

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT OF THE KOUILOU POTASH PROJECT

TABLE OF CONTENTS

	<i>Page</i>
Table of Contents	12-i
List of Tables	12-i
12. SUMMARY OF MITIGATION MEASURES AND RESIDUAL IMPACTS.....	12-1

LIST OF TABLES

	<i>Page</i>
Table 12.1 Summary of Magnitude of the Impacts on the Physical, Biological and Human Valued Elements of the Environment prior to the Implementation of Mitigation Measures.....	12-2
Table 12.2 Summary of Medium and High Magnitude Potential Impacts, Mitigation Measures and Residual Impacts on Valued Elements of the Physical Environment.....	12-5
Table 12.3 Summary of Medium and High Magnitude Potential Impacts, Mitigation Measures and Residual Impacts on Valued Elements of the Biological Environment.....	12-9
Table 12.4 Summary of Medium and High Magnitude Potential Impacts, Mitigation Measures and Residual Impacts on Valued Elements of the Human Environment.....	12-17
Table 12.5 Implementation of Mitigation Measures through Management Plans during Construction, Operation and Closure.	12-31

confidential

12. SUMMARY OF MITIGATION MEASURES AND RESIDUAL IMPACTS

A summary of the potential impacts of the exploration, construction and operational phases of the Project on the physical, biological and human Valued Elements of the Environment (VEEs) is presented below, as well as planned mitigation measures and the resulting residual impacts.

During the exploration phase, the Project has impacted particularly on the VEEs of the human environment as well as on soil. The magnitude of the positive impacts on the VEEs is considered high for the public health services and infrastructure, economy, employment and education. The magnitude of negative impacts is deemed to be medium for the quality of soil, and either low, very low or non-existent for the other VEEs (Table 12.1).

During the construction phase, the VEEs of the human environment will also be most affected. On the one hand, the magnitude of positive impacts will be high for the economy, employment and education, and medium for existing infrastructure. On the other hand, the magnitude of negative impacts could be high for the public health services and infrastructure, demography and community health. The potential negative impacts could be medium for soil quality, land birds, land mammals, land use, social organisation, and cultural and religious heritage, and either low, very low or non-existent for the other VEEs (Table 12.1).

During the operational phase, the potential impacts of the Project will be of a high or medium magnitude for about half of the VEEs. Amongst these, the Project will impact positively some of the human environment VEEs, *i.e.* economy, employment and education, and negatively public health services and infrastructure, demography and community health (Table 12.1).

It is noteworthy that a VEE could potentially be impacted both positively and negatively by different Project Components or activities, and was therefore deemed to be impacted in an undetermined way.

Potential impacts, mitigation measures and the residual impacts are described in greater detail for VEEs whose magnitude of the Project impacts, prior to the consideration of mitigation measures, are deemed to be high or medium (Tables 12.2 to 12.4).

The mitigation measures proposed to reduce unavoidable impacts, to minimise environmental and social hazards and to optimise the positive outfalls of the Project will be implemented through different management plans during construction, operation and closure (Table 12.5).

Table 12.1 Summary of Magnitude of the Impacts on the Physical, Biological and Human Valued Elements of the Environment prior to the Implementation of Mitigation Measures.

Valued Element of the Environment	Magnitude of the Impact by Project Phase		
	Exploration	Construction	Operational
Physical Environment			
Climate	No impact	Low	Low
Air quality	Low	Low	Medium
Ambient noise	No impact	Low	Low
Geology, seismicity and geotechnics	No impact	No impact	No impact
Topography and geomorphology	Very low	Low	Low
Soil quality	Medium	Medium	Medium
Hydrogeology	Low	Low	Low
Hydrology	Low	Low	Medium
Water and freshwater sediment quality	Low	Low	Medium
Physical oceanography	No impact	No impact	Low
Water and marine sediment quality	No impact	Low	Low
Biological Environment			
Vegetation	Low	Low	Low
Freshwater benthos	Low	Very low	Very low
Freshwater fish	Low	Low	Medium
Amphibians and reptiles	Very low	Low	Medium
Land birds	Low	Medium	Medium
Land mammals	Low	Medium	Medium
Marine benthos	No impact	Low	Medium

Table 12.1 (cont.) Summary of Magnitude of the Impacts on the Physical, Biological and Human Valued Elements of the Environment prior to the Implementation of Mitigation Measures.

Valued Element of the Environment	Magnitude of the Impact by Project Phase		
	Exploration	Construction	Operational
Biological Environment (continued)			
Marine fish	No impact	Low	Low
Marine reptiles	No impact	Very low	No impact
Marine birds	No impact	No impact	No impact
Marine mammals	No impact	No impact	No impact
Human Environment			
Land use	Very low	Medium	Medium
Existing infrastructure	Very low	Medium (+)	Medium (+)
Public health services and infrastructure	High (+)	High	High
Demography	No impact	High	High
Economy	High (+)	High (+)	High (+)
Employment	High (+)	High (+)	High (+)
Social organisation	No impact	Medium	Medium
Community health	No impact	High	High
Education	High (+)	High (+)	High (+)
Cultural and religious heritage	No impact	Medium	Medium
Landscape	No impact	Low	Low

(+) Positive impacts

confidential

Table 12.2 Summary of Medium and High Magnitude Potential Impacts, Mitigation Measures and Residual Impacts on Valued Elements of the Physical Environment.

Valued Element of the Physical Environment	Phase ¹	Potential Impact	Magnitude of the Impact	Mitigation or Optimisation Measure	Magnitude of the Residual Impact
Air quality	Op	Emission of: <ul style="list-style-type: none"> • Gases, particulates, vapours, or Ozone Depleting Substances (ODSs) caused either by the combustion of hydrocarbons, the storage of hydrocarbons, or the use of cooling and air-conditioning equipment; • Dust caused either by soil stripping, earth works, and movements of machinery and vehicles; • Potash dust caused by the production, storage, loading, transport and transshipment activities; • Odours caused by accumulation of organic waste. 	Medium	<ul style="list-style-type: none"> • Use of clean air technologies, regular maintenance of all power-driven equipment and vehicles, and of cooling and air-conditioning equipment, and recovery and recycling of Ozone Depleting Substances (ODSs), all refrigerants will comply with the Montreal Protocol requirements; • Limiting the entrainment of dust by minimising devegetation, soil stripping and earth works, restricting some activities when wind speeds exceed 2.5 m/s, planting vegetation as anti-dust screens; • Use of appropriate filters for the stacks of the bagging building, the exhaust stacks of the crystalliser's vacuum pump, the exhaust stacks of the dust collector silo;; • Proper management and composting of organic waste; • Implementing a monitoring program for ambient air quality, and gaseous and particulate atmospheric emissions. 	Low
Soil quality	Ex	Deterioration of soils caused by : <ul style="list-style-type: none"> • Deforestation, removing vegetation, surface stripping, excavation, levelling, backfilling; • Accidental discharge of hydrocarbons from operating vehicles and power-driven equipment and of salts, bentonite and cement for preparing the mud, as well as a small quantity of diesel fuel. 	Medium	<ul style="list-style-type: none"> • Deforestation work, removal of vegetation, surface stripping of organic soil, as well as excavation, levelling and backfilling operations have been limited to the minimum required surface area; • Salts, bentonite and hydrocarbons were stored undercover and handled responsibly; • Drill-cuttings were stored in mud pits set up at every drilling platform and, where necessary, the diesel fuel was collected in a tank to be reused; • Cleared surfaces will be revegetated. 	Low
	Co	Deterioration of soils caused by: <ul style="list-style-type: none"> • Devegetation, earth works, encroachment of machinery on the edge of the work areas, and resulting erosion and sedimentary transport by run-off; • Accidental discharge of reagents, chemicals, hydrocarbons, wastewater and any resulting contamination of run-off or surface water; • The clearance of new areas by villagers replacing cultivated land lost because of the Project, or by an increase in agricultural activity by the local population and immigrants who may settle in the region. 	Medium	<ul style="list-style-type: none"> • Implementing preventive and protective measures against accidental discharges and appropriate management of contaminated soil; • Minimising devegetation and earth works, restricting the movement of machinery and vehicles to the work areas, revegetating temporary work areas, and implementing soil erosion control procedures; • Putting aside organic topsoils during the work, and storing them separately to prevent deterioration of the stored soil; • Minimising the deterioration of soil by villagers and immigrants through a technical support programme for intensive agriculture in gardens delivered by the Community Development Plan (CDP). 	Low
	Op	Deterioration of soils caused by: <ul style="list-style-type: none"> • Devegetation, earth works, encroachment of machinery on the edge of the work areas, and resulting erosion and sedimentary transport by run-off; • Accidental discharge of reagents, chemicals, hydrocarbons, wastewater, brine, hypersaline water or potash, and any resulting contamination of run-off or surface water; • Emissions of gases and particulates from the combustion of hydrocarbons, the manufacture, handling and transport of the potash, and the storage of salt; • Clearance of new areas by villagers replacing cultivated land lost because of the Project, or by an increase in agricultural activity by the local population and immigrants who may settle in the region. 	Medium	<ul style="list-style-type: none"> • Putting aside organic topsoils during the work, and storing them separately to prevent deterioration of the stored soil; • Implementing preventive and protective measures against accidental discharges, notably control systems for brine or hypersaline water leaks, and appropriate management of contaminated soil; • Minimising devegetation and earth works, restricting the movement of machinery and vehicles to the work areas, revegetating temporary work areas, and implementing soil erosion control procedures; • Use of clean air technologies and appropriate air filters; • Minimising the deterioration of soil by villagers and immigrants through a technical support programme for intensive agriculture in gardens delivered by the CDP; • Implementing a monitoring programme for soil quality. 	Low

