

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT OF THE KOUILOU POTASH PROJECT

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5. METHODOLOGY FOR ASSESSMENT OF IMPACTS

5.1 General Approach

The approach used to carry out the Environmental and Social Impact Assessment (ESIA) complies with the legal and statutory framework of the Republic of Congo, as well as to the policies, guidelines and procedures of the World Bank Group (WBG), in particular the performance standards of the International Finance Corporation (IFC) (IFC, 2006).

The general principles guiding the implementation of this approach are as follows:

- Ensure that the ESIA concentrates on the main environmental and social issues of the Kouilou Potash Project;
- Maximise the use of local knowledge and skills by taking into account the available information and involving as many Congolese consultants as possible;
- Use international expertise in environmental and social sciences as well as in industrial and mining engineering, especially as far as energy production and potash mining are concerned;
- Ensure that the ESIA takes into consideration the main concerns of the stakeholders and the people who will be affected by the Project;
- Comply with the permit request procedures relating to the environment, especially with legal, institutional and political constraints;
- Maintain good relations with the national authorities responsible for permits, through effective communication with the various stakeholders.

This general approach is based on current knowledge of the Project's characteristics and the environment in which the Project will be implemented. More specifically, the methodology used to establish and assess the environmental and social impacts consists of:

- Presenting and describing the Project components and activities for each phase, *i.e.* exploration, construction and operation. This Project description enables identification of the source of impacts based on the technical characteristics of the infrastructure to be constructed, as well as construction activities, methods and schedule;
- Presenting and describing the Valued Elements of the Environment (VEEs) that make up the physical, biological and human landscapes, and that could be affected by the Project components. Describing the landscape gives a better understanding of the Project's current environmental and social context, helps to distinguish the most sensitive elements of the environment and helps to identify, if need be, certain issues to be considered. It is therefore a matter of identifying the characteristics of the receiving environment which prevail before the implementation of the Project;

- Identifying and taking into consideration, as much as possible, the concerns of the stakeholders and the people affected by the Project;
- Identifying the interactions between the Project components and the VEEs. It is worth noting that the integration of various environmental optimisation elements directly into the concept of the Project at the development stage greatly simplifies the environmental evaluation, so as to immediately decrease the quantity and scope of potential impacts;
- Ascertaining and describing the potential impact generated by one or more Project components. It is a question of defining possible future changes depending on the source of impact of the Project. An impact can be positive, negative or undetermined;
- Determining mitigation measures, aimed at reducing, or even eliminating, if possible, the identified impacts. The incorporation of these measures at this stage constitutes a commitment by the Project's initiator to implement said measures in the execution phase;
- Evaluating the residual impact, *i.e.* after the implementation of mitigation measures, and determining possible compensation measures, if applicable, for certain residual impacts.

The evaluation of the impacts according to the method described subsequently for each VEE is presented on an impact assessment sheet (Figure 5.1). This form includes the following elements:

- The Project components and activities which may cause an impact;
- The Project phase during which the impact will take place;
- The nature of the impact;
- The ecosystemic and social values, as well as the overall environmental value of the VEE;
- The degree of disturbance of the VEE;
- The intensity of the impact on the VEE;
- The extent of the impact on the VEE;
- The duration of the impact on the VEE;
- The probability of occurrence of the impact on the VEE;
- The overall magnitude of the impact on the VEE;
- The potential mitigation or optimisation measures of the impact on the VEE;
- The overall magnitude of the residual impact on the VEE.

