



Chapter 16 | Conclusions

Chapter 16 | Conclusions

16 CONCLUSIONS.....	16-1
16.1 Impacts, Risks and Opportunities	16-1
16.1.1 Economic Development and Employment	16-1
16.1.2 Displacement and Land Use Impacts	16-2
16.1.3 Gambia River and Tributaries	16-4
16.1.4 Biodiversity	16-5
16.1.5 Niokolo-Koba National Park and its Outstanding Universal Values (OUVs)	16-6
16.1.6 Archaeology and Cultural Heritage.....	16-7
16.1.7 Settlement Areas	16-8
16.1.8 Other Key Aspects	16-9
16.1.9 Cumulative Impacts.....	16-10
16.2 Management and Monitoring	16-10
16.3 Rehabilitation and Closure	16-11
16.4 Implementation.....	16-11

16 CONCLUSIONS

The ESIA has identified the potential impacts and risks of the Project based on available information and a professional management and mitigation programme has been developed in accordance with Senegalese legislation and industry best practice. The effective implementation and regular updating of the ***Environmental and Social Management and Monitoring Plan (ESMMP)***, Volume C) and other management plans in response to changing needs will ensure that environmental impacts attributable to the Project are minimised and potential environmental and social benefits are maximised. Ongoing consultation with the Government of Senegal, local communities and other stakeholders will also be important to ensure stakeholder interests continue to be taken into account in the planning and development of the Project.

16.1 Impacts, Risks and Opportunities

Key impacts, risks and opportunities that are expected from the development of the Mako Gold Project include:

- Economic benefits and income for the Government of Senegal;
- Work opportunities and skill development for the people of Senegal and in particular for communities proximal to the Project;
- Minor direct impacts on land within the Project Development Area and livelihood of local communities near the proposed mine;
- Impacts on biological resources in the vicinity of the Project; and
- Minor impacts on the tributaries and rivers surrounding the mine development, and risk associated with the use of hazardous materials.

16.1.1 Economic Development and Employment

Economic development at national, regional and local levels is likely to be one of the most significant benefits of the proposed Project. Revenues to be paid by the Project to the Government are based on the Mining Code (2003), the General Tax Code (2012) and the Company's Mining Convention with the Government. Tax income associated with capital expenditure along with employment and material supply expenses will make a significant contribution to the development of the Senegalese economy. Direct economic benefits to the national Government and economy are likely to include:

- Free issue of shares (10% of the Project ownership as a free carried interest);
- Taxes and royalties;
- Dividends;
- Labour costs; and
- Payments to suppliers.

The anticipated economic benefits of the Mako Gold Project at the national level will include direct economic benefits (e.g. dividends, royalties, taxes and duties, salaries and expenditure) and indirect economic benefits (e.g. flow on effects, training and skill development, infrastructure development). Revenues to be paid by the Project to the Government are based on the *Mining Code* (2003), the *General Tax Code* (2012) and the Company's *Mining Convention* with the Government. The most significant benefits will be received over the Construction and Operation Phases covering approximately eight years.

If managed effectively, the injection of income and economic opportunity into the local community as a result of the Project will be a major benefit. Through employment, training, procurement and livelihood

improvement programmes, the Project can be a catalyst for sustained economic growth in Tomboronkoto Commune and the Kedougou Region more generally. The Company’s existing social investment programme will also continue to complement Project-related activities and contribute to achieving local development objectives.

The Project pre-construction and construction activities are expected to last 18 months. The Project will provide employment for approximately 700 – 900 workers during construction with a maximum permanent operation workforce totalling between 300 - 360 persons during the Operation Phase. Approximately 90% of the workforce will be national employees of which 30% are estimated to be sourced from within the Kedougou Region during construction and 45% during operations. The Company will support skills training of local villagers to prepare them for employment with the Project and ‘on the job’ training. The Project, and Project employees, will also require goods and services to be procured in the local area. Local procurement will result in increased business opportunities for local villages (particularly Mako and Niemenike and surrounding villages). The introduction of new employment, training and business opportunities (both direct and indirect) is likely to increase average income in the Project-affected villages and result in an improvement in living standards.