confidential

Table 12.2 (cont.) Summary of Medium and High Magnitude Potential Impacts, Mitigation Measures and Residual Impacts on Valued Elements of the Physical Environment.

Valued Element of the Physical Environment	Phase ¹	Potential Impact	Magnitude of the Impact	Mitigation or Optimisation Measure	Magnitude of the Residual Impact
Hydrology	Op	<ul style="list-style-type: none"> Modification of the hydrological regime of the Tienga and Patra Rivers caused by changes in the relief and in the drainage pattern; Modification of the hydrological regime of the Loémé River caused by continuous abstraction of 1,040 m³/h of water during the first two years of operation and 540 m³/h of water for the remainder of the operational phase. 	Medium	<ul style="list-style-type: none"> Minimising devegetation and earth works, restricting the movement of machinery and vehicles to the work areas, reprofiling and revegetating temporary work areas, prohibiting any exploitation of vegetation on the Mengo Plateau, and implementing soil erosion control procedures; Minimising encroachment on watercourses as far as possible, notably by maintaining a 20-m riparian strip of vegetation, installing temporary culverts and using set crossings; Managing the plant site drainage water in a stormwater collection basin, which is returned to the plant process; Implementing a water recycling policy, in order to minimise water abstraction from the Loémé River. 	Very low
Water and freshwater sediment quality	Op	<p>Deterioration of water and sediment quality caused by:</p> <ul style="list-style-type: none"> Accidental discharge of reagents, chemicals, hydrocarbons, wastewater, brine, hypersaline water or potash, and any resulting contamination of run-off or surface water; Devegetation, earth works, encroachment of machinery on the edge of the work areas, and resulting erosion and sedimentary transport by run-off; Emissions of gases and particulates from the combustion of hydrocarbons, and the manufacture, handling and transport of the potash. 	Medium	<ul style="list-style-type: none"> Minimising encroachment on watercourses as far as possible, notably by maintaining a 20-m riparian strip of vegetation, installing temporary culverts and using set crossings; Implementing preventive and protective measures against accidental discharges, notably control systems for brine or hypersaline water leaks, and appropriate management of contaminated soil and waste; Minimising devegetation and earth works, restricting the movement of machinery and vehicles to the work areas, reprofiling and revegetating temporary work areas, prohibiting any exploitation of vegetation on the Mengo Plateau, and implementing soil erosion control procedures; Use of clean air technologies and appropriate air filters; Managing the plant site drainage water in a stormwater collection basin, which is returned to the plant process; Implementing a monitoring programme for the effluents, as well as for the surface water, groundwater and freshwater sediment quality. 	Low

¹ Ex : exploration, Co : construction, Op : operational

confidential

Table 12.3 Summary of Medium and High Magnitude Potential Impacts, Mitigation Measures and Residual Impacts on Valued Elements of the Biological Environment.

Valued Element of the Biological Environment	Phase ¹	Potential Impact	Magnitude of the Impact	Mitigation or Optimisation Measure	Magnitude of the Residual Impact
Freshwater fish	Op	<p>Destruction or deterioration of habitats and fish populations caused by:</p> <ul style="list-style-type: none"> • Disturbance due to noise at the pumping station, leading to the avoidance by fish of peripheral areas; • Accidental discharge of reagents, chemicals, hydrocarbons, wastewater, brine, hypersaline water or potash, and any resulting contamination of run-off or groundwater; • Devegetation, earth works, encroachment of machinery on the habitats bordering the banks and in the watercourses, and resulting erosion and sedimentary transport by run-off; • Lowering of the water level as a result of pumping water from the Loémé River, particularly during the dry season; • Mortality of larvae, fry and fish drawn into the pumping station; • Increase in fishing pressure by Project workers, local population and immigrants who may settle in the region; • Introduction of invasive alien species from materials and equipment brought to site. 	Medium	<ul style="list-style-type: none"> • Minimising encroachment on watercourses as far as possible, notably by maintaining a 20-m riparian strip of vegetation, installing temporary culverts and using set crossings; • Implementing preventive and protective measures against accidental discharges, notably control systems for brine or hypersaline water leaks, and appropriate management of contaminated soil and waste; • Minimising devegetation and earth works, restricting the movement of machinery and vehicles to the work areas, reprofiling and revegetating temporary work areas, prohibiting any exploitation of vegetation on the Mengo Plateau, and implementing soil erosion control procedures; • Managing the plant site drainage water in a stormwater collection basin, which is returned to the plant process; • Installing a wire screen to prevent fish being drawn into the water feeder channel of the pumping station; • Implementing a policy prohibiting Project workers to capture, purchase or possess wildlife including fish or by-products; • Implementing measures provided for in the Biodiversity Management Plan (BMP) to prevent the unintended introduction of species. 	Very low
Amphibians and reptiles	Op	<p>Destruction or deterioration of habitats and amphibian and reptile populations caused by:</p> <ul style="list-style-type: none"> • Disturbance of certain amphibian and herpetofauna species due to noise during construction of the brine field infrastructure, or noise from the pumping station; • Accidental discharge of reagents, chemicals, hydrocarbons, wastewater, brine, hypersaline water or potash, and any resulting contamination of run-off or groundwater; • Devegetation, earth works, encroachment of machinery on the habitats bordering the work areas, and resulting erosion and sedimentary transport by run-off; • Dust caused either by soil stripping, earth works, and movements of machinery and vehicles; • Lowering of the water level as a result of pumping water from the Loémé River, particularly during the dry season; • Clearance of new areas by villagers replacing cultivated land lost because of the Project; • Increase in hunting pressure by Project workers, local population and immigrants who may settle in the region; • Introduction of invasive alien species from materials and equipment brought to site. 	Medium	<ul style="list-style-type: none"> • Implementing preventive and protective measures against accidental discharges, notably control systems for brine or hypersaline water leaks, and appropriate management of contaminated soil; • Minimising devegetation and earth works particularly in the secondary forest and wetlands, restricting the movement of machinery and vehicles to the work areas, reprofiling and revegetating the temporary work areas with indigenous species, prohibiting any exploitation of vegetation on the Mengo Plateau, and implementing soil erosion control procedures; • Minimising encroachment on watercourses as far as possible, notably by maintaining a 20-m riparian strip of vegetation, installing temporary culverts and using set crossings; • Managing the plant site drainage water in a stormwater collection basin, which is returned to the plant process; • Installing a wire screen to prevent amphibians being drawn into the water feeder channel of the pumping station; • Minimising the destruction or deterioration of vegetation by villagers and immigrants through an environmental protection awareness programme and a technical support programme for intensive agriculture in gardens, both delivered by the CDP; • Implementing a policy prohibiting Project workers to capture, purchase or possess wildlife including amphibians or reptiles, or by-products; • Implementing measures provided for in the BMP to prevent the unintended introduction of species. 	Very low

confidential

Table 12.3 (cont.) Summary of Medium and High Magnitude Potential Impacts, Mitigation Measures and Residual Impacts on Valued Elements of the Biological Environment.