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT SHEET – PHASE

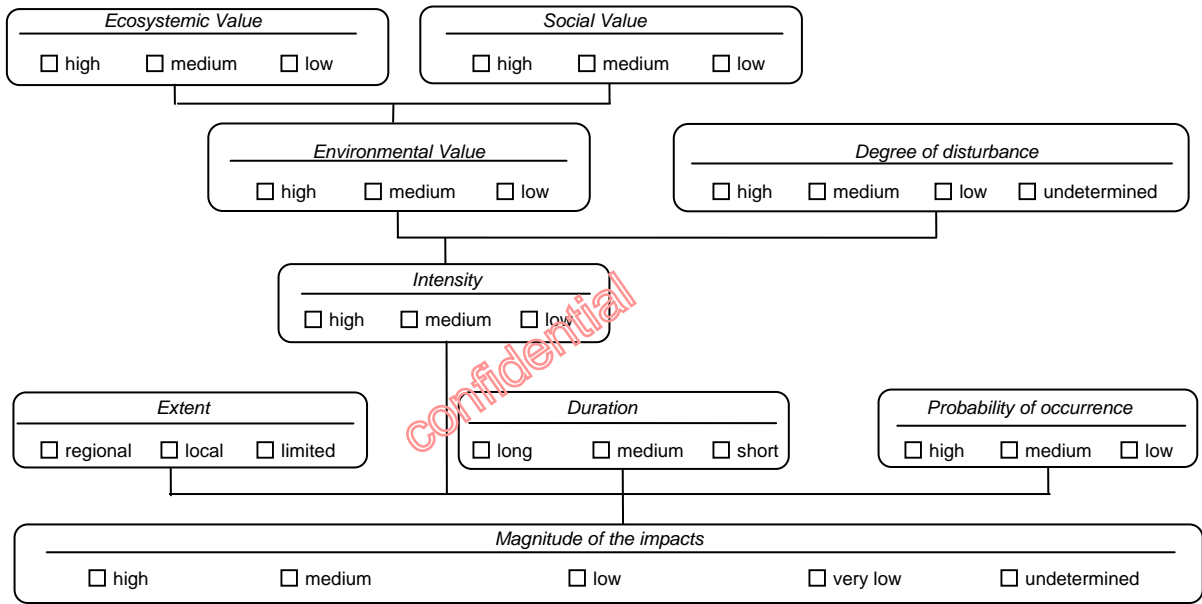
VALUED ELEMENT OF THE ENVIRONMENT:

ENVIRONMENT: physical biological human

PROJECT COMPONENT:

DESCRIPTION OF POTENTIAL IMPACTS:

ASSESSMENT OF IMPACTS Nature of impacts: positive negative undetermined



MITIGATION AND/OR OPTIMISATION MEASURES:

-
-

RESIDUAL IMPACTS:

-

Magnitude of residual impacts

high medium low very low undetermined

JUSTIFICATION:

Ecosystemic Value :

Social Value :

Environmental Value :

Degree of disturbance :

Extent :

Duration :

Probability of occurrence :

Figure 5.1 Environmental and Social Impact Assessment Sheet.

5.2 Valued Elements of the Environment

The VEEs are elements of the physical, biological and human landscapes which are likely to be affected by the Project.

The valued elements of the physical landscape to be taken into account are:

- For the continental physical landscape:
 - Climate;
 - Air quality;
 - Ambient noise;
 - Geology, seismicity and geotechnics;
 - Topography and geomorphology;
 - Soil quality;
 - Hydrogeology;
 - Hydrology;
 - Water and freshwater sediment quality.
- For the physical marine landscape:
 - Physical oceanography;
 - Sea water and marine sediment quality.

The valued elements of the biological landscape are:

- For the terrestrial biological landscape:
 - Vegetation;
 - Freshwater benthos;
 - Freshwater fish;
 - Amphibians and reptiles;
 - Land birds;
 - Land mammals.
- For the marine biological landscape:
 - Marine benthos;
 - Marine fish;
 - Marine reptiles;

- Marine birds;
- Marine mammals.

The valued elements of the human landscape are:

- Land use;
- Existing infrastructure;
- Public health services and infrastructure;
- Demography;
- Economy;
- Employment;
- Social organisation;
- Community health;
- Education;
- Cultural and religious heritage;
- Landscape.

5.3 Project Components

The impact assessment requires proper identification of the Project components which are likely to affect the VEEs. These Project components are presented according to the Project phases, *i.e.* exploration, construction and operational.

5.3.1 Exploration Phase

The main components and activities of the Kouilou Potash Project during the exploration phase were:

- Establishment of paths through the vegetation cover to carry out seismic surveys;
- Establishment of access roads and drilling platforms;
- Drilling boreholes;
- Storage and use of reagents, chemicals and fuels;
- Supply of water and water management;
- Vehicular transport;
- Establishment and operation of the Marcel-Rigny Camp;

- Waste management.

5.3.2 Construction and Operational Phases

During construction and operational phases, the Project components which may lead to interactions with the VEEs are:

- Solution mining surface infrastructure;
- Drilling and solution mining activities;
- Potash plant and process;
- Plant utility services;
- Auxiliary plant infrastructure;
- Reagents, chemicals and fuels;
- Water supply and management;
- Energy supply;
- Transport – roads, brine and freshwater pipelines, railway, vehicles –;
- Port infrastructure and activities;
- Camp;
- Waste management.

