

## **NON TECHNICAL SUMMARY OF THE ENVIRONMENTAL IMPACT ASSESSMENT**

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### **1. GENERAL PRESENTATION OF THE PROJECT**

By means of a mining Convention, the Government of Senegal (GoS) has granted to the company *Mineral Deposit Limited* a license of exploitation of gold and related substances in a 20 km<sup>2</sup> surface in the zone of Sabodala. Within this perimeter and its surroundings, MDL will create and operate an open-pit mine and its related infrastructure (roads, mining village, power station, etc.); and build a process plant, a dam for rainwater storage, facilities for waste/process water and for tailings storage.

The exploitation of the ores of Sabodala will be done through classical open-pit mining technique (mining) and cyanide leaching method (treatment).

Accordingly to the Senegalese Mining Code, the exploitation will last for duration of five years, with a possibility of renewal. Moreover, the results of the drilling program started by MDL in the project area favour for an extension of the exploitation period. Also it is possible MDL applies for and obtains (from GoS) a mining concession.

The project includes an important component regarding mine closure and site rehabilitation issues. Indeed, all the facilities of the project are subject to the requirements for mine closure and rehabilitation plan as stated in the mining Convention. Thus, accordingly to relevant norms and procedures, all the required measures will be taken and fully enforced to ensure an appropriate rehabilitation of the mine as well as to eliminate risks associated with mining activities. A mine closure and rehabilitation plan will be prepared to that end.

### **2. PRESENTATION OF THE ENVIRONMENTAL ASSESSMENT**

The environmental and social impact assessment (ESIA) of the project allowed a well characterization of the natural environment and the stakes of the project as well. Thanks to this evaluation, MDL will be able to foresee the potential impacts of the project and, accordingly, to implement the required mitigation measures and monitoring plan so as to prevent from potential environmental risks that have been identified.

In addition to the efforts of consultation made during the preparation of the EIES report, information arising from the characterization of the biophysics and human environments was used to identify the major environmental concerns related to the project. These factors are components on which the project management will draw particular attention. Such factors will be considered as parameters to follow up any environmental and social change.

Seven major elements of ecosystem, including socio-economic factors, have been considered for the assessment of the impacts of the project:

- the vegetation;
- the fauna and its habitat;
- the quality of the soils and the landscape;
- the quantity and the quality of surface and ground waters;
- the human environment and the potential impacts the project may have on it;
- the issues of employment and the local development;
- the technological risks potentially induced by the project.

The identification of these environmental and social components made it possible to better specify the analysis of the environmental impacts. A rigorous method of environmental analysis (including induced technological risks) has been used to identify such impacts. The analysis of the effects (negative as well as positive), was based on the project's development options, construction and exploitation. Also, the mitigation measures that are included in the project design by the sponsor were taken into account. The environmental impacts were considered for each of the three main steps of the project; that is to say construction-installation, exploitation and closing. The impacts were classified and analyzed according to their importance, their probability of occurrence and the sustainable use of the natural resources.

### **3. STRUCTURE OF THE REPORT**

Besides the summary and annexes, the results of the ESIA are organized and presented in two (02) volumes, dealing respectively with:

- detailed description of the project and the environmental and social context of the area it will be implemented, identification and analysis of potential impacts (positive and negative) as well as corresponding measurements of attenuation (volume 1);
- the environmental and social management plan, including the elements of surveillance and monitoring, in addition to some actions to be integrated in the closing and rehabilitation plan for which the sponsor commits himself to do it properly (volume 2).

## 4. THE MAIN OUTCOMES OF THE ASSESSMENT

### 4.1. *Baseline environmental and social conditions*

#### ☞ **The abiotic environment**

The landscape of the zone of the project is characterized by a relief made up of plateau of sandstone which can go up to 400 m in altitude, contrasting distinctly with the flat and relatively low landscape of the country.

The soils are characterized as sandy, argillaceous and “lateritique” type, with alternating of breastplates, stony grounds and litho soils, with poor agricultural aptitudes due to the nature of the relief that is broken. The main factors of soil degradation are bush fires, overgrazing in dry season, wood cutting, and water erosion.

From the geological point of view, the project is located at the level of the so called Mako series which, according to J.P. Bassot (1966), consists of volcano - sedimentary grounds that are metamorphosed. The geological formations are complex, from the lithological and structural point of view: the granite, metamorphic, quartzite and sedimentary series are overlapped on the one hand and intersect again dolerites of volcanic origin on the other hand. They are characterized thus by a great variation of hydrodynamic parameters. The water table in this crystalline environment has a depth varying between 40 and 60 meters.

The aquifers are not very productive (1 to 5 m<sup>3</sup>/h), rare and difficult to reach. As far as water quality is concerned, the analyses of ground waters carried out show, at least in the villages of Sabodala, Bransan and Makhana, a high contamination by the nitrates of the waters in the village wells (concentration of 131, 6 mg/litre with Sabodala and 230, 2 mg/litre with Bransan).