Valued Element of the Biological Environment	Phase ¹	Potential Impact	Magnitude of the Impact	Mitigation or Optimisation Measure	Magnitude of the Residual Impact
Land birds	Co	<p>Deterioration of habitats and bird populations caused by:</p> <ul style="list-style-type: none"> • Disturbance of certain bird species due to noise from the machinery and the movement of vehicles; • Accidental discharge of reagents, chemicals, hydrocarbons, wastewater and any resulting contamination of run-off, surface or ground water; • Devegetation, earth works, encroachment of machinery on the habitats bordering the work areas, and resulting erosion and sedimentary transport by run-off; • Dust caused either by soil stripping, earth works, and movements of machinery and vehicles; • Clearance of new areas by villagers replacing cultivated land lost because of the Project, and increase in hunting pressure by Project workers, local population and immigrants who may settle in the region; • Introduction of invasive alien species from materials and equipment brought to site. 	Medium	<ul style="list-style-type: none"> • Use of equipment with low sound emission levels; • Implementing preventive and protective measures against accidental discharges and appropriate management of contaminated soil; • Minimising devegetation and earth works particularly in the secondary forest and wetlands, restricting the movement of machinery and vehicles to the work areas, reprofiling and revegetating the temporary work areas with indigenous species, prohibiting any exploitation of vegetation on the Mengo Plateau, and implementing soil erosion control procedures; • Minimising encroachment on watercourses as far as possible, notably by maintaining a 20-m riparian strip of vegetation, installing temporary culverts and using set crossings, installing pipe bridges and using cranes to install them, and carrying out the work during the dry season; • Minimising the destruction or deterioration of vegetation by villagers and immigrants through an environmental protection awareness programme and a technical support programme for intensive agriculture in gardens, both delivered by the CDP; • Implementing a policy prohibiting Project workers to capture, purchase or possess wildlife including land birds, or by-products; • Implementing measures provided for in the BMP to prevent the unintended introduction of species. 	Low
	Op	<p>Deterioration of habitats and bird populations caused by:</p> <ul style="list-style-type: none"> • Disturbance of certain bird species due to noise from the machinery and the movement of vehicles; • Accidental discharge of reagents, chemicals, hydrocarbons, wastewater, brine, hypersaline water or potash, and any resulting contamination of run-off or groundwater; • Devegetation, earth works, encroachment of machinery on the habitats bordering the work areas, and resulting erosion and sedimentary transport by run-off; • Dust caused either by soil stripping, earth works, and movements of machinery and vehicles; • Lowering of the water level as a result of pumping water from the Loémé River, particularly during the dry season; • Clearance of new areas by villagers replacing cultivated land lost because of the Project, and increase in hunting pressure by Project workers, local population and immigrants who may settle in the region; • Introduction of invasive alien species from materials and equipment brought to site. 	Medium	<ul style="list-style-type: none"> • Use of equipment with low sound emission levels; • Implementing preventive and protective measures against accidental discharges, notably control systems for brine or hypersaline water leaks, and appropriate management of contaminated soil; • Minimising devegetation and earth works particularly in the secondary forest and wetlands, restricting the movement of machinery and vehicles to the work areas, reprofiling and revegetating the temporary work areas with indigenous species, prohibiting any exploitation of vegetation on the Mengo Plateau, and implementing soil erosion control procedures; • Minimising encroachment on watercourses as far as possible, notably by maintaining a 20-m riparian strip of vegetation, installing temporary culverts and using set crossings; • Minimising the destruction or deterioration of vegetation by villagers and immigrants through an environmental protection awareness programme and a technical support programme for intensive agriculture in gardens, both delivered by the CDP; • Implementing a policy prohibiting Project workers to capture, purchase or possess wildlife including land birds, or by-products; • Implementing measures provided for in the BMP to prevent the unintended introduction of species. 	Low

confidential

Table 12.3 (cont.) Summary of Medium and High Magnitude Potential Impacts, Mitigation Measures and Residual Impacts on Valued Elements of the Biological Environment.

Valued Element of the Biological Environment	Phase ¹	Potential Impact	Magnitude of the Impact	Mitigation or Optimisation Measure	Magnitude of the Residual Impact
Land mammals	Co	<p>Deterioration or destruction of habitats and mammal populations caused by:</p> <ul style="list-style-type: none"> Disturbance of certain mammal species and avoidance of the peripheral areas due to noise from the machinery and the movement of vehicles; Accidental discharge of reagents, chemicals, hydrocarbons, wastewater and any resulting contamination of run-off or groundwater; Accidental access of mammals to domestic, organic and biomedical waste; Devegetation, earth works, encroachment of machinery on the habitats bordering the work areas, and resulting erosion and sedimentary transport by run-off; Dust caused either by soil stripping, earth works, and movements of machinery and vehicles; Clearance of new areas by villagers replacing cultivated land lost because of the Project, and increase in hunting pressure by Project workers, local population and immigrants who may settle in the region; Introduction of invasive alien species from materials and equipment brought to site. 	Medium	<ul style="list-style-type: none"> Use of equipment with low sound emission levels; Implementing preventive and protective measures against accidental discharges and appropriate management of contaminated soil; Store domestic, organic and biomedical waste which is potentially contaminated or dangerous inside sealed containers prior to managed disposal; Minimising devegetation and earth works particularly in the secondary forest and wetlands, restricting the movement of machinery and vehicles to the work areas, reprofiling and revegetating the temporary work areas with indigenous species, prohibiting any exploitation of vegetation on the Mengo Plateau, and implementing soil erosion control procedures; Minimising encroachment on watercourses as far as possible, notably by maintaining a 20-m riparian strip of vegetation, installing temporary culverts and using set crossings, installing pipe bridges and using cranes to install them, and carrying out the work during the dry season; Minimising the destruction or deterioration of vegetation by villagers and immigrants through an environmental protection awareness programme and a technical support programme for intensive agriculture in gardens, both delivered by the CDP; Implementing a policy prohibiting Project workers to capture, purchase or possess wildlife including any bush meat, or by-products; Implementing programmes detailed in the BMP aiming to reduce the local population dependency on wild biological resources which should reduce hunting pressure; Implementing measures provided for in the BMP to prevent the unintended introduction of species. 	Low
	Op	<p>Deterioration or destruction of habitats and mammals populations caused by:</p> <ul style="list-style-type: none"> Disturbance of certain mammal species and avoidance of the peripheral areas due to noise from the machinery and the movement of vehicles during construction of the brine field infrastructure, or noise from the pumping station; Accidental discharge of reagents, chemicals, hydrocarbons, wastewater, brine, hypersaline water or potash, and any resulting contamination of run-off or groundwater; Accidental access of mammals to domestic, organic and biomedical waste; Devegetation, earth works, encroachment of machinery on the habitats bordering the work areas, and resulting erosion and sedimentary transport by run-off; Dust caused either by soil stripping, earth works, and movements of machinery and vehicles; Lowering of the water level as a result of pumping water from the Loémé River, particularly during the dry season; Clearance of new areas by villagers replacing cultivated land lost because of the Project, and increase in hunting pressure by Project workers, local population and immigrants who may settle in the region; Introduction of invasive alien species from materials and equipment brought to site. 	Medium	<ul style="list-style-type: none"> Use of equipment with low sound emission levels; Implementing preventive and protective measures against accidental discharges, notably control systems for brine or hypersaline water leaks, and appropriate management of contaminated soil; Store domestic, organic and biomedical waste which is potentially contaminated or dangerous inside sealed containers prior to managed disposal; Minimising devegetation and earth works particularly in the secondary forest and wetlands, restricting the movement of machinery and vehicles to the work areas, reprofiling and revegetating the temporary work areas with indigenous species, prohibiting any exploitation of vegetation on the Mengo Plateau, and implementing soil erosion control procedures; Minimising encroachment on watercourses as far as possible, notably by maintaining a 20-m riparian strip of vegetation, installing temporary culverts and using set crossings; Installing a wire screen to prevent amphibious or aquatic mammals going into the water feeder channel of the pumping station; Minimising the destruction or deterioration of vegetation by villagers and immigrants through an environmental protection awareness programme and a technical support programme for intensive agriculture in gardens, both delivered by the CDP; Implementing a policy prohibiting Project workers to capture, purchase or possess wildlife including any bush meat, or by-products; Implementing programmes detailed in the BMP aiming to reduce the local population dependency on wild biological resources which should reduce hunting pressure; Implementing measures provided for in the BMP to prevent the unintended introduction of species. 	Low

confidential

Table 12.3 (cont.) Summary of Medium and High Magnitude Potential Impacts, Mitigation Measures and Residual Impacts on Valued Elements of the Biological Environment.