5.4 **Analysis and Assessment of Impacts**

All impacts, whatever their importance, are evaluated and, when possible, are the subject of mitigation or optimisation measures. The importance of an impact depends upon the intensity of the disturbance, itself incorporating concepts pertaining to the value of the VEE and the degree of disturbance. The extent, the duration and the probability of occurrence are also taken into consideration when evaluating the importance of the impact. Each of these aspects is presented in the subsequent sections.

5.4.1 Evaluation of the Valued Elements of the Environment

5.4.1.1 Ecosystemic Value

The ecosystemic value of a VEE corresponds to the relative importance of a component with regard to its influence on the ecosystem of which it is a part, from the standpoint of its ecological role, its uniqueness or rarity, its diversity or its representativeness. The value can be high, medium or low.

High: the VEE holds an important role in the ecosystem, a major interest in terms of biodiversity, as well as having exceptional qualities whose conservation or protection is the subject of a large consensus within the scientific community, or a unique international status.

Medium: the VEE holds a high level of interest and has recognised qualities whose conservation and protection constitute a concern on the part of certain interest groups, without however being the subject of a consensus within the scientific community.

Low: the VEE holds an interest or a quality whose conservation or protection is the subject of little concern.

The ecosystemic value of the VEEs was established as a result of a consensus amongst consulted experts.

5.4.1.2 Social Value

The social value of a VEE corresponds to the relative importance given to a component by the various national stakeholders, *i.e.* the people directly affected by the Project, the national government bodies or any legislative or regulatory authority. The social value indicates the popular or political desire or will to preserve the integrity or the original character of a component. The social value is also expressed by the stakeholders' expectations with regard to the improvement of this VEE. This will is expressed by the legal protection it is given or by the interest shown by the stakeholders.

Because of its subjective nature, the social value given to a VEE may not reflect a consensus as important as its ecosystemic value, and may vary with social groups, gender, time, etc. The social value of the VEEs was therefore established through public consultations carried out in October-November 2005 and in November 2007 (Tables 5.1 to 5.6).

The objectives of the consultations were not only to determine the social value of the VEEs but also to describe the nature and the extent of the concerns and expectations of the various stakeholders, *i.e.* the people and the various government bodies directly involved in the Project and its possible impacts. All concerns and expectations that were raised by the stakeholders during these meetings are discussed in the Stakeholder Engagement Plan (SEP).

A methodology based on a participatory approach was implemented. This took into account the objectives to be achieved, a recent past marked by unmet expectations and previous projects being stopped or abandoned, the social organisation of the affected region, and the deployment of experts all over the Study Area. This method means involving the largest number of stakeholders interviewed with local authorities.

The experts mandated to carry out the public consultations drew up an information-gathering questionnaire, a scenario for the running of the discussion groups, data compilation sheets and a report template. Several monitoring and evaluation meetings were held bringing together the Mengo Centre Village Council and the experts, in order to determine the methodology to be used. Following these meetings, the small and large discussion groups' method proved to be the most appropriate.

Two-hour long meetings were held for each discussion group. Each meeting included the presentation of the proceedings by the Chief of the Village Council, the villagers' welcome, the general presentation of the Project by the experts, open discussion, questions, responses and comments along with the closing remarks by the Chief or his representative. The Chief and the members of the Village Council took an active part in identifying the target groups along with the organisation and running of the meetings. The members of the Council took turns accompanying the experts during meetings with the *blocs* and the *brigades*, in a guiding role but also and above all as interpreters and facilitators.

It should be noted that at this initial stage of the Project, the public consultations involved communities spread over the entire Study Area.

The various stakeholders selected were:

- Representatives of the Hinda subprefecture located both in Hinda and Pointe-Noire;
- The Mengo Centre Village Council;
- The villagers of Mengo Centre Village, divided into four focus groups: the first two comprising respectively women and young people, the third comprising adult villagers and charcoal makers, and a last group made up of land owners, elders and heads of family;
- The communities living in the subdivisions of the Mengo Centre Village, called *blocs* and *brigades*: Bimbakassa *Bloc*, Nkondi *Bloc*, Wolo *Bloc* and NKande-MBambi *Bloc*, Yabou *Brigade*, Ntoumbi *Brigade*, Tchitoungou *Brigade*, N'Singa *Brigade*;

- The communities living in the village of Mpofo and in its *brigade*, made up of the Tchiniambi, Tchiniambi-Loémé and Lukala *Blocs*.

The social value was established by means of a relative appreciative scale including high, medium or low values.

