to a reduction in the visual aesthetics of the local area. The mine, tailings storage facility, processing plant site and other project infrastructure will be visible from nearby populated areas. Visual intrusion will also be caused by the ongoing operation of the mine, the movement of heavy vehicles and the generation of dust on unpaved roads around the mining area, between the mine and the waste rock facilities and on the tailings dam.

The principal natural hazards are from earthquakes and extreme climate and geotechnical (e.g., slope failure) events. Man-made hazards include accidents or malfunctions in the processing plant or other facilities, including rail or road transportation accidents (e.g., spills or collisions with people).

During construction and operation, impacts from hazards will be managed through risk mitigation. Risk analyses will be completed within an ongoing management program. Risk mitigation measures will be implemented for all potential major hazard scenarios. Designs for the processing plant, mine site and tailings storage facility will be developed using international standards to minimize risks to within acceptable levels for the public and environment. The transportation program will incorporate mitigation measures to minimize risks from accidental spills and collisions.

Construction activities that will affect air quality include dust (particulates) caused by traffic and site clearing and tailpipe emissions (exhaust) from vehicles. During operation, dust and tailpipe emissions will continue and processing plant emissions may cause additional effects. Wind erosion from exposed surfaces will occur during all of the project phases unless surfaces are revegetated or kept moist. Volatile organic compounds (VOCs) from the solution extraction facility and acid mist from the acid plant could have negative effects. Greenhouse gas emissions can contribute to global warming.

TFM proposes to mitigate the effects of dust through all phases of the project using effective and proven techniques. These include the use of water on roads, treating the surfaces of portions of the road network, use of speed limits for drivers and covering loads. Revegetation of selected exposed areas will also be used when feasible and the tailings storage facility will be kept wet to limit wind erosion. Water sprays will be used in high traffic areas and on the waste and ore stockpiles, as necessary, to control dust generation.

Tailpipe exhaust will be kept low during all project phases through use of adequate exhaust control systems on vehicles that will be kept in good repair. Emissions from the acid plant, the leaching circuit and the cobalt recovery section of the processing plant will be minimized through the use of scrubbers. Air quality modeling predicted that all emissions will be within applicable and reference guidelines at the nearest communities during operation. Greenhouse gas emissions will be reduced through the use of hydropower that will provide electricity to the processing plant and other facilities.

The TFM project will contribute to local noise and vibration levels through vehicle traffic on the access roads, blasting and haulage of waste rock and limestone and processing of the ore. As a surface miner will be used (a machine with a rotating drum with steel spikes that grinds ore at the active pit face) blasting for ore and a crusher at the processing plant site may not be necessary, leading to reduced noise and vibration levels. Noise and vibration modeling was performed, based on the proposed mining at Kwatebala. Results from the modeling indicated that none of the nearest communities (i.e., post-resettlement) will experience noise or vibration above applicable guidelines as a result of the project. As a result, no harmful effects are predicted.

Groundwater will be pumped from wells to supply the processing plant, construction camp and other mine facilities with water. Rainfall will also be captured on the tailings storage facility, waste rock storage facilities, ore stockpiles and portions of the processing plant site and used for process water and other uses. Beginning in Year 8, when the pit will be mined below the water table, groundwater flowing to the Kwatebala pit will be intercepted by dewatering wells to prevent the pit from filling with water. All of these actions have the potential to lower the local water table and reduce the discharge of groundwater to springs and surface water. Mitigation will include augmentation of baseflows in the dry season with excess dewatering water.

Groundwater quality has the potential to be affected by water infiltrating through waste rock facilities and ore stockpiles, stormwater control dams and accidental spills. The post-mining pit lake may also affect the long-term groundwater system. Secondary containment will be used at all surface tanks and fuel/chemical storage areas containing potential contaminants to prevent groundwater contamination. These measures will ensure that effects on groundwater quality are minimized.

Surface water flows will be disrupted at the mine site by diversion of non-contact water around the facilities and by capture of all contact water for use in the processing plant. Clearing of land will lead to increased runoff until the land can be reclaimed and revegetated. Changes in groundwater levels, described above, will likely result in a lower rate of groundwater discharge to the headwaters of local rivers.