Valued Element of the Biological Environment	Phase ¹	Potential Impact	Magnitude of the Impact	Mitigation or Optimisation Measure	Magnitude of the Residual Impact
Marine benthos	Op	Deterioration of the marine benthic habitat by: <ul style="list-style-type: none"> • Change in physico-chemical characteristics of the seawater in the area influenced by the dispersion plume of hypersaline water; • Contamination by accidental discharges of potash during ship-loading operations in the port; • Introduction of unwanted benthic species arising from discharge of ballast water by the bulk carrier ships loading potash; • Creation of an artificial substrata for the sessile benthos and a shelter for mobile epibenthos caused by the presence of the pipeline – positive impact 	Medium	<ul style="list-style-type: none"> • Design the diffuser to ensure maximum dilution of the hypersaline water into the coastal sea waters; • Use the results from the monitoring of effluent, water and sediment quality, benthos, and coastal oceanographic conditions to improve the design of the diffuser; • Inspect the pipeline and diffuser on a regular basis to detect and mitigate any erosion along the pipeline and implement remedial work if required; • Reducing potash spillages through procedures to avoid exposure of the potash to winds and rain when unloading trains, storage and loading ships; • Implementing preventive and protective measures against accidental discharges; • Minimising brine effluent volume by maximising the backfilling of salts in spent caverns; • Requiring contractually that ships comply with Regulation B-4 Ballast Water Exchange of the IMO International Convention for the Control and Management of Ships' Ballast Water and Sediments (2008). 	Low

¹ Ex : exploration, Co : construction, Op : operational

confidential

confidential

Table 12.4 Summary of Medium and High Magnitude Potential Impacts, Mitigation Measures and Residual Impacts on Valued Elements of the Human Environment.

Valued Element of the Human Environment	Phase ¹	Potential Impact	Magnitude of the Impact	Mitigation or Optimisation Measure	Magnitude of the Residual Impact
Land use	Co	<ul style="list-style-type: none"> Temporary and occasional disruptions of passenger and goods transport services during the construction of the power lines, the pipelines and the repair of the railway; Temporary and occasional interruption of traffic, electricity and telecommunications services during the construction phase, due to heavy-load transport between the port and the plant; Temporary and permanent loss of land for agriculture, and increased demand and speculation for residential or agricultural land; Creation of a partial obstacle for some fishermen during construction of the marine pipeline and diffuser. 	Medium	<ul style="list-style-type: none"> Implementing a worker's code of conduct to reduce the impact on road traffic during the construction and heavy-load transportation; Financial and in-kind compensating for temporary or permanent loss of land affected by the construction of the infrastructure; Replacement of the lands lost permanently and currently used for agriculture by other lands, and implementing a support programme for intensive agriculture in gardens delivered by the CDP; Setting up navigation buoys indicating the marine pipeline and diffuser. 	Low
	Op	<ul style="list-style-type: none"> Diversification of natural resource industries in ROC, notably potash and natural gas; Loss of land for agriculture, and increased demand and speculation for residential or agricultural land; Risk of damage to fish farms or agriculture land by accidental discharge of brine, hypersaline water or potash; Loss of a fishing area caused by the brine effluent plume. 	Medium	<ul style="list-style-type: none"> Financial and in-kind compensating for temporary or permanent loss of land affected by the construction of the infrastructure; Replacement of the lands lost permanently and currently used for agriculture by other lands, and implementing a support programme for intensive agriculture in gardens delivered by the CDP; Implementing preventive and protective measures against accidental discharges; Setting up navigation buoys indicating the marine pipeline and diffuser; Design the diffuser to ensure maximum dilution of the hypersaline water into the coastal sea waters; Use the results from the monitoring of effluent, water and sediment quality, benthos, and coastal oceanographic conditions to improve the design of the diffuser; Minimising brine effluent volume by maximising the backfilling of salts in spent caverns. 	Low
Existing infrastructure	Co	<ul style="list-style-type: none"> Addition of infrastructure in order to fulfil all the operational requirements of the Project; Improvement of services and reliability of rail transport for passengers and goods; Enhancement of existing port infrastructure. 	Medium Positive	<ul style="list-style-type: none"> Contribution to the creation and implementation of a plan to encourage the development of localities in the Project Area and, more specifically, in the Mengo sector. This plan should deal with population growth and increased pressure on the public services and infrastructure, and optimise the positive effects on the existing infrastructure. 	Medium Positive
	Op	<ul style="list-style-type: none"> Addition of infrastructure in order to fulfil all the operational requirements of the Project; Improvement of services and reliability of rail transport for passengers and goods; Enhancement of existing port infrastructure; Increase in freight traffic, in terms of vessel and tonnage, in the port of Pointe-Noire 	Medium Positive	<ul style="list-style-type: none"> Contribution to the creation and implementation of a plan to encourage the development of localities in the Project Area and, more specifically, in the Mengo sector. This plan should deal with population growth and increased pressure on the public services and infrastructure, and optimise the positive effects on the existing infrastructure. 	Medium Positive
Public health services and infrastructure	Ex	<ul style="list-style-type: none"> Construction of an accessible drinking water well for the villagers of Mengo and Boutoto; Renovation of the drinking water well of the village of Mengo. 	High Positive	<ul style="list-style-type: none"> Assistance in maintaining the drinking water wells built during the exploration phase. 	High Positive
	Co	<ul style="list-style-type: none"> Deterioration of services and inadequacies of the public health infrastructure, such as supply of drinking water and the medical clinic, caused by a potential influx of migrant workers. 	High	<ul style="list-style-type: none"> Contributing to the elaboration and implementation of a plan to encourage the development of localities in the Project Area and, more specifically, in the Mengo sector. This plan should deal with population growth and increased pressure on the public services and infrastructure, and optimise the positive effects on the existing infrastructure; Supporting the improvement in public health of the Project Area's communities by implementing a CDP, aimed in particular at the development of public health infrastructure and services, such as access to drinking water and medical services, along with education programmes on hygiene, nutrition, malaria, family planning and prevention of sexually transmitted diseases (STDs); Strengthening of government investments through CDP actions aimed at improving public health services and infrastructure. 	Medium

confidential

Table 12.4 (cont.) Summary of Medium and High Magnitude Potential Impacts, Mitigation Measures and Residual Impacts on Valued Elements of the Human Environment.

Valued Element of the Human Environment	Phase ¹	Potential Impact	Magnitude of the Impact	Mitigation or Optimisation Measure	Magnitude of the Residual Impact
Public health services and infrastructure (cont.)	Op	<ul style="list-style-type: none"> Deterioration of services and inadequacies of the public health infrastructure, such as supply of drinking water and the medical clinic, caused by a potential influx of migrant workers. 	High	<ul style="list-style-type: none"> Contributing to the elaboration and implementation of a plan to encourage the development of localities in the Project Area and, more specifically, in the Mengo sector. This plan should deal with population growth and increased pressure on the public services and infrastructure, and optimise the positive effects on the existing infrastructure; Supporting the improvement in public health of the Project Area's communities by implementing a CDP, aimed in particular at development of public health infrastructure and services, such as access to drinking water and medical services, along with education programmes on hygiene, nutrition, malaria, family planning and prevention of STDs; Strengthening of government investments through CDP actions aimed at improving public health services and infrastructure. 	Medium
Demography	Co	<ul style="list-style-type: none"> Change of the demographic situation, <i>i.e.</i> age structure, sex ratio and relative abundance of various ethnic groups, caused by the potential influx of outsiders. 	High	<ul style="list-style-type: none"> Contributing to the elaboration and implementation of a plan to encourage the development of localities in the Project Area and, more specifically, in the Mengo sector. This plan should deal with population growth and increased pressure on the public services and infrastructure, and optimise the positive effects on the existing infrastructure; Implementing a balanced, fair and transparent recruitment plan which gives priority to the current residents of the Project Area and which distributes the jobs between the villages and in accordance with socio-economic vulnerability, gender, age and ethnicity, whilst meeting the needs of the Project in terms of skilled, semi skilled and unskilled labour; Implementing an awareness programme to educate the stakeholders about the customs of the various groups; Implementing a transport service for the workers, via shuttles connecting the villages where they live, which will limit immigration into the Project Area; Implementing personnel management procedures which take into account gender, cultural and generational differences, along with security measures adapted to the intercultural conflicts; Supporting the development of the communities of the Project Area by implementing a CDP optimising the relations between various age groups, in particular with regard to occupying jobs, to minimise conflicts. 	Medium
	Op	<ul style="list-style-type: none"> Changes to the demographic situation, <i>i.e.</i> age structure, sex ratio and relative abundance of various ethnic groups, caused by the potential influx of outsiders; Slowing down of demographic growth and normalisation of the age structure, through improvement of socio-economic and public health conditions – positive impact. 	High	<ul style="list-style-type: none"> Contributing to the elaboration and implementation of a plan to encourage the development of localities in the Project Area and, more specifically, in the Mengo sector. This plan should deal with population growth and increased pressure on the public services and infrastructure, and optimise the positive effects on the existing infrastructure; Implementing a balanced, fair and transparent recruitment plan which gives priority to the current residents of the Project Area and which distributes the jobs between the villages and in accordance with socio-economic vulnerability, gender, age and ethnicity, whilst meeting the needs of the Project in terms of skilled, semi skilled and unskilled labour; Implementing an awareness programme to educate the stakeholders about the customs of the various groups; Implementing a transport service for the workers, via shuttles connecting the villages where they live, which will limit immigration into the Project Area; Implementing personnel management procedures which take into account gender, cultural and generational differences, along with security measures adapted to the intercultural conflicts; Supporting the development of the communities of the Project Area by implementing a CDP optimising the relations between various age groups, in particular with regard to occupying jobs, to minimise conflicts. 	High