Contrary to the ground water resources, the surface water potential is very important in the zone of the project. It mainly comes from a rather dense hydrographic network which is situated around the Senegal, the Falémé and Gambia rivers. The project includes the building of a dam on the tertiary axis of the Balé river (situated in the catchment area of Gambia River) to collect the needed water.

The average annual rainfall in the zone is approximately 1000 mm leads to a potential of precipitation of 2 to 3 billion m<sup>3</sup> of water. At the cote 160, the basin will have a surface of 100 hectares in low assumption and 150 hectares in high assumption. This corresponds to storage capacities of 6.000.000 m<sup>3</sup> in low assumption and 7.000.000 m<sup>3</sup> capacities in high assumption,

taking into account important evaporation, but not possible infiltration. This makes it possible to cover 2 to 3 times the water needed by the project.

### ☞ **The Biotic Environment (vegetation, fauna and protected areas)**

The project is located in the Southern - Eastern part of Senegal. That area is characterized by the presence of various types of vegetation formations: grassy savannas, shrubby savannas, arborous savannas, timbered savannas, clear forest, forest gallery, "rôneraies", "raphia"; bamboo and marshy meadow.

The diversity of the vegetation remains very important, varying from "Soudanian" species (*Bombax costatum*, *Pterocarpus erinaceus*, *Anogeissus leiocarpus*...) to the Guinean species (*Afzelia africana*, *Ceiba pentandra*, *Erythrophlem guineense*...).

Within the MDL concession perimeter three features can be observed:

- Breastplate plateau occupied by arborous, even grassy savannas;
- Slopes are colonized by woody savannas and clear forests;
- Gallery forests are found in *Talwegs*.

In the perimeter of the concession, approximately 2.000 ha, 80 of ligneous or sub ligneous species were identified. The Niokolo koba National Park (NKNP) as a developed area contains 80% of the gallery forests of the country, at least 1500 species of flowered plants, that is to say more than 62% of the flowered plant species of Senegal and more than 120 plant families. The main constraints facing the vegetation resources consist of climatic extrapolation, bush fires, clearings, and illegal exploitation.

The very diverse fauna of the area take refuge in the so – called "Zone d'Intérêt Cynégétique (ZIC)" which is a natural area under control and the NKNP. The NKNP constitutes an area of conservation of the biodiversity. It contains more than 80 species of mammals, 330 species of birds, 36 species of reptiles, 20 species of Amphibians and 60 species of birds. Among the mammals, 5 species are rare or endangered: Colobe bai, chimpanzee, elephant, elk of derby, lycaon. These are met in the northern west boundary of the park. The main current threats to the fauna are the destruction of habitat and the poaching.

### ☞ **The socio-economic context**

The project site is located in the Rural Community (RC) of Khossanto which itself is in the department of Kédougou which is among the poorest department of the country.

From 1988 to 2000 the population of the RC of Khossanto increased from 5,711 to 7,821 inhabitants. This population is unequally distributed over the large surface; the average density is about 3, 26 inhabitants per km<sup>2</sup>.

The main ethnic groups that are present in the RC are the Malinkés who represent up to 94% of the population, followed by the Peul (4%), the Diankhanké (2%), the remainders being composed of the Bassari and the Ouolof.

The majority of the population of RC is Moslem, a minority remains animists. This population in general is well organized, especially women. There is at least one community – based organization in each village.

The main activities of the zone are: agriculture (dominant activity), herding, picking of wild fruits, craft industry (traditional exploitation of gold is particularly important and lucrative for local populations in the zone of the project. It ensures a rather substantial flow of income to the inhabitants of the villages of Sabodala, Bambaraya and Tenkhoto.) and Hunting (mainly tourist hunting which is very important in the zone).

From a cultural point of view, sacred sites are mentioned in the project area. Rituals are celebrated by population to obtain protection, purification, etc. In spite of the diversity of activities and the dynamism of the local populations, some constraints remain in the zone of the project, among which one can quote:

- Weakness of primary healthcare facilities coverage in the RC which has only one health post which is facing crucial problems of water supply, medical equipments and lack of medical staff. However the State of Senegal plans to create a health post in the village of Sabodala in June 2007;
- A high prevalence of the endemic diseases like malaria, dermatological infections, respiratory problems and sexually transmitted diseases;
- Insufficient water coverage over all the RC which has only twelve drillings among which only two that are located in the villages of Bransa and Khossanto are motor-driven or equipped with pump. Water supply is generally ensure through traditional wells which tare in the dry season between March and May;
- Low schooling rates continue to exist in the area even if many efforts have made in terms of sensitization, awareness raising, construction of classrooms (the RC counts 13 schools among which 6 are under the form of shelters; absence of water supply and lack of equipments are facing those schools);
- Some structural problems also exist in the agriculture which is the main economic activity (cotton, groundnut, sorghum, rice, fonio and corn are the main crops); while many constraints are facing herding (second economic activity), among which supply of cattle, lack of courses, absence of animal health (veterinary) facilities, etc;
- The weakness of infrastructure (roads, commercial equipments, means of transport, etc).