High: the VEE takes on a great value when one or more of the following applies: it is the subject of legal or statutory protection; it proves to be essential to human activity; it is the subject of high expectations in terms of improvement, or even major concerns in terms of decline or negative consequences.

Medium: the VEE has either a certain economic, social or cultural value, or is used by a significant proportion of the affected population, without however being the subject of legal protection.

Low: the VEE holds little or no value or use for the affected population.

The social values of the VEEs are reported for the various discussion groups (Tables 5.1 to 5.6). When interpreting these values, it should be kept in mind that for the respondents, the major level of concern is day-to-day subsistence and self-sufficiency. As demonstrated by Maslow's hierarchy of needs, the value of the VEEs can evolve and change over time. When people in a precarious situation are asked to think about the positive or negative effects of setting up a new plant in their region, it is normal that the initial comments concern the possibility of finding employment and that the negative effects are rarely, if at all, mentioned. It is up to the proponent's team to maintain contact with the villagers and inform them about the progress of the work and the measures taken to keep the human and natural environments safe.

Mengo Centre

All the discussion groups gave a high score for the social importance of the following VEEs: soil quality, hydrogeology, hydrology, water and freshwater sediment quality, the economy, employment, community health and education (Table 5.1).

Interestingly, the women's group classified the importance of the VEEs almost exclusively as being either high or low. As for the land owners, elders and heads of family, they tended to use the classification high for all the VEEs, apart from climate, geology, seismicity and geotechnics, topography and geomorphology, and landscape. The young people's group and the adults and charcoal makers were split in their assessment, dividing the VEEs amongst the three values.

Table 5.1 Social Importance of Valued Elements of the Environment according to Mengo Centre Village.

Valued Element of the Environment	Women			Young People			Adults and Charcoal Makers			Landowners, Elders and Heads of Families.		
	H	M	L ¹	H	M	L	H	M	L	H	M	L
Climate			X		X				X			X
Air Quality			X		X		X					X
Ambient Noise			X		X		X					X
Geology, Seismicity and Geotechnics			X			X			X			X
Topography and Geomorphology			X			X			X			X
Soil Quality	X			X			X					X
Hydrogeology	X			X			X					X
Hydrology	X			X			X					X
Water and Freshwater Sediment Quality	X			X			X					X
Physical Oceanography												
Sea Water and Marine Sediment Quality												
Natural Habitats, Flora and Fauna – Biodiversity		X			X			X				X
Land Use			X			X			X			X
Existing Infrastructure		X			X			X				X
Public Health Services and Infrastructure			X		X			X				X
Demography												
Economy	X			X			X					X
Employment	X			X			X					X
Social Organisation			X	X				X				X
Community Health	X			X			X					X
Education	X			X			X					X
Cultural and Religious Heritage			X		X				X			X
Landscape			X		X				X			X

¹ H = High; M = Medium; L = Low

The women also qualified the following VEEs as having a low importance: climate, air quality, ambient noise, geology, seismicity and geotechnics, topography and geomorphology, land use, public health services and infrastructure, social organisation, cultural and religious heritage, as well as landscape. These choices can be explained by the fact that, on the one hand, women are more concerned about improvement of social measures, such as education, health, drinking water and increased economic contribution, and on the other hand, their societal role hardly, if at all, allows them to take an active role in social organisation, in the ritual of customs and traditions or even to have access to their heritage. Women are mainly responsible for ensuring their survival and that of their children, as is the case in most African societies.

During these same discussions, the women also specified that they would get used to the ambient noise, and, if need be, the pollution, provided that their young people and husbands could find work. It can however be expected that once these essential needs are taken care of, the women will give more importance to these VEEs.

The land owners, elders and heads of family group gave a high level of importance to most of the VEEs. These are, amongst others, the safeguarding of cultural and religious heritage and everything which affects, to a greater or lesser degree, the arable land and land owned by the village. These choices can be explained by the fact that this group comprises the most educated and advantaged people who have greater influence and power.

As for the young people's group, they gave a low level of importance to geology, seismicity and geotechnics, topography and geomorphology along with land use. However, a high level of importance is given to soil quality, hydrogeology, hydrology, water and freshwater sediment quality, economy, employment, social organisation, as well as community health, and education. These choices can be explained by the fact that young people are above all preoccupied with their future. Thus, environmental, social and economic VEEs are the most highly valued.