A water-flow model was prepared for the mine site and used to predict effects. The environmental assessment determined that both wet and dry season flows would be reduced in the three headwaters draining the Kwatebala hill. A reduction in the wet season flows was not considered to affect local users, flora or fish due to the large amounts of water that flows during that season. However, a reduction in dry season flows could affect surface water availability to users immediately downgradient, as well as ecosystems such as gallery forests on the Kasana River and aquatic habitat on the Shimpidi River. This impact is most likely to occur as a result of aquifer dewatering activities necessary to mine below the current water table at Kwatebala. It is predicted that the mining operation will reach the current water table in about the 8th year of mining. A portion of the groundwater removed for pit dewatering will be used to mitigate the dry season baseflows to the extent necessary to lessen impacts to the affected ecosystem. An equivalent amount of gallery forest to that potentially affected by groundwater drawdown will be restores in watersheds unaffected by the project.

Water quality in local springs and watercourses may be affected by site clearing and disruption of natural drainage patterns, disposal and stockpiling of waste rock and ore, ore processing, sewage treatment effluent, accidental releases and spills and site reclamation and closure activities. Water from mine pit dewatering wells may be released to local rivers and have a minor influence on water quality, but is not predicted to impair the water for any of it's current uses.

Best management practices (BMPs) will be used during site clearing and construction to minimize erosion and sedimentation. These practices will include diversion of runoff water away from roads and disturbed areas and the use of sedimentation ponds and silt fences.

The TFM project will be designed using a "zero discharge" concept, where water release will be kept to the minimum and will meet applicable water quality guidelines. Key mitigation measures for water quality include lining the tailings storage facility and return water dams and recycling of all contact water in the processing plant. Sewage treatment plants will be installed at the plant site and at the permanent village. Sewage will be treated so that all effluent meets discharge criteria. Solids will be composted and used as a soil amendment or disposed of in a landfill. BMPs will be employed during reclamation and closure. The closure landscape will be designed with sustainable drainage and vegetation cover so that erosion and sedimentation is reduced and so contact of runoff water with mine or waste material is minimized.

Little or no effects above baseline levels are predicted for erosion and sedimentation effects, sewage effluents, mine pit dewatering, or seepage from waste rock storage facilities and ore stockpiles. All parameters are predicted to be at acceptable levels at the nearest downstream village.

No impacts from radioactivity are expected due to low levels of uranium, thorium and alpha and beta radiation in ore and waste rock samples.

The TFM project is expected to bring about overall improvements in transportation infrastructure. Increases in traffic volumes along the access routes will have the greatest potential impact in relation to bicycle and pedestrian traffic. To minimize this, TFM will delineate and mark a pedestrian lane on main access roads, including the use of marker stakes implanted in the road surface. Common crossing points will be identified by signs and crosswalks. Several safety measures will also be

implemented in parallel to these physical measures, including speed limits, drivers' education, vehicle scheduling, vehicle maintenance and, most importantly, public education. These measures will reduce the potential for accidents along roadways within the concession.

Management of wastes will include dedicated facilities for tailings, waste rock, water treatment residue, and domestic, industrial and hazardous waste. Hazardous wastes will include substances generated from plant and vehicle maintenance, the acid plant, the incinerator and lab and medicinal facilities. The major hazardous wastes will be used chemical reagents for copper and cobalt extraction processes, converter fluid from the acid plant, solvents, fuels, oils and grease, hydraulic fluids, incinerator ash and some lab and medical wastes.

Objectives for waste management will be for (1) waste reduction, recycling, re-use and composting, and treatment, as applicable, and (2) safe storage of any wastes produced. Storage of wastes will be conducted such that effects to the environment (air, surface water, soils, groundwater) will be minimized. Monitoring of waste facilities will be conducted so that remedial action can be taken if any effects are found to occur. Hazardous wastes will be transported off-site if a suitable, licensed hazardous waste disposal facility is available.

The tailings facility will be lined with an impermeable liner and tailings water will be recycled to the processing plant. Enhanced evaporation (water sprays) will be used, if necessary, to balance process water inventories, thereby minimizing the likelihood of process waters being discharged as a waste to the environment. Waste rock (and low-grade ore and plant site) runoff also will be collected and recycled in the processing plant. Process water treatment residues, including iron-aluminum-manganese (FAM) residue will be combined with the tailings.

Solid wastes will be classified and sorted according to their characteristics (recyclable, suitable for clean landfill, compostable or hazardous). Non-hazardous and hazardous waste management landfills will be constructed for the project. The proposed lining for both landfills will consist of double lining systems with a leachate collection system above the primary liner and a leakage collection system between the primary and secondary liner system. The leachate will be collected in a detention pond, then transported or pumped to the sewage treatment works or recycled to the processing plant, if possible.