The Company is committed to assisting local business development, actively identifying opportunities to outsource services and giving preference to local businesses. Local infrastructure and services will be upgraded to directly support Project development. Elements of this infrastructure and services will also benefit local communities, in particular the upgrade of local roads, telephone networks, transportation services and access to markets. The Project design includes the upgrade and maintenance of the Mako - Tambanoumouya road and construction of the Main Access Road. The upgrade of local roads will facilitate transport of agricultural inputs, accessibility to land holdings and access to markets and services, particularly for residents of Niemenike, Tambanoumouya and Linguekoto, further promoting local economic development.

In addition, the Project will continue its social and environmental investment towards conservation and biodiversity management within and adjacent to the PNNK, and community development in Tomboronkoto Commune.

16.1.2 Displacement and Land Use Impacts

There is not expected to be any resettlement or physical displacement of households from the Project, as no settlement areas occur within the proposed Project Development Area.

Most of the Project impact on farmland will be on fallow farms of long duration, which are not in immediate demand due to the reduced level of farming activity. Construction of the Main Access Road will result in the direct loss of a small amount (<3 ha) of actively cultivated agricultural land. This will affect arable land owned by the villagers of Tambanoumouya, Linguekoto, Niemenike and Badon.

The Main Access Road will be accessible to the public and will improve access through the Wayako Valley. Improved access will likely have a positive impact on the viability of farming in Wayako Valley, and may stimulate renewed interest in farming there.

The total area of agricultural land expected to be lost is approximately 46.5 hectares. Approximately 35 ha of this land has lain fallow for more than ten years. Table 16-1 below provides a summary of impact on arable and fallow land by location.

Table 16-1 Impact on arable and fallow land, by location

Location and Cause of Impact	Affected Villages	Area Affected (ha)	Description of Affected Area	Pre-Mitigation Impact Evaluation
Petowal/Badalla Valley: TMF, WRD (small portion) and security buffer	Tambanoumouya	28.5	Fallows of about 30 years; sloping, stony land, suitable for manual cultivation only.	The land is not currently in use or in immediate demand and alternative farming areas are available. Overall impact: Minor

Kobokou Valley: Water Storage Dam and security buffer	Tambanoumouya (one household)	7	A single fallow farm consisting partly of sloping land and partly of valley bottom land.	The land is not currently in use or in immediate demand, and alternative farming areas are available. Overall impact: Minor
Kobokou/Wayako: Proposed new Accommodation Camp	Tambanoumouya (two households)	3.5	One fallow (for more than 10 years) farm consisting partly of sloping land and partly of valley bottom land, and a fraction of an adjacent farm.	The land is not currently in use or in immediate demand, and alternative farming areas are available. Overall impact: Minor
Dinkoncono, Main Access Road	Niemenike	1.3	The Main Access Road will bisect a small number of active and/or fallow farms.	The impact on any particular family will only be a fraction of their land. Overall impact: Minor
	Badon (one household)	< 0.5		
Wayako Valley, Main Access Road	Tambanoumouya	4.64	The Main Access Road will bisect a moderate number of active and/or fallow farms. The majority of the Tambanoumouya land has been fallow for more than 10 years.	The impact on any particular family will only be a fraction of their land. Overall impact: Minor
	Linguekoto	0.6		
	Mako (one household)	< 0.5		

In relation to pastoralism, cattle owners in Tambanoumouya and Linguekoto will lose access to a portion of their traditional grazing land. Eleven households in Tambanoumouya and Linguekoto are expected to be impacted by the loss of the Petowal Hill wet-season cattle grazing area and the Kobokou grazing area. To compensate for this impact, the Company is committed to implementing the **Livelihood Restoration Plan** to improve conditions in alternative grazing areas. Restoration and improvement measures include identifying and managing one or two preferred cattle grazing areas to improve pastures, establishing water points and constructing fencing in consultation with affected villages. Following the implementation of mitigation measures, the sensitivity of livestock herders to this impact is expected to decrease and thus the residual impact to Tambanoumouya is considered Minor, while the impact to Linguekoto is considered Negligible.