Finally, the adults and charcoal makers discussion group gave a low level of importance to climate, geology, seismicity and geotechnics, topography and geomorphology, land use, cultural and religious heritage as well as landscape. These choices might be explained by the fact that villagers and charcoal makers have no influence on these elements. However, they gave a high level of importance to air quality, ambient noise, soil quality, hydrogeology, hydrology, water and freshwater sediment quality, economy, employment, social organisation, as well as community health, and education. As is the case for the young people, the future is very important for the villagers and charcoal makers. They thus give a higher level of importance to the environmental, social and economic values which affect them more specifically.

Mengo Centre, Blocs and Brigades

According to the high, medium and low relative appreciation scale, the social importance of the VEEs has also been established for the communities of the *blocs* and *brigades* of Mengo Centre that were consulted (Table 5.2).

For all the discussion groups, a high score was given to the following VEEs: soil quality, hydrogeology, hydrology, water and freshwater sediment quality, public health services and infrastructure, economy, employment, community health, and

education. A low level of importance was given to climate, geology, seismicity and geotechnics, topography and geomorphology, as well as landscape. Natural habitats, flora and fauna – biodiversity – were given high and medium values. As for the following VEEs – land use, existing infrastructure, social organisation as well as cultural and religious heritage – they are unequally distributed between the high, medium and low values.

Table 5.2 Social Importance of Valued Elements of the Environment according to the *Blocs* and *Brigades* of Mengo Centre.

Valued Element of the Environment	Yabou			Ntoumbi Bimbakassa			Nkondi			Wolo			Tchitoungou NKande-MBambi			N'Singa		
	H	M	L ¹	H	M	L	H	M	L	H	M	L	H	M	L	H	M	L
Climate			X			X			X			X			X			X
Air Quality			X	X					X			X			X			X
Ambient Noise			X	X					X			X			X			X
Geology, Seismicity and Geotechnics			X			X			X			X			X			X
Topography and Geomorphology			X			X			X			X			X			X
Soil Quality	X			X			X			X			X			X		
Hydrogeology	X			X			X			X			X			X		
Hydrology	X			X			X			X			X			X		
Water and Freshwater	X			X			X			X			X			X		
Sediment Quality																		
Physical Oceanography																		
Sea Water and Marine Sediment Quality																		
Natural Habitats, Flora and Fauna – Biodiversity		X			X			X		X			X			X		
Land Use			X			X			X			X			X			X
Existing Infrastructure			X			X			X			X			X			X
Public Health Services and Infrastructure	X			X			X			X			X			X		
Demography																		
Economy	X			X			X			X			X			X		
Employment	X			X			X			X			X			X		
Social Organisation		X			X			X			X			X				X
Community Health	X			X			X			X			X			X		
Education	X			X			X			X			X			X		
Cultural and Religious Heritage		X			X			X		X			X			X		
Landscape			X			X			X			X			X			X

¹ H = High; M = Medium; L = Low

Soil quality, hydrogeology, hydrology, water and freshwater sediment quality, economy, employment, community health, and education were the common VEEs of all the discussion groups of Mengo Centre and its *blocs* and *brigades*. The two last groups, however, classified public health services and infrastructure as high (Table 5.2), while the groups of Mengo Centre gave it a medium classification (Table 5.1). As the communities of the *blocs* and *brigades* have little or no access to services, no school, no integrated health centre, roadways and tracks which are in poor condition and often hardly usable, it is understandable that public health services and infrastructure have a high level of importance for them.

Mpofo and its Blocs

The high, medium and low relative appreciation scale was used to qualify the social importance of the VEEs as expressed by the villagers of Mpofo and its *blocs* (Table 5.3).

Table 5.3 Social Importance of Valued Elements of the Environment according to the Mpofo Village and *Blocs*.

Valued Element of the Environment	Mpofo			Tchiniambi			Tchiniambi-Loémé			Lukala		
	H	M	L ¹	H	M	L	H	M	L	H	M	L
Climate	X			X			X				X	
Air Quality	X			X				X				X
Ambient Noise	X			X				X				X
Geology, Seismicity and Geotechnics			X			X			X			X
Topography and Geomorphology			X			X			X			X
Soil Quality	X			X			X				X	
Hydrogeology			X			X	X					X
Hydrology	X				X			X			X	
Water and Freshwater Sediment Quality	X				X			X			X	
Physical Oceanography												
Sea Water and Marine Sediment Quality												
Natural Habitats, Flora and Fauna – Biodiversity	X			X			X				X	
Land Use			X	X			X				X	
Existing Infrastructure			X	X			X				X	
Public Health Services and Infrastructure	X			X			X				X	
Demography												
Economy	X			X			X				X	
Employment	X			X			X				X	
Social Organisation	X			X			X				X	
Community Health		X		X			X				X	
Education		X		X			X				X	
Cultural and Religious Heritage	X			X			X				X	
Landscape		X		X					X		X	