PROTECTING AND ENHANCING BIOLOGICAL RESOURCES

The TFM project will disturb floral communities on the ore outcrops that will be mined and in the areas where the mine and its associated facilities will be constructed. Other potential effects to flora include those from airborne dust, emissions from the mine fleet and the processing plant, changes in surface water hydrology and the introduction of non-native plants. Also of concern are effects related to the likely in-migration of people to the area. This may lead to increased clearing of forests for charcoal and agricultural production.

An important issue affecting flora is the removal of rare copper-cobalt floral communities on the Kwatebala, Goma and Fwaulu hills as these hills are mined. These hills support unique floral communities of copper-cobalt flora and some species are currently known to occur only in the region.

Habitat potentially classifiable as 'critical' under the guidelines of the IUCN was identified on Kwatebala Hill. TFM will employ a multi-faceted approach to keep impacts to flora to an acceptable level. This will include avoiding copper-cobalt plants as much as is practical and the creation of copper-cobalt plant micro-reserves (PMRs) in areas adjacent to the development site. These reserves will be identified and protected from accidental disturbance. Conservation areas will be established to protect copper-cobalt flora for the life of the mine. TFM will also set aside areas for ecosystem reconstruction and plant propagation activities. Relocation of critical habitat will also be undertaken to meet the requirements of the IFC's Performance Standard 6. Such activities will add to the current knowledge base for copper-cobalt flora conservation and will aid in the future planning for possible mine expansion. All of these activities will be implemented through a Biological Diversity Action Plan (BDAP). It is expected that no species loss will occur as a result of the TFM project.

Impacts to fauna will include habitat loss due to site clearing and possibly habitat change as a result of changes in dust or air emission, changes in stream flow, noise, and fencing or other obstructions impeding movement. Animals may also be affected by mine infrastructure such as ponds, power lines and stacks. Animals may be killed or injured by vehicles. Increased hunting of fauna as the human population of the area grows is also an issue.

The project is being designed to minimize its disturbance area. For example, the waste rock facilities are being designed to be high so that their footprints can be smaller. In addition, best management practices will keep erosion and sedimentation under control.

Any areas that are abandoned will be promptly reclaimed, as will all sites (except open pits) at closure. Most site clearing will occur in miombo woodland and agricultural habitats. These habitats are not limited in the region. Site clearing will also affect copper-cobalt habitats. However, no Red-listed species are known to be restricted to these areas.

Fish and aquatic habitat may be affected by the TFM project due to loss or disturbance of habitat including changes in surface water flows, sedimentation and water quality. Increased fishing pressure due to an influx of newcomers into the area is also a concern, though no fishery of local importance occurs under baseline conditions.

Mitigation measures for fish and aquatic habitat are primarily related to those described above for water flows, sedimentation and water quality. BMPs will be used to minimize erosion and sediment loading to streams. Watercourse crossing guidelines will be implemented to protect aquatic habitats. Flows in the upper catchments around the mine site will be augmented with pit dewatering water (intercepted by wells) to maintain dry season baseflows. As a result, impacts to fish and aquatic habitat are predicted to be low.

No protected areas will be directly affected by the project. The nearest protected area is 75 kilometers away. It is predicted that there will be little, if any, effects from air or water quality or increases in the local population that may put pressure on protected areas.

PROTECTING AND ENHANCING SOCIAL AND CULTURAL RESOURCES

Stakeholder consultation results indicate that socio-economic opportunities created by the mine are a main concern. This includes individuals who expect to directly benefit, but also those people (particularly rural villagers and women) who view employment as less of a project benefit. For these people assistance with agriculture, education, health services, water, electricity and housing are the expected benefits of project development.

There is considerable complexity in assessing the socio-economic impacts of a project. Impacts, mitigation measures and even benefits can result in many interacting effects, both positive and negative. Managing socio-economic impacts, more so than other disciplines, involves minimizing negative effects and enhancing positive benefits.

Impacts related to land use include impacts to livelihoods and residences. The loss of agricultural land due to occupation by the project may result in the loss of agricultural income and livelihoods, increased pressure on other farm lands or land-related conflicts. Depending on the land and livelihood resources that are affected by the TFM project, preferable alternatives for compensation will be identified for affected peoples. This could include replacing that portion of the land or livelihood resource affected, or other restoration measures.