Project-induced in-migration may result in increased pressure on agricultural land in the vicinity of the PDA. This may include conversion of arable land to residential land (i.e. construction of housing for migrants). Land adjacent to the Niemenike cluster of villages, Mako and the Main Access Road is likely to be most susceptible to in-migration impacts.

The loss of parts of the Badalla and Kobokou artisanal mining sites and the reduction in wet-season water flow in the ephemeral streams downstream of these sites will most significantly impact the artisanal miners of Tambanoumouya and Linguekoto. However, affected miners have low sensitivity to these impacts as there are other available and attractive mining sites nearby, including lower Badalla, Niamanoukhou and the Gambia River, while water availability will only be reduced (in the wet season and on a temporary basis) rather than eliminated. With ongoing consultation and the provision of livelihood restoration measures, the residual impact on artisanal mining is considered Minor.

The Company has committed to a number of programmes related to agriculture and land use as part of their **Livelihood Restoration Plan** (Volume D). Livelihood pilot programs have already been developed and tested by the Company to enhance agricultural productivity in Tambanoumouya and Linguekoto villages. Table 16-2 below provides a summary of the livelihood restoration measures for each type of impact.

Table 16-2 Summary of the livelihood restoration measures, by impact type

Type of Impact	Main Villages	Livelihood Restoration Measure
Loss of grazing land	Tambanoumouya, Linguékoto, Niemenike, Mako	Grazing land management and enhancement in Tambanoumouya and Linguékoto New livestock water points outside of the Project area Post-mine restoration of grazing resources
Loss of forest land	Tambanoumouya, Linguékoto	Replacement and propagation of useful trees Post-mine restoration of forest resources
Loss of agricultural land	Tambanoumouya, Linguékoto, Niemenike	Facilitation and compensation for replacement of agricultural (active and fallow) land for affected families Land preparation for replacement of active farms for affected families
	Tambanoumouya, Linguékoto, Niemenike, Mako	Intensification of agriculture through irrigation
Loss of artisanal mining sites	Tambanoumouya, Linguékoto, Niemenike, Mako	Intensification of agriculture through irrigation
Restrictions on access to lands outside of PDA	Tambanoumouya, Linguékoto	Improvement and maintenance of Mako-Tambanoumouya road Public use of Main Access Road which will improve access to and through Wayako Valley

16.1.3 Gambia River and Tributaries

Detailed modelling was undertaken to assist in predicting the expected residual hydrology, hydrogeology and water quality impacts of the Project.

Impacts to surface water hydrology during pre-construction / construction and operation will be Moderate. The hydrology of Badalla Creek and Kobokou Creeks will be significantly impacted during the rainy season, with flow restricted to that stemming from the catchments downslope of the Project Footprint. Impacts will be restricted to the lower reaches of Badalla and Kobokou Creeks. The morphology of the Badalla Creek will be altered and all water flow from the upper reaches of the creek will be impounded in the TMF, while flow of Kobokou Creek will be impounded in the WSD.

Impacts to broader hydrology (e.g. of the Gambia River) will be Negligible. Water will be abstracted from the Gambia River during the wet season and stored in the WSD as make-up water for operation of the Process Plant. Water abstraction from the Gambia River during the rainy season will not impact the river. The total volume of water abstracted for the Project is less than 0.04% of the total annual Gambia River flow during a dry year and less than 0.03% of the annual flow during the median flow year. Impacts to the hydrology of Kelendourou Creek will be Negligible during operation. Post-closure impacts to surface water hydrology downstream of the Project Area are expected to be Negligible.

The primary impact to surface water quality during construction will be suspended sediments generated from land clearing / earthworks, extraction from quarries / borrow areas, and road construction / unsealed road surfaces. The majority of sediment input will result from erosion of disturbed areas during the wet season. Water courses most affected by suspended sediments are likely to be the Badalla and Kobokou Creek and, to much lesser extent, the Gambia River.