¹ H = High; M = Medium; L = Low

For the majority of the villagers of Mpofu and its *blocs* that were consulted, the VEEs that held a high value were: climate, soil quality, hydrology, water and freshwater sediment quality, natural habitats, flora and fauna – biodiversity –, land use, public health services and infrastructure, economy, employment, social organisation, community health, education, as well as cultural and religious heritage. As for air quality, ambient noise, hydrogeology, existing infrastructure and landscape, these are all VEEs with a medium level of importance for these communities. Only the VEEs related to the physical geography, *i.e.* geology, seismicity and geotechnics, as well as topography and geomorphology, were classified as having a low level of importance.

Civil Servants of the Hinda Subprefecture

The social importance given to VEEs by civil servants of the Hinda subprefecture, working in Pointe-Noire and Hinda, was also established according to the high, medium and low values (Table 5.4).

Table 5.4 Social Importance of Valued Elements of the Environment according to the Civil Servants of the Hinda Subprefecture.

Valued Element of the Environment	Pointe-Noire			Hinda		
	H	M	L ¹	H	M	L
Climate			X			X
Air Quality			X			X
Ambient Noise			X			X
Geology, Seismicity and Geotechnics			X			X
Topography and Geomorphology			X			X
Soil Quality	X			X		
Hydrogeology	X			X		
Hydrology	X			X		
Water and Freshwater Sediment Quality	X			X		
Physical Oceanography						
Sea Water and Marine Sediment Quality						
Natural habitats, Flora and Fauna – Biodiversity		X			X	
Land Use	X			X		
Existing Infrastructure		X		X		
Public Health Services and Infrastructure	X			X		
Demography						
Economy	X			X		
Employment	X			X		
Social Organisation	X				X	
Community Health	X			X		
Education	X			X		
Cultural and Religious Heritage		X			X	
Landscape			X		X	

¹ H = High; M = Medium; L = Low

The VEEs which received a high score by both groups of civil servants were: soil quality, hydrogeology, hydrology, water and freshwater sediment quality, land use, public health services and infrastructure, economy, employment as well as community health, and education. For both groups of civil servants, a low level of importance was given to the following VEEs: climate, air quality, ambient noise, geology, seismicity and geotechnics, as well as topography and geomorphology. Natural habitats, flora and fauna – biodiversity – along with cultural and religious heritage were VEEs classified as medium. As for the importance of existing infrastructure, social organisation and landscape, it varied depending on the group.

Summary of the Social Importance of Valued Elements of the Environment

Overall, the majority of the discussion groups from Mengo and Mpofo gave a high level of importance to soil quality, hydrogeology, hydrology, water and freshwater sediment quality, public health services and infrastructure, economy, employment as well as community health, and education. A medium value was given by the Mengo Centre communities to the following VEEs: natural habitats, flora and fauna – biodiversity –, existing infrastructure, social organisation as well as cultural and religious heritage (Table 5.5). As for the communities of Mpofo and its *blocs*, they gave a high level of importance to those same VEEs (Table 5.6). With the exception of the communities of the Mpofo region, which gave them a high level of importance, the following VEEs were classified as low: climate, air quality, ambient noise, geology, seismicity and geotechnics, topography and geomorphology, land use, as well as landscape (Table 5.6).

As for the Hinda subprefecture civil servants, they gave about the same social importance to the VEEs as the Mengo Centre and Mpofo villagers as well as their respective sub-divisions.

5.4.1.3 Overall Environmental Value

The overall environmental value integrates both the ecosystemic value and the social value of a VEE (Table 5.7). It corresponds to the higher of the two values. It can therefore be high, medium or low.

5.4.2 Degree of Disturbance of the Valued Element of the Environment

The degree of disturbance of a VEE corresponds to the scale of modifications affecting this component. Depending on the nature of the impact, modifications may be positive, negative or undetermined and the effects may be direct or indirect. The degree of disturbance also takes into account cumulative, synergistic or deferred

effects, which, beyond the simple cause and effect relationship, may amplify the disturbance of a component when the environment is particularly sensitive. The degree of disturbance may be high, medium, low or undetermined.

Table 5.5 Social Importance of Valued Elements of the Environment according to all the Groups Met in the Mengo Centre Region.