confidential

Table 12.4 (cont.) Summary of Medium and High Magnitude Potential Impacts, Mitigation Measures and Residual Impacts on Valued Elements of the Human Environment.

Valued Element of the Human Environment	Phase ¹	Potential Impact	Magnitude of the Impact	Mitigation or Optimisation Measure	Magnitude of the Residual Impact
Economy	Ex	<ul style="list-style-type: none"> Capital investments of USD 5 M; Economic outcomes at local and regional levels, arising from the presence of workers and salaries; Stimulation of the local and regional economies by purchase of goods and services from surrounding populations, both by the Project itself and by the workers. 	High Positive	<ul style="list-style-type: none"> Implementing a procedure encouraging the purchase of goods and services from the surrounding populations and suppliers from Pointe-Noire. 	High Positive
	Co	<ul style="list-style-type: none"> Capital investments of USD 866 M for construction of plant and infrastructure; Diversification of economic activities at local, regional and national levels, by starting the exploitation of potash; Important economic outfalls at local, regional and national levels, arising from the presence of workers and salaries paid during the construction phase of the Project; Stimulation of the local and regional economies through purchase of goods and services from surrounding populations, both by the Project itself and by the workers. 	High Positive	<ul style="list-style-type: none"> Implementing a procedure encouraging the purchase of goods and services from the surrounding populations and suppliers from Pointe-Noire; Implementing a CDP to optimise the economic outfalls at local and regional levels, and improvement of living standards. 	High Positive
	Op	<ul style="list-style-type: none"> Diversification of economic activities at local, regional and national levels, by starting the exploitation of potash; Increase in revenues to the Congolese Government through collection of royalties, income taxes and after tax earnings; Important economic outfalls at local, regional and national levels, arising from the presence of workers and salaries paid during the operational phase of the Project; Stimulation of the local and regional economies through purchase of goods and services from surrounding populations, both by the Project itself and by the workers. 	High Positive	<ul style="list-style-type: none"> Implementing a procedure encouraging the purchase of goods and services from the surrounding populations and suppliers from Pointe-Noire; Implementing a CDP to optimise the economic outfalls at local and regional levels, and improvement of living standards. 	High Positive
Employment	Ex	<ul style="list-style-type: none"> Creation of specialised and non-specialised local jobs; Diversification of employment sources for the local populations; Indirect impact on employment due to subcontracting activities and purchase of goods and services; Training provided improves skill levels within the workforce. 	High Positive	<ul style="list-style-type: none"> Setting-up of training programmes to encourage local labour being recruited; Implementing a transparent and fair process of recruitment with the various local authorities concerned by the Project; Setting-up a transport service for the workers via a shuttle linking Pointe-Noire to the Marcel-Rigny Camp; Taking people on again in the future who provided entirely satisfactory work performance. 	High
	Co	<ul style="list-style-type: none"> Creation of specialised and non-specialised local jobs; Diversification of employment sources for the local populations; Indirect impact on employment due to subcontracting activities and purchase of goods and services; Taking on foreign workers for the construction work. 	High Positive	<ul style="list-style-type: none"> Setting-up of training programmes to encourage local labour being recruited; Implementing a transparent and fair process of recruitment with the various local authorities concerned by the Project. 	High Positive
	Op	<ul style="list-style-type: none"> Creation of specialised and non-specialised local jobs; Diversification of employment sources for the local populations; Indirect impact on employment due to subcontracting activities and purchase of goods and services; Taking on limited numbers of foreign workers for the operational phase of the Project. 	High Positive	<ul style="list-style-type: none"> Setting-up of training programmes to encourage local labour being recruited; Implementing a transparent and fair process of recruitment with the various local authorities concerned by the Project; Replacement of expatriate workers with Congolese workers over time, as necessary skilled are gained. 	High Positive

confidential

Table 12.4 (cont.) Summary of Medium and High Magnitude Potential Impacts, Mitigation Measures and Residual Impacts on Valued Elements of the Human Environment.

Valued Element of the Human Environment	Phase ¹	Potential Impact	Magnitude of the Impact	Mitigation or Optimisation Measure	Magnitude of the Residual Impact
Social organisation	Co	<ul style="list-style-type: none"> Disturbance of clan structures, social cohesion, relationships between men and women and young and old, as well as with other vulnerable groups; Increase in racial and ethnic conflicts, as well as in the crime rate, illicit activities and drug abuse and calling into question customs and elders authority due to the potential influx of outsiders into Mengo; Improvement in living standards of the communities through job creation and improvement of socio-economic and public health conditions – positive impact; Revitalisation of the associative structures such as micro-enterprises, cooperatives and NGOs through improvement of living standards – positive impact. 	Medium	<ul style="list-style-type: none"> Contributing to the elaboration and implementation of a plan to encourage the development of localities in the Project Area and, more specifically in the Mengo sector. This plan should deal with population growth and increased pressure on the public services and infrastructure, and optimise the positive effects on the existing infrastructure; Implementing Social Management Plans (SMPs) designed to facilitate the input of women in participative planning activities and their participation in SMP programmes. These programmes include attention to the distinct impacts experienced by women. Gender-specific workshops are planned to further increase their participation; Implementing a balanced, fair and transparent recruitment plan which gives priority to the current residents of the Project Area and which distributes the jobs between the villages and in accordance with socio-economic vulnerability, gender, age and ethnicity, whilst meeting the needs of the Project in terms of skilled labour; Implementing a transport service for the workers, via shuttles connecting the villages where they live, which will limit immigration into the Project Area; Implementing personnel management policies which takes into account gender, cultural and generational differences, along with security measures adapted to the intercultural conflicts; Implementing of a communication plan to educate the stakeholders about the customs of the various groups; Implementation of a CDP taking special care to make provisions for vulnerable people, <i>i.e.</i> people who by virtue of gender, ethnicity, physical or mental disability, economic disadvantage or social status may be more adversely affected by the Project than others and who may be limited in their ability to claim or take advantage of Project benefits; Supporting the development of the communities of the Project Area by implementing a CDP enabling stimulation of creation of micro-enterprises and associative structures such as cooperatives and NGOs; Implementing a workers' code of conduct for their interactions with the villagers of the Project Area, and encouragement to get involved in community service. 	Medium
	Op	<ul style="list-style-type: none"> Disturbance of clan structures, social cohesion, relationships between men and women and young and old, as well as with other vulnerable groups; Increase in racial and ethnic conflicts, as well as and in the crime rate, illicit activities and alcohol abuse and calling into question customs and elders authority due to the potential influx of outsiders into Mengo; Improvement in living standards of the communities through job creation and improvement of socio-economic and public health conditions – positive impact; Revitalisation of the associative structures such as micro-enterprises, cooperatives and NGOs through improvement of living standards – positive impact. 	Medium	<ul style="list-style-type: none"> Contributing to the elaboration and implementation of a plan to encourage the development of localities in the Project Area and, more specifically in the Mengo sector. This plan should deal with population growth and increased pressure on the public services and infrastructure, and optimise the positive effects on the existing infrastructure; Implementing Social Management Plans (SMP) designed to facilitate the input of women in participative planning activities and their participation in SMP programs. These programs include attention to the distinct impacts experienced by women. Gender-specific workshops are planned to further increase their participation; Implementing a balanced, fair and transparent recruitment plan which gives priority to the current residents of the Project Area and which distributes the jobs between the villages and in accordance with socio-economic vulnerability, gender, age and ethnicity, whilst meeting the needs of the Project in terms of skilled, semi skilled and unskilled labour; Implementing a transport service for the workers, via shuttles connecting the villages where they live, which will limit immigration into the Project Area; Implementation of a CDP taking special care to make provisions for vulnerable people, <i>i.e.</i> people who by virtue of gender, ethnicity, physical or mental disability, economic disadvantage or social status may be more adversely affected by the Project than others and who may be limited in their ability to claim or take advantage of Project benefits; Implementing personnel management policies which takes into account gender, cultural and generational differences, along with security measures adapted to the intercultural conflicts; Implementing of an awareness programme to educate the stakeholders about the customs of the various groups; Supporting the development of the communities of the Project Area by implementing a CDP enabling stimulation of creation of micro-enterprises and associative structures such as cooperatives and NGOs; Implementing a workers' code of conduct for their interactions with the villagers of the Project Area, and encouragement to get involved in community service. 	Medium