A number of hazardous materials are required for construction, operation and decommissioning / closure. There is a risk that fuel and chemical spillage may occur during transport, handling, processing, etc. resulting in the release of a hazardous substance to soil substrate, downstream / down gradient receiving waters. The

Project has been designed to specifically address and minimise potential risks associated with hazardous materials, particularly related to transportation.

Groundwater is the main source of water for domestic use and consumption in Project-affected villages. There is not expected to be any impact on groundwater resources in Project-affected villages. Post-closure, the development of the pit lake is not expected to substantially alter the hydrogeology of the aquifers of the surrounding area.

A detailed water management and monitoring programme for the Project has been developed as outlined in the *ESMMP* (Volume C), which will ensure that potential impacts of the project related to water quality, sediment transport and hydrology are minimised. The implementation of the *Rehabilitation and Conceptual Mine Closure Plan* (Volume E) will ensure facilities are closed and rehabilitated in a way which restores hydrological regimes and post-closure water quality impacts are minimised.

16.1.4 Biodiversity

The Project has been designed to minimise impacts on biodiversity features, and extensive consultation with various stakeholders regarding biodiversity issues has been conducted during the ESIA. The Project has aligned with best practice and applied the mitigation hierarchy so that adverse potential Project-related impacts are avoided, minimised, restored or rehabilitated. However it is recognised that even after all feasible mitigation is put in place, residual impact will remain for some priority habitats and species. A detailed *Biodiversity Action Plan* (Volume C) has been developed which outlines the strategy for mitigating Project-related impacts and offsetting residual impacts to achieve at least No Net Loss to biodiversity.

Given the successful implementation of the proposed mitigation and management measures, the residual impacts that will require offsetting are associated with the chimpanzee, the hippopotamus, and potentially three species of restricted-range plants (if found to be present in bowal habitat within the Project Footprint). These residual impacts have been calculated as 1086 quality hectares for chimpanzee habitat, 5 quality hectares for hippopotami habitat and 24 quality hectares for priority flora and bowal habitat. These residual impacts are associated with:

- **Habitat loss** – Some loss of habitat (and flora) for Project development cannot be avoided nor mitigated. The loss will be partially counterbalanced by restoration and rehabilitation activities, the remaining will be offset as per the *Biodiversity Action Plan* (Volume C). It is likely that some fauna species will not return to use this habitat;
- **Habitat fragmentation, degradation** and barriers to movement of fauna – Due to the permanent loss of habitat, fragmentation effects will remain. Degradation will be reduced, but not eliminated, by effective mitigation and restoration;
- **Habitat loss, fragmentation and degradation, and the cumulative disturbance caused by the Project** (i.e. noise, light-spill), are expected to cause permanent displacement of the **chimpanzees** known to be currently nesting, foraging and moving through the PDA. This impact will commence in the Pre-Construction / Construction Phase. Due to the length of time (approx. 8 years) that the mine will be operating and the level of disturbance caused by its operation, following closure of the Project chimpanzees may not return to use the habitat in the PDA as they did before. This is a Moderate residual impact and therefore will be the focus of the offset strategy (see below);
- **Air and noise impacts on fauna** – mitigation and management will aim to attenuate the impacts of air and noise impacts, but it will be impossible to mitigate all impacts. There will be nuisance level impacts for fauna species near to the PDA associated with noise and vibration from mine pit blasting. This impact will gradually decrease as the pit develops, as the pit walls will provide some natural attenuation. With effective blast management, overall impacts should be minor;
- **In-migration and increased natural resource collection, fishing and poaching** – It is difficult to quantify the residual impacts arising from Project-induced in-migration, however impacts to habitats and species from increased natural resource collection, fishing and poaching are expected to be of Minor to Moderate significance. The Offset Strategy will take a collaborative approach to enhance the

protection of habitats and species in offset sites. Activities proposed as part of the Offset Strategy include working with local authorities to minimise the impacts of in-migration on natural resource exploitation and community education and awareness; and

- Residual impacts on **aquatic biodiversity** are expected to correspond to the quality of water released from the Project and the efficacy of erosion and sediment control. It is difficult to quantify the residual impacts from in-migration and increased aquatic resource use (i.e. fishing), however it is anticipated that there will be some risk of residual impacts to aquatic fauna, particularly fish. Given the successful implementation of the proposed mitigation and management measures, the most significant residual impacts at closure for the Project will be some loss of sections of drainage channels within the Project footprint.