Where permanent residences fall within the project footprint, residents will be physically displaced. People whose lands are required for the project will be resettled according to a Resettlement Action Plan (RAP). The village of Mulumbu will be impacted and all of the approximately 1,300 individuals in the village will be resettled. This impact will also apply to the villages of Amoni and Kiboko, which have 224 and 134 residents respectively. Criteria that have guided TFM resettlement planning are derived from IFC Performance Standards and address the following issues:

- Both economic (e.g., farm fields) and physical (e.g., homes) displacement will be addressed when resettlement planning is needed.
- If the source of any individual's livelihood is affected by more than 10 percent (e.g. more than 10 percent of their farm fields), the replacement of that livelihood and not simple cash compensation will be required.
- Affected people will be left no worse off and preferably better off by the project.
- Losses will be compensated at full replacement cost plus 50 percent and informal occupation rights will be taken into consideration.
- Resettlement will be carried out in a consultative manner, particularly when it comes to the selection of resettlement sites, with the affected people, the host communities and local authorities. The objective is to reach broad community consensus.
- The RAP is tied to the ESIA process and provisions will be made for long-term monitoring of affected people and their livelihood.

Impacts to the local population are expected to begin during the construction phase as a large workforce will be brought in from outside the project area. Large numbers of job seekers and migrants can also be attracted to the project area. These often rapid changes in local demographics can result in a number of undesirable pressures and consequences, including:

- Pressures on housing and existing minimal infrastructure.
- Development of spontaneous settlements around the project site, often associated with poor sanitation conditions, inappropriate rent taking and unmanaged agriculture.
- Disruptions to local cultures.
- Increased incidences of sexually transmitted diseases (STDs) and HIV/AIDS associated with worker and migrant influx.

Measures to manage potential effects will be put in place through a combination of public consultations, policies and planning. These measures will include:

- A hiring policy giving priority to local residents with the best qualifications for a given position. In case of equal qualifications among many candidates, preference will be given to DRC citizens and local residents of the TFM area.
- A procurement policy that gives preference to locally produced goods and services.
- Accommodation of non-local workers in a dedicated construction camp with independent water and waste treatment facilities.
- Control of spontaneous settlements in the project vicinity.
- Busing construction workers from Tenke and Fungurume.
- Establishing a project-sponsored commercial area near the construction site.
- A code of conduct for project workers that establishes rules for interaction between the project, its workers and the local community.
- Developing a workforce HIV/AIDS management and awareness program.
- Voluntary and free-of-charge HIV testing and counseling for project workers.

The project itself will make few demands on existing services and infrastructure as the non-local construction workforce will be housed at dedicated camps where all their service requirements will be met. As well, project construction will require infrastructure upgrades in the power, road, and water supply sectors. These upgrades will remain after the end of construction and will be beneficial to local communities and beyond. Improvements to transportation infrastructure associated with the project will improve roadway safety and access for local residents.

It is the project's policy to provide training to employees. A positive impact of local workforce recruitment is the improved employability of those hired. Local recruitment and training will improve skills needed for better job performance and promotion, broaden the skill base of employees and prepare them for new opportunities in the future. Temporarily hired local workers will obtain on-the-job training in aspects such as safety and other technical topics. This training will enhance the capacity of temporary workers to secure better jobs in the future.

Perhaps the most significant benefit for local communities will be through direct employment and job creation. The number of direct project hires is anticipated to be 2,000 construction workers at peak of the construction phase and approximately 1,100 workers (1,000 employees and 100 contractors) during operation at the mine.

Salaries for locally hired residents will benefit both household and local economies through increases in purchasing power and by directing economies away from barter exchanges. As local people gain skills and experience through work and training, they will also improve their access to more skilled jobs.

It is estimated that a total of 643 million USD will be spent during the construction of the project. Of this, at least 75 million USD will be spent in the DRC. The estimated spending during operations will be significant, of which approximately 40 percent will be spent in the DRC. Taxation over the life of the project will also be significant and will be allocated to local, regional and national governments. Because anticipated project expenditures are expected to be large relative to the size of the local and national economy the benefit is considered to be of high consequence.