#### **4.2. Potential impacts of the project**

The ESIA mentions a number of **positive impacts** that can be expected from the project among which:

- Increase in the GDP and in foreign currencies for the country;
- Reduction of the trade balance deficit and increase of exports;
- Contribution to the development of the mining sector in the sub region (West Africa);
- Improvement of the basic social services at the local level;
- Improvement of the living conditions of the local populations through direct and indirect employments generated by the project; etc.

However, **negative social and environmental effects** can arise from the implementation of the various components of the project. The following activities most contribute to the occurrence of such negative impacts:

- the construction of roads and the development of the mine;
- the construction of the plant and its related facilities like the mining villages;
- soil stripping at mine site, use of explosives, storage of tailings;
- the ore extraction, transport, and temporary storage;
- the ore treatment including chemical extraction;
- maintenance and repairs of the plant;
- the operating of the (water storage) dam , the occupation of the mining village by the workers,
- the presence of the project in general;
- the closing and rehabilitation of the project site.

According to their effectiveness and scope, these activities that are the sources of the impacts are likely to induce abiotic, biotic and socio-economic disorders.

On the **Abiotic environmental component**, the possible impacts include:

- air quality degradation;
- pressure (qualitative and quantitative) and disturbances on water resources;
- degradation of the soils due to compressing, compaction and enhancement of their vulnerability to erosion;

- significant visual impacts on the landscape with important modification of the panoramic environment: excavations, mounds, temporary clouds of dust in the project area;
- risk of soil pollution by waste water, leaching water from tailings, hydrocarbons, etc;
- risk of pulling down of the wells (water table) villagers rely on for their domestic water supply due to pumping of important quantities by the project or its related activities;
- risk of surface water pollution by dusts, waste waters, leaching water from tailings, hydrocarbons, etc.;
- risks of reduction of the times of drying up of the village wells of the area due to pumping of large quantities of water by the project or its related activities (process water, domestic water in mining villages, water for ore washing, etc);
- risks of modifications of local hydraulic functioning (sub basins of Niorofara, Koumbako and Balé); etc

**On the biotic medium** (vegetation, fauna, protected areas), the potential impacts include:

- the risk of non respect of regulatory procedures for clearing activities;
- the loss of vegetation following the clearings;
- Exceeding resource use norms;
- illegal exploitation of ligneous species;
- The loss of individual protected species;
- The risk of bush fire;
- The risk of failure of the operations of reforestation;
- Destruction of the habitat of the fauna;
- The risk collision with fauna;
- The risk of poaching (ZIC and NKNP);
- The risk of weakening of biological diversity due to the contamination of the rivers of the NKNP.

**At the socio-economic level**, the suspected negative impacts are linked with:

- the risk of conflict with local populations in the event of their non-involvement;
- the risk of social degradation in the event of partial or non-transparency in the mode of recruitment of workers;
- the potential cultural conflicts and degradation of morals induced by the massive arrival of migrants workers;
- the risk of development of sexually transmitted diseases (STD/HIV/AIDS) induced by the mixing of foreign young people from different places;

- the spontaneous and unorganized (risky) occupation of the space by populations hoping to benefit from the project;
- the loss of land for cultivation and pasture.

**In the field of hygiene, health and safety**, adverse effects are expected from:

- nuisances (emission of smoke, noise, vibrations and dusts);
- risk of accidents during the implementation of the activities considered;
- diverse pollutions from hydrocarbons, solid and liquid wastes.

**In the field of technological risks**, the main concerns are related to:

- the flammability (or the explosiveness) of the handled products;
- the toxicity of the handled products;
- explosion and fire hazards related to the operating conditions of certain equipment;
- to some facilities of the project.

In response to these potential negative impacts, mitigating measures were identified, discussed and adopted. These measures are translated into concrete initiatives designed to safeguard the environment in the zone of the project.