The Company is committed to offsetting the Project-related residual impacts on biodiversity and is developing an offset strategy with the aim of achieving no net loss on biodiversity and preferably net positive gains. The offset strategy is presented in the **Biodiversity Action Plan** (Volume C). Stakeholder consultation and support is integral to the design and implementation of the strategy. Mitigation measures in the **Biodiversity Action Plan** are tailored to reducing the impacts on priority habitats (gallery forest, bowal habitat and the Gambia River) and species (including mammal species, vultures, restricted-range plants and a fish species), but in doing so, also mitigate impacts on other biodiversity.

A number of candidate offsets sites have been identified and provisionally assessed for technical feasibility. The next steps for the development of the offset strategy is to carry out a feasibility study where offset sites are chosen with input from stakeholders, and the requirements for biodiversity gains are assessed. The Company has also identified a number of Supporting Conservation Actions, which will be implemented and will contribute to lowering risk or magnitude of the residual impact and will provide broad scale benefits to biodiversity.

With the successful implementation of this offset programme and the other biodiversity management and mitigation measures outlined in the Project management plans, the Project is not expected to result in any significant adverse impact on biodiversity features.

16.1.5 Niokolo-Koba National Park and its Outstanding Universal Values (OUVs)

Notably there will be no direct impact of the Project on habitats within the Niokolo-Koba National Park (PNNK) and buffer zone arising from habitat clearance as none of the Project components are located within these areas. Given the successful implementation of the proposed mitigation and management measures, the residual impacts for the PNNK Outstanding Universal Values (OUVs) are expected to be:

- **In-migration and natural resource collection, poaching and fishing**– It is difficult to quantify the residual impacts arising from Project-induced in-migration, however impacts to habitats and species from increased natural resource collection, agro-pastoral activities, poaching and fishing in the eastern periphery of PNNK are expected to be of Minor significance. As part of the Offset Strategy the Company will support management activities in the PNNK including strengthening enforcement. The Offset Strategy will also take a collaborative approach to further enhance the protection of habitats and species in candidate offset sites including the PNNK Study Area. Activities proposed as part of the Offset Strategy include working with local authorities to minimise the impacts of in-migration on natural resource exploitation and community education and awareness.
- **Habitat loss, fragmentation and barriers to movement for PNNK ranging species** – Most OUV species of the PNNK appear to be currently restricted to the PNNK and therefore their movement patterns will not be affected by the Project. Habitat loss and fragmentation is expected to act as a barrier to the movement of chimpanzees outside of the PNNK and buffer zone. The degradation and fragmentation of fauna habitats will be partially counterbalanced by restoration and rehabilitation activities as per the **RCMCP** (Volume E), however habitat will not be completely restored at closure. Many species are expected to return and use the revegetated areas within the Project Footprint post-closure including leopards, Guinea baboons and other legally protected species. However, chimpanzees are considered

unlikely to return and use the habitat in the PDA as they did before the Project. The Company is developing an Offset Strategy which will offset residual impacts to chimpanzees and their habitat.