It was clear during stakeholder consultations that there is a strong desire for improved roads within the project area. Access to agricultural markets, health and educational services would all be enhanced by road improvements and would significantly assist in addressing fundamental socio-economic constraints. Communities also expressed concerns about the deterioration of roads as a result of increased traffic and raised community safety concerns regarding potential accidents. Increases in traffic volumes will be minimized by the construction, upgrading and maintenance of access roads and by the construction of a bypass road around Fungurume.

The potential for adverse effects to human health during operations and post-closure were considered low to negligible. Potential impacts on aquatic life and agricultural resources were also considered negligible. The risks of increasing incidences of STDs and HIV/AIDS are of special concern and will be addressed through vigorous prevention, awareness and monitoring programs. Safeguarding human health is of critical importance. Sound and sustainable project development is built around regard for the social well-being of locally affected communities. The fabric of community life can be affected by a project through increases in many unwanted social pathologies, such as crime and other social ailments, or social disruptions caused by the unequal distribution of income and employment. Several measures and policies will be employed to reduce potential negative impacts on community well-being, including:

- Implementation of a workers' code of conduct.
- Accommodation of non-local workers in a dedicated construction camp.
- Establishment of a fair compensation mechanism.
- Transparent and publicly-disclosed employability and hiring policies.

Community development investments supported by the TFM project are expected to bring significant benefits to the local community. This program has already been launched with the building of three primary schools and installation of 10 village wells during the project ESIA and Feasibility Study phase. TFM is working closely with local communities and NGOs to identify and implement additional such projects during the construction phase of the project in 2007.

Avoiding sites of cultural and historical significance is always the preferred mitigation option for sound and sustainable project development. All of these sites recorded in the project area can be safely avoided. Archaeological sites within the project's buffer zone (at the western boundary of the

project area) can be avoided. The proposed project footprint avoids all of the cemeteries recorded. Protecting or enhancing the cultural and historical resources of the area relies not only on best practices for appropriate identification, protection and mitigation, but also on consultation with local communities to assist in understanding the meaning and importance attached to particular locations and resources.

SUSTAINABILITY ASSESSMENT

Impact analysis methodology is centered on a process to minimize negative impacts and to optimize benefits. This process focuses on direct and indirect effects that arise during all phases of the project life cycle. However, two additional areas will be considered for the TFM project:

- Development of project-supported actions over and above impact-related mitigation measures that would benefit people and the environment (social and environmental investment) beyond closure of the mine.
- Prediction of the ecological or social consequences of predicted positive effects.

Actions that TFM could take to encourage positive, long-term effects were identified through a combination of stakeholder consultations and a series of workshops and discussions among the ESIA specialists, project design teams and management personnel. Once the actions were identified and the impact criteria were rated for each action, the overall effect of these actions on people and the environment and on sustainability could be assessed in a semi-quantitative explicit manner.

Considering sustainability goals is in line with several recent industry initiatives, including the Global Reporting Initiative and the International Federation of Consulting Engineers. Results of sustainability analyses for this ESIA are found in each discipline's assessment section, as well as in the environmental and social action plans.

These ideas, and any others that might be considered, depend on stakeholder review, support and involvement as a condition of implementation. Development of a final sustainable development plan will only be finalized with the input and support of the many communities near the project. A Sustainability Forum will be created, comprised of local community members, local government, NGOs and TFM. This forum will be involved in selecting and monitoring the progress of sustainability actions.

CUMULATIVE EFFECTS ASSESSMENT

A cumulative effects assessment was conducted for each physical, biological and social discipline. A cumulative effects assessment should consider the proposed project in addition to all other existing, planned or reasonably foreseeable projects in the regional study area. The nearest industrial project to the TFM concession is the Kakanda Mine, located some 21 kilometers to the southeast. It was considered to be outside any zone of possible interaction with the TFM project. Also, no other planned or reasonably foreseeable projects are known for the region other than TFM's own potential expansion plans. The ESIA focused on the effects of the Kwatebala mine. The cumulative effects

assessment investigated the effects of the current proposed project with the effects of an expanded project, including development of the Goma and Fwaulu ore bodies.

Expansion of the project to a production rate of 400,000 tonnes per year of copper was considered for the cumulative effects assessment. Because of the conceptual nature of the expanded project at this time, the following assumptions were made:

- Mining of ore at Kwatebala, Goma, Fwaulu and Fungurume.
- Expansion of the proposed Kwatebala processing plant to a production of 200,000 tonnes per year of copper.
- Construction of a second processing plant north of Fungurume with a production of 200,000 tonnes per year of copper.
- Construction of a second tailings storage facility north of Fungurume.
- Deposition of waste rock near the Goma, Fwaulu, Kwatebala and Fungurume pits.
- Expansion of the construction camp and ancillary facilities as required.