confidential

confidential

Table 12.4 (cont.) Summary of Medium and High Magnitude Potential Impacts, Mitigation Measures and Residual Impacts on Valued Elements of the Human Environment.

Valued Element of the Human Environment	Phase ¹	Potential Impact	Magnitude of the Impact	Mitigation or Optimisation Measure	Magnitude of the Residual Impact
Community health	Co	<ul style="list-style-type: none"> Accidental spillages during transport of reagents, chemicals and hydrocarbons and any resulting contamination of run-off or groundwater; Deterioration in health caused by dust, gases and particles emissions arising from soil stripping and earth works, the movements of machinery, vehicles and trains, the combustion and storage of hydrocarbons, and the burning of waste; Endangering of community health by reusing, recycling or recovering waste which might be contaminated; Increased risks of accidents, fire and explosion due to intensification of movement of vehicles, machinery and trains, and to the transport, storage and use of hydrocarbons; Increased prevalence of STDs and other pathogens caused by Project workers and immigrants who may settle in the region; Deterioration in community health caused by unintended introduction of invasive alien species, potentially pathogens carriers. 	High	<ul style="list-style-type: none"> Implementing preventive and protective measures against accidental discharges; Implementing an Emergency Preparedness and Response Plan and a Waste Management Plan so as to minimise the impact on community health and safety; Use of clean air technologies enabling prevention of deterioration in surrounding air quality; Limiting the entrainment of dust by minimising devegetation, soil stripping and earth works, restricting some activities when wind speeds exceed 2.5 m/s, planting vegetation as anti-dust screens and using dust control agents, and using a road by-passing the village of Mengo; Implementing rigorous control procedures for waste and recyclable material management, so as to prevent sale or circulation of contaminated or hazardous materials; Implementing a signalling system on the work sites and on the roads used for transport, to minimise the risks of accidents; Implementing a workers' code of conduct for their interactions with the villagers of the Project Area and a HIV/AIDS Management Plan, particularly aimed at prevention of HIV/AIDS, and other STDs and pathogens, and encouragement to get involved in community service; Supporting the improvement in public health of the Project Area's communities by implementing a CDP, aimed in particular at development of public health infrastructure and services, such as access to drinking water and access to medical services, along with education programmes on hygiene, nutrition, malaria, family planning and prevention of STDs; Strengthening of government investments through CDP actions aimed at improving public health services and infrastructure; Implement measures provided for in Biodiversity Management Plan (BMP) to prevent unintended introduction of species which could deteriorated community health. 	Low
	Op	<ul style="list-style-type: none"> Accidental spillages during transport of reagents, chemicals, hydrocarbons, wastewater, brine, hypersaline water or potash, and any resulting contamination of soil or surface water; Deterioration in community health or well-being caused by dust, gases and particles emissions arising from soil stripping and earth works, the movements of machinery, vehicles and trains, the combustion and storage of hydrocarbons, and the burning of waste; Endangering of community health by reusing, recycling or recovering waste which might be contaminated; Increased risks of accidents, fire and explosion due to intensification of movement of vehicles, machinery and trains, and to the transport, storage and use of hydrocarbons; Increased prevalence of STDs and other pathogens caused by Project workers from overseas and from outside the region, as well as newcomers in the communities of the Project Area. 	High	<ul style="list-style-type: none"> Implementing preventive and protective measures against accidental discharges; Implementing an Emergency Preparedness and Response Plan and a Waste Management Plan so as to minimise the impact on community health and safety; Use of clean air technologies enabling prevention of deterioration in surrounding air quality; Limiting the entrainment of dust by minimising devegetation, soil stripping and earth works, restricting some activities when wind speeds exceed 2.5 m/s, planting vegetation as anti-dust screens and using dust control agents, and using a road by-passing the village of Mengo; Implementing rigorous control procedures for waste and recyclable material management, so as to prevent sale or circulation of contaminated or hazardous materials; Implementing a signalling system on the work sites and on the roads used for transport, to minimise the risks of accidents; Implementing a workers' code of conduct for their interactions with the villagers of the Project Area and a HIV/AIDS Management Plan, particularly aimed at prevention of HIV/AIDS, and other STDs and pathogens, and encouragement to get involved in community service; Supporting the improvement in public health of the Project Area's communities by implementing a CDP, aimed in particular at development of public health infrastructure and services, such as access to drinking water and access to medical services, along with education programmes on hygiene, nutrition, malaria, family planning and prevention of STDs; Strengthening of government investments through CDP actions aimed at improving public health services and infrastructure; Implement measures provided for in BMP to prevent unintended introduction of species which could deteriorated community health. 	Low
Education	Ex	<ul style="list-style-type: none"> Improvement of knowledge, know-how and personal qualities of workers through work-based training programmes. 	High Positive	<ul style="list-style-type: none"> An employment training programme was implemented by the proponent to encourage recruitment of local labour; A transparent and fair process of recruitment with the various local authorities concerned by the Project was implemented; Implementation of training programmes specific to the jobs on offer. 	High

confidential

Table 12.4 (cont.) Summary of Medium and High Magnitude Potential Impacts, Mitigation Measures and Residual Impacts on Valued Elements of the Human Environment.