- **Vehicle collisions** – PNNK fauna are most at risk of collision on the existing RN7 which passes through the PNNK and which will be the primary transportation route during all Project phases for supplies and material delivery. However, only approximately three trucks per day are expected for Project-related transportation, while total daily traffic movements are estimated to be approximately 300 on the RN7. With the implementation of the proposed management and mitigation measures (e.g. speed limits, restrictions on night driving, driver safety awareness training), there should be Minor impact on the OUVs and other biodiversity values of the PNNK from vehicle collisions.
- **Invasive species encroachment** – There should be no residual adverse impact of the Project on the PNNK due to spreading of invasive plants. The risk of introduction of introduced species will be Minor.
- **Hydrology and water quality** – There is expected to be no residual impacts to hydrology and water quality within the PNNK following implementation of mitigation and management measures.
- **Noise and vibration** – The proposed mitigation and management programme for noise and vibration will greatly reduce the potential for noise, vibration and airblast impacts on the wildlife of the PNNK which lead to species displacement and dispersal, but it will be impossible to mitigate all impacts. In particular, there will still be some noise and vibration from blasting reaching the eastern periphery of the PNNK which may cause some disturbance to priority species including African elephant, western giant eland, African lion, chimpanzee and potential African wild dog (if present). Residual impacts are expected to be of minor significance to OUVs.
- **Artificial lighting** - There is a minor risk of disturbance to PNNK ranging fauna due to light spill from the Project areas during operation. Impacts due to Project lighting could result in movement of some nocturnal wildlife away from the part of the eastern periphery of the PNNK close to the Project further into the Park following Project commencement, with some species also becoming adapted to the new lighting regime. This disturbance will be temporary and will cease post-closure.

With the implementation of the Biodiversity Offset Strategy, and the other biodiversity management and mitigation measures proposed, the Project is not expected to result in a significant impact on the OUVs of the PNNK.

16.1.6 Archaeology and Cultural Heritage

No sites of national or international archaeological or cultural heritage significance have been identified as being directly impacted by the Project components.

Approximately 66 cultural sites were identified in the vicinity of the PDA during multiple baseline surveys conducted between 2012 and 2015. The Project Footprint is expected to directly impact two prayer trees within the PDA, which are of local cultural significance for the villagers of Tambanoumouya. The Company has committed to engage a Senegalese cultural anthropologist or sociologist to carry out the consultation process regarding the prayer trees to be impacted and supervise any compensation.

Archaeological surveys of the Study Area identified a total of 141 archaeological sites and 820 isolated sites (defined as more than five artefacts greater than 50 years old within a 15 m diameter). The vast majority of the materials recovered from the sites are from the “Historic” period, particularly the latter part of the second millennia (i.e. the last 500 years). Several examples of Neolithic (circa 7500 – 3000 BC) tools were obtained while no Palaeolithic or Iron Age objects were encountered. Five sites considered of ‘Medium’ archaeological importance and one site of ‘High’ archaeological importance have been identified within the Project footprint, and are expected to be lost as a consequence of Project development. No sites containing Neolithic material fall within the Project Footprint.

The Company has committed to conducting further archaeological investigations of sites within the Project footprint in accordance with the expert archaeological advice. Appropriate mitigation measures for material culture will be agreed with relevant stakeholders such as local government and the Ministry of Culture. Additional mitigation measures are also expected to be implemented to assist in minimising the risk to other

archaeological sites including designation of 'No Go Areas', implementation of a Chance Find Procedure and awareness programmes. With implementation of the proposed measures, the residual impacts of the Project on archaeology are expected to be Minor.

16.1.7 Settlement Areas

As per Section 16.1.2, there are no settlement areas in the PDA and therefore no requirement for physical displacement or resettlement of settlement areas, however several villages are located in the surrounding area. The settlement nearest to the PDA is Tambanoumouya located approximately 1.3 km from the PDA at its nearest point. The largest village in the vicinity of the Project is Mako, at a distance of 7 km from the PDA.

In addition to the impacts and benefits described in the sections above, other issues and risks for existing villages associated with the development of the Mako Gold Project are:

- **Dust** – During the dry season, the villages of Mako and Linguekoto could experience Minor impacts from dust during the upgrade of Mako-Tambanoumouya road, as their settlement areas are located directly along this road. These impacts will be short term and localised. In the Operation Phase, dust may be noticeable within approximately 5 km of the PDA during days when wind conditions promote dispersion. Five settlements occur within 5 km of the PDA which are the villages of Tambanoumouya and Kerekonko, and the hamlets of Dalakoy, Wassadou and Linguekoto. Negligible dust impacts are expected for all local villages during Project decommissioning/closure as well as post-closure. Dust suppression will be undertaken to minimise dust where Project activities are likely to have an adverse impact on sensitive receptors, and dust monitoring will be conducted at these sensitive receptors.
- **Other Air Emissions** – With effective implementation of the proposed management measures, impacts on settlement areas from other air emissions (e.g. exhaust emissions from fuel combustion) are expected to meet Senegal Government and IFC emission and ambient air quality standards.
- **Noise** – During the Construction Phase, Minor temporary noise impacts for some parts of the settlement areas in Mako and Linguekoto may occur during the upgrade of the Mako - Tambanoumouya road. During the Operation Phase, some noise from truck/vehicle movement along the Main Access Road may be discernable in Tambanoumouya and other nearby villages under certain climatic conditions. This is not expected to have any health or significant nuisance impacts.
- **Vibration / Airblast**– Potential impacts on sensitive receptors from vibration can occur due to ground or air vibrations (airblast). Project impacts on settlement areas associated with ground vibrations from the Project are not expected to be significant. With appropriate mitigation, there should be only Minor nuisance level impacts associated with airblast from Mine Pit / quarrying blasting for two settlements located within 3 km of the PDA (Tambanoumouya and Kerekonko), and Negligible impact for settlement areas beyond this distance. This impact will progressively decrease as the pit develops, as the pit walls will provide some natural attenuation. Negligible vibration impacts are expected to occur for sensitive receptors in the Decommissioning / Closure Phase, and post-closure, as no blasting is required.
- **In-migration** - The Project will create many employment and other economic opportunities that will lead to Project-induced in-migration, particularly during construction. Villages such as Mako and the Niemenike cluster are expected to experience the highest levels of Project-related in-migration. These two villages have been steadily growing at an average rate of 4% from 2004 to 2014. If they experience a population growth rate similar to the rate experienced by Sabodala village with the development of the nearby Sabodala Mine, it is conceivable that the population could easily double within the life of the Project. Moderate levels of in-migration can be expected for other villages adjacent to the Project. This can lead to positive benefits for economic development, however, careful management will be required to avoid and minimise the potential adverse impacts where possible (e.g. pressures on land resources and social services). The Company has committed to working closely with local authorities and communities to assist in ensuring potential impacts of in-migration are minimised. This will include developing a Hygiene and Sanitation Program in partnership with local government in Project affected villages, and construction of potable water infrastructure in key villages. During closure, a net out-migration may occur, as people leave to seek other employment opportunities.

The influx of Project employees and contractors will be minimised through preferential local recruitment policies and worker accommodation measures, while impacts to villages will be reduced through measures such as the enforcement of codes of conduct for all Project employees and contractors, and restrictions of access to villages.