Predictions of effects are made with a low level of confidence given that the eventual form of the expanded project may be different from that considered in the analysis. Given the conceptual nature of the expanded project scenario, the description of cumulative effects is similarly broad and conceptual in nature. More specific and detailed assessments of potential impacts would be required prior to any expansion of the project.

Cumulative effects to topography are expected to be high as approximately four times more land will be mined out or otherwise used, compared to the current project. Effects to soils are expected to be similar to, but larger than, those for the current project. Some 2,700 ha of soils are predicted to be lost due to the current and expanded projects combined. Visual aesthetics are expected to be highly altered during operations, but the impact will be reduced to moderate levels following reclamation and closure. Hazards are expected to be similar to those discussed for the current project, but the chance of hazards occurring (e.g., interaction of people with traffic) will be higher. Air and noise impacts are expected to be greater due to the increased size of the project, and it being spread out over a larger area. Separation of emission sources, such as through construction of a second plant or mining of widely separated pits, will help to lessen cumulative effects. Groundwater is expected to be affected due to an increase in groundwater demand. Water quality effects have the potential to be greater due to mining and processing of sulfide ores. Mining of sulfide materials may require that mitigations to control acid rock drainage be put in place.

The cumulative effects for the biological disciplines are all expected to be larger in magnitude, but similar in type, to effects predicted for the current project. The most important terrestrial effect is predicted to be the potential loss of rare copper-cobalt plant communities, as these occur where most mining is expected to take place. Mitigation techniques developed over the course of the current project, including translocation of rare species, ecosystem reconstruction and conservation of small management areas, will aid for future mitigation for the expanded project. However, the expanded project will result in larger areas of tailings and open pits that will not be possible to restore to the conditions that exist at these sites today. In-migration of people to the region as a result of an

expanded project, and their effect on the local ecology through deforestation, increased fishing pressure, and other impacts, will also be an important cumulative effect.

Extension of the current project's life through expansion will have a positive effect on the local and regional economies through continued and increased employment, acquisition of skills, taxation and payments to the local development fund. The expanded project will therefore aid in the sustainable development of the region. More land, however, will be required to achieve these benefits and some additional communities may have to be relocated. Planning has already been initiated during the current project to minimize population influx to mineralized areas in order that future relocations can be kept to a minimum. Other negative social effects will be as described for the current project. These include effects related to in-migration of people with a resultant strain on local infrastructure and social fabric and increased likelihood of alcoholism, prostitution, drug-use and sexually-transmitted diseases. Effective means to address these concerns, developed over the course of the current project, will be used to lessen these potential effects of the expanded project.

The cumulative effects of an expansion of the project could considerably increase the geographic extent of impacts on cultural heritage resources. Project development would occur across much of the study area, including additional ore-bearing hills such as the Fungurume hills. However, with additional consideration of the cultural and heritage resources of the area including surveying, ongoing consultation with local communities and best practices for the preservation, enhancement and mitigation of heritage resources, the social consequence of cumulative impacts is likely to be negligible.

ENVIRONMENTAL AND SOCIAL MANAGEMENT SYSTEM

An environmental and social management system (ESMS) has been designed to implement the measures required to mitigate and manage the environmental and social impacts of the proposed project.

The environmental action plans include 15 separate plans for pertinent environmental disciplines (e.g., air quality, surface water, flora, etc.) assessed in the ESIA and important waste streams (e.g., mine waste, domestic and industrial waste) as well as materials management.

The social action plans consider four key aspects relating to social mitigation, management and monitoring, including:

- A community development plan (CDP) will be implemented to provide a framework for effective local development, and which is unrelated to mitigation-driven actions.
- A social management plan to address the key socio-economic issues raised in the ESIA.
- A cultural heritage plan to minimize impacts to archaeological, historical and cultural resources.
- A resettlement action plan (RAP) to ensure that any required resettlement is carried out to best international standards (see below).