Valued Element of the Human Environment	Phase ¹	Potential Impact	Magnitude of the Impact	Mitigation or Optimisation Measure	Magnitude of the Residual Impact
Education (cont.)	Co	<ul style="list-style-type: none"> Improvement of knowledge, know-how and personal qualities of workers relative to the jobs created, through implementation of theoretical, practical and work-based training programmes; Improvement of knowledge, know-how and personal qualities of workers relative to public interest domains, such as health and safety at work, medical first aid, fire and environmental emergency interventions, management of waste and chemicals, and the protection of the environment, through implementation of training programmes; Deterioration of services and inadequacy of school infrastructure in the Project Area, caused by the potential influx of workers and immigrants – negative impact. 	High Positive	<ul style="list-style-type: none"> Implementing a balanced, fair and transparent recruitment plan which gives priority to the current residents of the Project Area and which distributes the jobs between the villages and in accordance with socio-economic vulnerability, gender, age and ethnicity, whilst meeting the needs of the Project in terms of skilled, semi skilled and unskilled labour; Implementing a transport service for the workers, via shuttles connecting the villages where they live, which will limit immigration into the Project Area; Designing and implementing a training programme for some construction workers and a continuing education programme for the Operating Company workers; Contributing to the elaboration and implementation of a plan to encourage the development of localities in the Project Area and, more specifically in the Mengo sector. This plan should deal with population growth and increased pressure on the public services and infrastructure, and optimise the positive effects on the existing infrastructure; Supporting the development of the communities of the Project Area by implementing a CDP aimed at improving school services and infrastructure; Strengthening of government investments through CDP actions aimed at improving education services and infrastructure. 	High Positive
	Op	<ul style="list-style-type: none"> Improvement of knowledge, know-how and personal qualities of workers relative to the jobs created, through implementation of theoretical, practical and work-based training programmes; Improvement of knowledge, know-how and personal qualities of workers relative to public interest domains, such as health and safety at work, medical first aid, fire and environmental emergency interventions, management of waste and chemicals, and the protection of the environment, through implementation of training programmes; Deterioration of services and inadequacy of school infrastructure in the Project Area, caused by the potential influx of workers and immigrants – negative impact. 	High Positive	<ul style="list-style-type: none"> Implementing a balanced, fair and transparent recruitment plan which gives priority to the current residents of the Project Area and which distributes the jobs between the villages and in accordance with socio-economic vulnerability, gender, age and ethnicity, whilst meeting the needs of the Project in terms of skilled labour; Implementing a transport service for the workers, via shuttles connecting the villages where they live, which will limit immigration into the Project Area; Designing and implementing a training programme for some construction workers and a continuing education programme for the Operating Company workers; Contributing to the elaboration and implementation of a plan to encourage the development of localities in the Project Area and, more specifically in the Mengo sector. This plan should deal with population growth and increased pressure on the public services and infrastructure, and optimise the positive effects on the existing infrastructure; Supporting the development of the communities of the Project Area by implementing a CDP aimed at improving school services and infrastructure; Strengthening of government investments through CDP actions aimed at improving education services and infrastructure. 	High Positive
Cultural and religious heritage	Co	<ul style="list-style-type: none"> Disturbance of or reduction of access to some cultural and religious sites by Project infrastructure; Increase of external influences, possible arrival of new churches and loss of influence of traditional moral, social and religious values, caused by the potential influx of workers and immigrants; Creation or strengthening of NGOs with a cultural vocation, such as traditional music, dance and theatre, by the communities following improvement of the living standards of communities – positive impact; Strengthening of existing religious groups, following improvement of living standards; Renovation or reactivation of cultural or religious sites by the communities, following the improvement of their living standards – positive impact. 	Medium	<ul style="list-style-type: none"> Supporting the development of the communities of the Project Area by implementing a CDP enabling NGOs with a cultural vocation to become more dynamic; Preservation of and maintenance of access to cultural and religious sites, through specific mitigation or compensation measures agreed to with the owner of the site; Protection of archaeological sites if found during any phase of the Project by works stopping in that area and bringing a specialist to survey the site and assess its importance; Implementing a transport service for the workers, via shuttles connecting the villages where they live, which will limit immigration into the Project Area; Contributing to the elaboration and implementation of a plan to encourage the development of localities in the Project Area and, more specifically in the Mengo sector. This plan should deal with population growth and increased pressure on the public services and infrastructure, and optimise the positive effects on the existing infrastructure. 	Very low

confidential

Table 12.4 (cont.) Summary of Medium and High Magnitude Potential Impacts, Mitigation Measures and Residual Impacts on Valued Elements of the Human Environment.

Valued Element of the Human Environment	Phase ¹	Potential Impact	Magnitude of the Impact	Mitigation or Optimisation Measure	Magnitude of the Residual Impact
Cultural heritage and religious beliefs (cont.)	Op	<ul style="list-style-type: none"> Disturbance of or reduction of access to some cultural and religious sites by Project infrastructure; Increase of external influences, possible arrival of new churches and loss of influence of traditional moral, social and religious values, caused by the potential influx of workers and immigrants; Creation or strengthening of NGOs with a cultural vocation, such as traditional music, dance and theatre, by the communities following improvement of the living standards of communities – positive impact; Strengthening of existing religious groups, following improvement of living standards; Renovation or reactivation of cultural or religious sites by the communities, following the improvement of their living standards – positive impact. 	Medium	<ul style="list-style-type: none"> Design of infrastructure location and routing to avoid as far as possible cultural heritage sites; Supporting the development of the communities of the Project Area by implementing a CDP enabling NGOs with a cultural vocation to become more dynamic; Preservation of and maintenance of access to cultural and religious sites, through specific mitigation or compensation measures agreed to with the owner of the site; Protection of archaeological sites if found during any phase of the Project by works stopping in that area and bringing a specialist to survey the site and assess its importance; Implementing a transport service for the workers, via shuttles connecting the villages where they live, which will limit immigration into the Project Area; Contributing to the elaboration and implementation of a plan to encourage the development of localities in the Project Area and, more specifically in the Mengo sector. This plan should deal with population growth and increased pressure on the public services and infrastructure, and optimise the positive effects on the existing infrastructure. 	Low

¹ Ex : exploration, Co : construction, Op : operational

confidential

confidential

Table 12.5 Implementation of Mitigation Measures through Management Plans during the Construction, Operational and Closure Phases.

Mitigation Measures	Valued Elements of the Environment	Management Plans ¹	Construction Phase	Operational Phase	Closure Phase
Conduct inventory and relocate specimens of <i>Pseudosabicea batesii</i> , in secondary forest affected by mining infrastructure (the only plant species classified as "vulnerable" by the IUCN and whose distribution is rather limited).	Vegetation	BMP	X	X	
Implement monitoring programmes for soil quality, groundwater quality and depth, ambient air quality, surface water, groundwater and freshwater sediment quality, noise level, soil quality, benthic communities at the outfall, sea water and marine sediment quality	Air quality Ambient noise Topography and geomorphology Soil quality Hydrogeology Water and freshwater sediment quality Vegetation Physical oceanography Sea water and marine sediment quality Marine benthos Marine fish	ESMS, AQMP, Water MP, SEMP, PO		X	
Put aside organic topsoils and storing them separately to prevent their deterioration	Soil quality Vegetation	CRP; SEMP, PO	X	X	X
Carry out the installation of the marine pipeline during the periods of weak currents, in the Grande saison froide (GSF)	Sea water and marine sediment quality	CC	X		
Construct and maintain a vegetated earth embankment, around the pumping station, on the bank of the Loémé River	Ambient noise	PD; PO	X	X	
Cross watercourses at specified locations and install temporary culverts, during the dry season, so as to preserve the integrity of the banks	Hydrologie Water and freshwater sediment quality Vegetation Freshwater benthos Freshwater fish Amphibians and reptiles Land birds	SEMP; PO	X	X	
Design appropriately the caverns, the mining sequence and the safety pillars maintained between the caverns	Topography and geomorphology	PD	X	X	
If required, improve the design of the diffuser and the ducts on the basis of the monitoring results, in order to improve dilution of the hypersaline water	Physical oceanography Sea water and marine sediment quality Marine benthos Marine fish	PD; PO		X	
Ensure that vehicle exhausts are angled upwards away from road surfaces and pedestrians	Air quality	AQMP	X	X	
Maintain a riparian strip of vegetation with a width of 20 m along the watercourses, revegetate and reprofile temporary work areas after use	Hydrology Vegetation Freshwater benthos Freshwater fish Amphibians and reptiles Land birds Land mammals	BMP; SEMP	X	X	
Restrict the execution of some activities when wind speeds are greater than 2.5 m/s to minimise dust entrainment	Air quality Community health	AQMP, PO	X	X	
Minimise deforestation, removal of vegetation, surface stripping the soil, excavation, levelling and backfilling work	Air quality Ambient noise Soil quality Hydrology Water and freshwater sediment quality Vegetation Freshwater benthos Freshwater fish Amphibians and reptiles Land birds Land mammals	SEMP; PD; PO	X	X	
On the coast, surround the work area with a floating boom supporting a silt curtain to prevent dispersion of sediment if appropriate to method of installation	Sea water and marine sediment quality Marine benthos Marine fish	CC	X		
Install a wire screen to prevent some species to be drawn into the water feeder channel of the pumping station	Freshwater fish Amphibians and reptiles Land mammals	PD; PO	X	X	
Restrict the movement of machinery and vehicles to work areas	Soil quality Hydrology Water and freshwater sediment quality Vegetation Freshwater benthos Freshwater fish Land birds Land mammals Marine reptiles	SEMP; PO	X	X	
Use cranes on the banks of the watercourses to build pipe bridges for the installation of pipelines	Hydrology	SEMP; CC	X		

confidential

Table 12.5 Implementation of Mitigation Measures through Management Plans during the Construction, Operational and Closure Phases.