Valued Element of the Environment	Mengo and its <i>Blocs</i> and <i>Brigades</i>		
	H	M	L ¹
Climate			X
Air Quality			X
Ambient Noise			X
Geology, Seismicity and Geotechnics			X
Topography and Geomorphology			X
Soil Quality	X		
Hydrogeology	X		
Hydrology	X		
Water and Freshwater Sediment Quality	X		
Physical Oceanography	X		
Sea Water and Marine Sediment Quality	X		
Natural Habitats, Flora and Fauna - Biodiversity		X	
Land Use			X
Existing Infrastructure		X	
Public Health Services and Infrastructure	X		
Demography			
Economy			
Employment	X		
Social Organisation		X	
Community Health	X		
Education	X		
Cultural and Religious Heritage		X	
Landscape			X

¹ H = High; M = Medium; L = Low

High: the impact implicates the environmental integrity of the VEE or strongly and irreversibly modifies the VEE or its use.

Medium: the impact leads to a reduction or increase in the quality or use of the VEE, without however compromising its environmental integrity.

Low: the impact hardly modifies the quality, use or environmental integrity of the VEE.

Undetermined: the degree of disturbance of the VEE is impossible to establish or foresee; assessment of the magnitude of the impact cannot thus be completed.

Table 5.6 Social Importance of Valued Elements of the Environment according to All the Groups Met in the Mpofo Region.

Valued Element of the Environment	Mpofo and its Blocs		
	H	M	L ¹
Climate	X		
Air Quality		X	
Ambient Noise		X	
Geology, Seismicity and Geotechnics			X
Topography and Geomorphology			X
Soil Quality	X		
Hydrogeology		X	
Hydrology	X		
Water and Freshwater Sediment Quality	X		
Physical Oceanography			
Sea Water and Marine Sediment Quality			
Natural Habitats, Flora and Fauna - Biodiversity	X		
Land Use	X		
Existing Infrastructure		X	
Public Health Services and Infrastructure	X		
Demography			
Economy	X		
Employment	X		
Social Organisation	X		
Community Health	X		
Education	X		
Cultural and Religious Heritage	X		
Landscape		X	

¹ H = High; M = Medium; L = Low

5.4.3 Impact Intensity

The intensity of the impacts on the VEE corresponds to the relative magnitude of the consequences which can be attributed to the alteration of a VEE. The intensity incorporates the overall environmental value of the VEE, both in terms of its ecosystemic value and of its social value, along with its degree of disturbance. The impact intensity may be high, medium or low (Table 5.8).

Table 5.7 Ecosystemic, Social and Overall Values of the Valued Elements of the Environment.

Valued Element of the Environment	Ecosystemic Value ¹	Social Value ²	Overall Environmental Value
Climate	Low	Medium	Medium
Air Quality	Medium	Low	Medium
Ambient Noise	Low	Medium	Medium
Geology, Seismicity and Geotechnics	Medium	Low	Medium
Topography and Geomorphology	Low	Low	Low
Soil Quality	Low	High	High
Hydrogeology	High	High	High
Hydrology	High	High	High
Water and Freshwater Sediment Quality	Medium	High	High
Physical Oceanography	Low	³	Low
Sea Water and Marine Sediment Quality	Low	³	Low
Natural Habitats, Flora and Fauna – Biodiversity			
Vegetation	Low	Medium	Medium
Freshwater Benthos	Low	Low	Low
Freshwater Fish	Medium	Medium	Medium
Amphibians and Reptiles	Medium	Medium	Medium
Land Birds	Medium	Medium	Medium
Land Mammals	Medium	Medium	Medium
Marine Benthos	Low	Medium	Medium
Marine Fish	Medium	Medium	Medium
Marine Reptiles	Medium	Low	Medium
Marine Birds	Medium	Medium	Medium
Marine Mammals	Medium	Medium	Medium
Land Use	Medium	Medium	Medium
Existing Infrastructure	Low	Medium	Medium
Public Health Services and Infrastructure	High	High	High
Demography	High	³	High
Economy	High	High	High
Employment	High	High	High
Social Organisation	Medium	Medium	Medium
Community Health	High	High	High
Education	High	High	High
Cultural and Religious Heritage	Medium	Medium	Medium
Landscape	Low	Medium	Medium

1 Value established by consensus between the experts.

2 Value established by survey of the stakeholders.

3 Value not established by survey of the stakeholders.

Table 5.8 Combination of Criteria enabling the Establishment of Impact Intensity.