The reclamation and closure plan describes the actions that will be taken for the closure of project facilities. The main objectives of the reclamation and closure plan are to ensure the long-term physical and chemical stability of the project, wherever possible restore the project site conditions that would allow post-closure beneficial use, and to protect humans and wildlife from any hazards. This plan will also present necessary post-closure treatment, maintenance and monitoring measures that would be required following completion of closure measures.

The occupational health and safety plan describes the actions that will be taken to protect the health and safety of the employees involved in the construction and operation of the project.

The emergency response plan describes the actions that will be taken to respond to situations out of the scope of normal operations such as medical emergencies, fires, non-schedule explosions, vehicle accidents, hazardous materials spills/releases and natural disasters.

RESETTLEMENT ACTION PLAN

The management of social risk is a high priority for the TFM project. Achieving minimal involuntary displacement impacts is key not only to the project's social risk management strategy, but was central to decisions on where to site project facilities. TFM has committed to applying IFC Performance Standards and applicable DRC legislation in the design, construction, operation and closure of its mining project.

TFM has concluded that resettlement of the three closest villages to the mine site, Mulumbu, Kiboko and Amoni, with a combined population of approximately 1,600 individuals, represents the lowest overall risk to both the residents of these communities as well as to the future viability of the TFM mining operation. A number of factors were involved in arriving at this decision, including:

- Under available plant site options, the primary access road for import and export of materials to the Kwatebala mining operation will pass through the present-day sites of the three village sites of Mulumbu, Amoni and Kiboko; presenting public health and safety risks, even with mitigation measures.
- The estimated losses of farmland ranged from 30 to 50 percent of that available to Mulumbu villagers, and replacing this loss with land of equivalent value and accessibility is not considered feasible.
- Based on experiences elsewhere in sub-Saharan Africa, there would be a large influx of new settlement to the villages of Mulumbu, Amoni and Kiboko should they remain where they are, at the gates of an industrial mine development; and could expand by 5 to 10 times their current populations, rendering future resettlement nearly impossible if needed for mine expansion.

Extensive consultations with potentially affected people have helped to address potential concerns and considerations about resettlement site locations. Seven candidate scenarios have been identified for resettling populations from the three affected communities. Criteria used to identify candidate sites for resettlement included:

- Proximity to either the current village location, or to one of the towns of Tenke or Fungurume.

- Availability of large tracts of uncultivated agricultural land, similar or larger in size to the current area cultivated around Mulumbu.
- Suitable surface topography for establishment of a human settlement.

The process for the final selection of resettlement sites will be based on the following procedures:

- Presentation to communities of the pre-identified resettlement sites, and initial discussion of their acceptability.
- Further discussion with Resettlement Consultation Committees.
- Pre-selection of best candidate sites.
- Visits to pre-selected resettlement sites with the Resettlement Consultation Committees.
- Selection of preferred sites in collaboration with the Resettlement Consultation Committees.
- Validation of choice in general community meetings.
- Securing land on resettlement sites, particularly with respect to ascertaining relocated Land Chiefs as competent "Chefs de Terre" on the new sites, requiring contacts with higher-ranking traditional authorities, and possibly ceremonies to be covered by TFM.

Residential and livelihood restoration are cornerstone elements of resettlement planning under IFC Performance Standards. Consistent with such guidance, the following categories of Project Affected People (PAP) will be used to determine compensation to physically and economically-displaced people:

- Category A: Permanent residents, also customary concession-holders of agricultural land, including permanent residents of Mulumbu, Amoni and Kiboko communities.
- Category B: Permanent residents and tenants or sharecroppers of agricultural land.
- Category C: "Transhumant" (non-permanent or seasonally resident) farmers.
- Category D: Non-resident formal concession holders.
- Category E: Non-permanent agricultural laborers, residing in temporary housing on the agricultural plots of their employers.

Project-affected households are eligible to one of the three livelihood restoration packages. These include cash compensation (both currency and in-kind payments) for replacement of residences, non-residential structures, and standing crops, and both cash and in-kind compensation for the restoration of livelihoods during the transition period.

While careful planning, ongoing consultation, adherence to internationally-recognized standards, and a range of compensation measures all support best practices, some grievances and disputes are likely during the implementation of a resettlement program. TFM will put in place an extra-judicial mechanism for managing grievances and disputes arising from the resettlement process, based on explanation and mediation by third parties. Access to this mechanism will be available without compromising access to judicial resolution that may be due.

Finally, social and economic monitoring will provide a follow-up on the status of resettled people, and the implementation of program elements.