Mitigation Measures	Valued Elements of the Environment	Management Plans ¹	Construction Phase	Operational Phase	Closure Phase
Use equipment with low emission levels, e.g. clean-air technologies, noise reduction technologies	Land birds Air quality Land mammals	AQMP, CC	X	X	
Use of wet filters or washers, <i>i.e.</i> wet scrubbers, for the chimneys of the bagging building, the exhaust chimneys of the crystalliser's vacuum pumps, and the exhaust chimneys of the dust collector silo	Air quality Soil quality	PD		X	
Financial and in-kind compensating for temporary and permanent loss of land affected by the construction of infrastructure	Land use Cultural and religious heritage	CP	X		
Preservation of and maintenance of access to cultural and religious sites, thorough specific mitigation measures agreed to with the owner of the site	Cultural and religious heritage	PD; CP; SEP	X		
Develop and implement preventive and protective measures against accidental discharges, spillage of brine effluent or other incidents	Soil quality Hydrogeology Water and freshwater sediment quality Vegetation Freshwater benthos Freshwater fish Amphibians and reptiles Land birds Land mammals Sea water and marine sediment quality Marine benthos Marine fish Marine reptiles Land use Community health	EPRP, HMMP, Waste MP, PO, CC	X	X	
Develop and implement a response plan for accidental discharges	Soil quality Hydrogeology Water and freshwater sediment quality Vegetation Freshwater benthos Freshwater fish Amphibians and reptiles Land birds Land mammals Sea water and marine sediment quality Marine benthos Marine fish Marine reptiles Land use Community health	EPRP, HMMP, Waste MP	X	X	
Implementation of a policy prohibiting Project workers to capture, purchase or possess wildlife or by-products	Freshwater fish Amphibians and reptiles Land birds Land mammals	ESMS, LHR, PO, CC	X	X	
Implement a curfew period for all the Project's activities, during which noisy activities must be minimised and workers must be back in the camp	Ambient noise	LHR, PO, CC, AQMP	X	X	
Implement a good practice code for all drivers, in particular that the speed of all vehicles is reduced in built-up areas.	Ambient noise	LHR, PO, CC, AQMP	X	X	
Implementation of a workers code of conduct to reduce the impact on road traffic during the construction and heavy-load transportation	Land use	LHR, PO, CC, AQMP	X	X	
Implement a transport service for the workers, via shuttles connecting the villages where they live, which will limit immigration into the Project Area	Demography Social organisation Education Cultural and religious heritage	LHR, CDP	X	X	
Implement a workers' code of conduct for their interactions with the villagers in the Project Area and a HIV/AIDS Management Plan aimed at the prevention of HIV/AIDS, and other STDs and pathogens	Social organisation Community Health	LHR, CDP, CHSS, HAMP	X	X	
Set up navigation buoys close to the marine pipeline and diffuser	Land use	PD, PO	X	X	
Implementation of rigorous control procedures for waste and recyclable material management, so as to prevent sale or circulation of contaminated or hazardous materials	Community health	Waste MP, HMMP, PO	X	X	
Manage the salts, bentonite and hydrocarbons used for drilling in a responsible way	Hydrogeology Vegetation	Waste MP, HMMP	X	X	
Store domestic, organic and biomedical waste which is potentially contaminated or dangerous inside sealed containers prior to managed disposal	Soil quality Land mammals	Waste MP, HMMP	X	X	
Trial the production of organic soil with stripped soil, the sludge, the composted organic waste, potash waste and, possibly, shredded paper and cardboard waste	Vegetation	SEMP		X	
Recover the diesel fuel used for drilling in the saliferous horizons with a water and oil separator and store it in a tank for reuse	Hydrogeology	HMMP	X	X	

confidential

Table 12.5 Implementation of Mitigation Measures through Management Plans during the Construction, Operational and Closure Phases.

Mitigation Measures	Valued Elements of the Environment	Management Plans ¹	Construction Phase	Operational Phase	Closure Phase
Management of the plant site drainage in a stormwater collection basin, water from which is returned to the plant process	Water and freshwater sediment quality				
	Vegetation				
	Freshwater benthos	PD; PO; Water MP		X	
	Freshwater fish Amphibians and reptiles				
Make it a contractual requirement for the sea carriers that their ships are compliant with Regulation B-4 Ballast Water Exchange of the IMO	Marine benthos	CC, Water MP	X	X	
	Marine fish				
Implement operational procedures for unloading trains, storage in buildings and loading of ships, aimed at avoiding any exposure of the potash to winds and rain	Sea water and marine sediment quality				
	Marine benthos	PO		X	
	Marine fish				
Minimise brine effluent volume by maximising reinjection of salts into the caverns where mining is completed	Physical oceanography				
	Sea water and marine sediment quality	CLRP; PD; PO; Waste MP		X	X
	Marine benthos				
	Marine fish				
Complete the backfilling of each cavern before its closure	Topography and geomorphology	CRP; PD; PO	X	X	X
Management of work sites and storage areas, so as to reduce their visibility from the main highways	Landscape	PD; PO		X	
Planning and preservation of visual screens comprising mature eucalyptus trees or other species, so as to reduce the visibility of the infrastructure from the most frequent observation points	Landscape	PD; PO	X	X	
Contribution to the elaboration and implementation of a plan to encourage the development of localities in the Project Area and, more specifically in the Mengo sector. This plan should deal with population growth and increased pressure on the public services and infrastructure, and optimise the positive effects on the existing infrastructure.	Cultural and religious heritage				
	Social organisation				
	Education	CDP	X	X	
	Public health services and infrastructure				
	Demography Existing infrastructure				
Designing and implementing a training programme for some construction workers and a continuing education programme for the Operating Company workers;	Education	SEP, CDP	X	X	
Implementation of a CDP taking special care to make provisions for vulnerable people, i.e. people who by virtue of gender, ethnicity, physical or mental disability, economic disadvantage or social status may be more adversely affected by the Project than others and who may be limited in their ability to claim or take advantage of Project benefits;	Social organisation	CDP	X	X	
Implementation of a balanced, fair and transparent recruitment plan which gives priority to the current residents of the Project Area and which distributes the jobs between the villages and in accordance with socio-economic vulnerability, gender, age and ethnicity, whilst meeting the needs of the Project in terms of skilled, semi skilled and unskilled labour;	Social organisation				
	Education	LHR	X	X	
	Demography				
	Employment				
Implementation of a CDP to optimise the economic outfalls at local and regional levels, and improvement of living standards.	Economy	CDP	X	X	
Implementation of a procedure encouraging the purchase of goods and services from the surrounding populations and suppliers from Pointe-Noire;	Economy	SEP	X	X	
Implementation of a signalling system on the work sites and on the roads used for transport, to minimise the risks of accidents	Community health	CHSS	X	X	
Replacement of expatriate workers with Congolese workers over time, as necessary skilled are gained.	Employment	LHR	X	X	
Implementing Social Management Plans (SMP) designed to facilitate the input of women in participative planning activities and their participation in SMP programs. These programs include attention to the distinct impacts experienced by women. Gender-specific workshops are planned to further increase their participation;	Social organisation	SEP, CDP, HAMP, WCVCP	X	X	
Implementing a water recycling policy, in order to minimise water abstraction from the Loémé River.	Hydrology	Water MP, PD			
Implementing programmes detailed in the BMP aiming to reduce the local population dependency on wild biological resources which should reduce hunting pressure;	Land mammals	BMP			

¹ Management Plans

- ESMS: Environmental and Social Management System (main document) - includes Environmental Monitoring Plan
- LHR: Labour and Human Resources and Working Conditions
- AQMP: Air Quality Management Plan
- BMP: Biodiversity Management Plan
- CDP: Community Development Plan
- CHSS: Community Health, Safety and Security Management Plan
- CP: Compensation Plan
- OHS: Occupational Health and Safety Management Plan
- EPRP: Emergency Preparedness and Response Plan
- HMMP: Hazardous Materials Management Plan
- HAMP: HIV/AIDS Management Plan
- KPPSS: Kouilou Potash Project Security Plan
- SEMP: Soil and Erosion Management Plan
- Waste MP: Waste Management Plan
- Water MP: Water Management Plan
- CRP: Closure and Rehabilitation Plan
- SEP: Stakeholder Engagement Plan
- WCVCP: Workplace and Community Vector Control Program (Malaria)
- PD: Project Design
- PO: Project Operations
- CC: Contract Conditions

confidential