### ***4.3. Mitigation measures for negative impacts***

**On the biotic environment** (vegetation, fauna and protected areas), mitigation measures corresponding to the impacts that are identified through the different steps of the project were proposed. These measures are as follows:

- The respect of the regulatory procedures of clearing;
- The regeneration of vegetal places where tailings were stored;
- The application of compensatory reforestation principles;
- The application of fencing in sensitive areas;
- The participation in the Annual Work Plan (AWP) of the local forestry department;
- The safeguarding of the protected species and the protection of thickets and the big trees;
- The sensitizing of the actors, the monitoring of the clearings and the limitation of the clearings to precise work areas as well as the optimization of the layouts;
- The development of fire break and provision of materials for bush fires control;
- the sensitizing of the population and the promotion of so-called “*foyer amélioré*” (wood saving traditional cooker), the use of alternative (to wood) energy and the control of the control of tree cuts;
- The setting up of surveillance committees;

- The limitation of the speed and the appropriate planning of explosives;
- The reinforcement of the surveillance of the NKNP and support (especially material) at surveillance posts of the park;
- The respect of the standards/norms on effluents;
- -The monitoring of avian fauna by mean of ringing, counting, egg analysis...;
- The protection (fencing) of the waste water storage facility;
- The mastering of reforestation techniques and monitoring of reforestation...

**On the abiotic environment** (landscapes, soils and water resources), for each identified negative impact, at least one mitigation measure was proposed with the intention to make the project sustainable. Among these measures, one can quote:

- The dismantling of installed equipments and the rehabilitation of the site after exploitation (example deforestation, etc);
- The control of the sources of dust emission (periodic watering);
- The appropriate stripping and storage of fertile soil (mine) for their later valorization;
- The creation of waste water treatment facilities;
- The proper collect of Acid Mine Drainage liquids;
- The folding back of dust by water spraying, hermetic hooding, aspiration with wet process or rejection of dust in a handle filter;
- The drainage of streaming waters in the plant area towards the mine pit previously waterproofed;
- The monitoring of soils quality;
- The sensitizing of project workers on the scarcity water resources in the zone;
- Contribution to the water supply in villages that are affected by water scarcity;
- The promotion of recycling of hazardous waste derived from inputs like cyanide, acids, etc.;
- The securing of handling of hazardous products (hydrocarbons, lubricants, grease, etc.);

**From the social point of view**, the proposed measures that integrate the perceptions of the local populations living in the project zone are designed to facilitate their massive recruitment. Among the measures adopted to achieve this goal are the:

- Priority for local labor in recruitment of workers;
- sensitization and training for avoidance of morals degradation and socio-cultural conflicts caused by the arrival of migrant workers;
- the design and implementation of a campaign against the STD/HIV/AIDS with the involvement of at least a local ONG specialized in that field;

- The strict control of space occupation before and during project activity.

Concerning hygiene – health – safety and technological risks issues, measures for the mastering of risks have been identified. These are preventive and/or protective. The main measures deal with the mastering of processes and others activities such as supervision, control, use of protective equipments and application of safety procedures. These safety measures are included in program that integrates training and sensitization as well as monitoring.

#### **4.4. Environmental Management Plan**

The Environmental and Social Management Plan (ESMP) derived from the ESIA of the project consists of sections that are respectively related to the:

- implementation of mitigation measures in terms of specific actions as well as procedures and methods;
- management tools for mine closing and rehabilitation; here, the general principles and the parameters to be integrated in the mine closure plan and the post mine period are outlined
- roles and responsibilities in the institutional organization and the implementation of the ESMP;
- Mechanisms and methods of surveillance and monitoring as well as the liabilities in terms of communication and consultation of the projects' stakeholders.

In practice, the implementation of mitigation measures will be done through three components:

##### **4.4.1. Natural Resources Management Plan (NRMP)** which consists of two sub-plans

- The plan dealing with the management of Vegetation, Fauna and Protected Areas;
- The plan dealing with Landscapes, Soils and Waters

In each sub-plan, the procedures for the implementation of mitigation measures to prevent or minimize the negative impacts and/or risks are described. Also, the sub-plans indicate the main actors who will be involved and the role and responsibilities of each of them for the implementation of the various tasks; completion periods, monitoring indicators and financial resources that are required to reconcile the exploitation of gold with the sustainable management of natural resources.

##### **4.4.2. Social Management Plan (SMP)**

This Plan is proposed with a view to effectively manage the negative social impacts induced by the implementation of SMC project. This management plan indicates the

procedures to be followed in order to guarantee to the project an optimal social acceptability. Specifically, this plan proposes the creation of a commission whose role will be to coordinate two sub committees which will be responsible for the management of local labour issues and the management of conflicts respectively.

**4.4.3. *Hygiene - Health – Safety Plan (HHSP)*** which provides to SMC the necessary tools to manage all the aspects of the project dealing with each of these three fields. This plan is the principal means which will make it possible for the project to integrate hygiene, health and safety with the general goals of the prevention and management of each component. HHSP's management will be adapted to each phase of the project. Its scope will extend far beyond the duration of the project so as to guarantee compliance.

The total estimated cost of the implementation of the environmental and social management plan is CFA 844.165.000 francs. This amount covers the implementation of operational measures and those related to capacity building of actors involved in the implementation of the ESMP. From this point of view, the amount does not include physical equipments, materials, installations and technical devices of protection and prevention.