Environmental Value	Degree of Disturbance		
	High	Medium	Low
High	High	High	Medium
Medium	High	Medium	Low
Low	Medium	Low	Low

High: the environmental value is high as is the degree of disturbance; or the environmental value is high and the degree of disturbance is medium; or the environmental value is medium and the degree of disturbance is high.

Medium: the environmental value is medium as is the degree of disturbance; or the environmental value is low and the degree of disturbance is high; or the environmental value is high and the degree of disturbance is low.

Low: the environmental value is low and the degree of disturbance is medium or low; or the environmental value is medium and the degree of disturbance is low.

5.4.4 Extent of the Impacts

The extent of the impacts on the VEE corresponds to the scope or to the influence of the effects on the VEE. The extent of the impacts may be regional, local or limited.

Regional: the impact is felt in a vast area extending a large distance from the Project Area.

Local: the impact is felt in a relatively restricted area inside, close to or at a short distance from the Project Area.

Limited: the impact is felt in a very restricted area inside or close to the Project Area.

5.4.5 Impact Duration

The impact duration on the VEE corresponds to the temporal dimension, *i.e.* the period of time during which the impacts will affect the VEE. This criterion takes into account the intermittent nature of one or more impacts. The impact duration may be long, medium or short.

Long: the impact is felt continuously throughout the lifespan of the Project and even afterwards.

Medium: the impact is felt continuously during a relatively prolonged period, but which is generally less than the lifespan of the Project.

Short: the impact is felt during a relatively limited period, generally corresponding to the construction period or that of the start-up of activities.

5.4.6 Probability of Occurrence of the Impacts

The probability of occurrence of the impacts corresponds to the probability of occurrence of an impact on the environmental integrity of a VEE. The probability of occurrence of the impacts may be high, medium or low.

High: an impact will definitely occur.

Medium: an impact is likely to occur.

Low: an impact is unlikely or will only occur in the event of an accident.

5.4.7 Determination of Impact Magnitude

The magnitude of the impacts on the VEE incorporates the criteria of intensity, extent, duration and probability of occurrence. The combinations used to establish the level of magnitude of the impact are set in advance. The overall magnitude may be high, medium, low, very low or undetermined (Table 5.9).

Residual Impacts

The assessment of the overall magnitude of residual impacts on the VEE is then carried out, taking into account the degree of uncertainty of previous assessments and of the complete implementation of all the proposed mitigation or compensation measures. Mitigation measures are actions or terms of implementation of the Project that are defined in order to prevent a probable negative impact or to lessen the level of upheaval on an element of the landscape.

The overall magnitude of the residual impacts, determined after applying mitigation measures, is evaluated taking into account the judgement of the experts: it may be high, medium, low, very low or undetermined.

Table 5.9 Combinations of Criteria enabling the Establishment of the Magnitude of an Impact on a Valued Element of the Environment.

Intensity	Extent	Duration	Probability of Occurrence	Magnitude
High	Regional	Long	High	High
			Medium	High
			Low	High
		Medium	High	High
			Medium	High
			Low	High
	Local	Short	High	High
			Medium	High
			Low	High
		Long	High	High
			Medium	High
			Low	High
Limited	Medium	High	High	
		Medium	High	
		Low	Medium	
	Short	High	High	
		Medium	High	
		Low	Medium	
Medium	Regional	Long	High	High
			Medium	Medium
			Low	Medium
		Medium	High	High
			Medium	Medium
			Low	Medium
	Local	Short	High	Medium
			Medium	Medium
			Low	Medium
		Long	High	Medium
			Medium	Medium
			Low	Medium
Limited	Medium	High	Medium	
		Medium	Medium	
		Low	Low	
	Short	High	Medium	
		Medium	Low	
		Low	Low	

Table 5.9 (cont.) Combinations of Criteria enabling the Establishment of the Magnitude of an Impact on a Valued Element of the Environment

Intensity	Extent	Duration	Probability of Occurrence	Magnitude
Low	Regional	Long	High	Medium
			Medium	Low
			Low	Low
		Medium	High	Medium
			Medium	Low
			Low	Low
	Local	Short	High	Medium
			Medium	Low
			Low	Low
		Long	High	Low
			Medium	Low
			Low	Low
	Limited	Medium	High	Low
			Medium	Very low
			Low	Very low
		Short	High	Low
			Medium	Very low
			Low	Very low

5.5 References

INTERNATIONAL FINANCE CORPORATION (IFC). 2006. *Performance Standards on Social and Environmental Sustainability*. April 30, 2006. 34 p.