- **Health and Safety** – The presence of the Project is generally expected to improve local health facilities and services in local villages in the area, such as improvement of water supplies and sanitation facilities through the Project's mitigation and investment programmes, and easier access to such services (e.g. through road upgrade and maintenance). This is a significant potential benefit of the Project. The Project, however, may result in health impacts such as a potential increase in infectious diseases due to Project-induced in-migration. As above, villages such as Mako and the Niemenike cluster are expected to experience the highest levels of Project-induced in-migration, and therefore are likely to be at highest risk of associated health impacts. The Company will mitigate the impacts of Project-induced in-migration on public health, in partnership with the relevant technical services and the Commune Council.
- **Fly rock** – An exclusion zone of at least 500 m around the pit will be established to protect people and structures from flyrock. Flyrock will be carefully managed to ensure community safety risks are minimised, particularly in relation to unauthorised access to exclusion zone during the blast sequence. Access restrictions to the exclusion zone will be enforced and security personnel will be employed at key Project access points (road infrastructure) to prohibit access via the most obvious routes.
- **Fisheries and aquatic resource use** – Fishing and use of aquatic resources are not of significant importance for local food security, and are generally of low importance for livelihoods and income. Fishing is conducted by some households, particularly in the wet season. Potential impacts on aquatic resource use from the Project will primarily be associated with risks to water quality within the Gambia River. Minimising potential impacts on downstream water will be a priority for the Company and detailed management and mitigation measures will be implemented to minimise these impacts. A minor increase in pressure on aquatic resources may occur due to Project-induced in-migration.
- **Terrestrial Resources** – The collection of Timber Forest Products and Non-Timber Forest Products is considered to be of moderate importance for local subsistence use, as well as cultural use and food security. Project development will result in the loss of approximately 240 ha of natural habitat (e.g. grassland / bowal, woodland and savannah) as a result of vegetation clearance. This is considered to be of minor significance due to the availability of alternative areas for collection of terrestrial resources in the Project area. Indirect impacts will occur due to changes in accessibility and population pressure due to in-migration. Impacts on terrestrial resource use will be minimised through the implementation of the **Livelihood Restoration Plan** for the Project (Volume D) as well as the **Biodiversity Action Plan** (Volume C). Following the implementation of mitigation measures, residual impacts on forest products / ecosystem services associated with terrestrial resource use will be Minor for the village of Tambanoumouya and Negligible for other Project-affected villages.
- **Visual Amenity** – As all settlements are located several kilometres from the main Project infrastructure, visual amenity impacts for key sensitive receptors will be Negligible for most settlements in the surrounding area. However, during the Construction and Operation Phase, the visual amenity for the villages of Tambanoumouya and Kerekonko may be moderately impacted, with direct line-of-site to some of the Badalla Valley vegetation clearance and Power Plant construction area. Post-closure, rehabilitation and revegetation activities will progressively return the visual amenity of temporarily disturbed areas to comparable to pre-Project conditions.

16.1.8 Other Key Aspects

Other potential impacts, risks and opportunities likely to be associated with the development of the Mako Gold Project are:

- **Climate and energy** – The majority of greenhouse gas emissions associated with the Project are expected to be generated during operation, and are primarily associated with fossil fuel usage for power generation and non-stationary mining equipment. The mitigation and management measures will

minimise greenhouse gas emissions associated with the Project. These will include the use of energy efficiency measures, as well as monitoring of greenhouse gas emissions.

- **Accidental events** – A stand-alone **Risk Assessment** report (*Etude de Danger*, Volume B) has been prepared which specifically considers the potential hazards associated with the Project and how these will be mitigated: including a dam break consequence assessment. Whilst the probability of these events is very low, emergency response procedures will be required to ensure that risks are minimised and appropriate action is taken in the event of an accident or natural hazard event. As part of the environmental management system for the Project, *Emergency Preparedness and Response Plans* will be developed.

16.1.9 Cumulative Impacts

The Mako Gold Project area is relatively undeveloped, with few major industrial projects in the region. Given the lack of nearby major developments / activities, the Project is not expected to significantly hinder the development of any other existing or planned projects, and is not expected to result in any significant environmental and social cumulative impacts. The biggest contribution from the Project is likely to be associated with further enhancement of the socio-economic development of the region and development of a stronger mining skills base in the Kedougou region.

The proposed Sambangalou Hydropower Dam will lead to altered hydrology in the Gambia River upstream of the Project. Whilst this development will impact the Gambia River, its impact on the development of the Project (and vice versa) is expected to be Negligible.

The Company has incorporated environmental and social considerations into numerous aspects of the Project design, and a detailed management programme has been developed, which will assist in minimising adverse cumulative impacts associated with the Project. Local, regional and national level government and stakeholder consultation will need to be undertaken throughout the life of the Project to understand and manage any potential cumulative environmental and social risks. The proposed consultation for the Project is outlined in the **Stakeholder Engagement Plan** (Volume C).

16.2 Management and Monitoring

The Company is committed to establishing an Environmental Management System (EMS) for the Mako Gold Project which is consistent with Government of Senegal legislation and aligned with international standards (i.e. ISO14001, OHSAS 18001 etc.) This management system will provide the Company with a procedural framework for implementing, achieving, reviewing and maintaining the Company's environmental and community policies and all environmental and social management targets.

A professional management and monitoring programme has been developed for the Project in keeping with international mining standards. The programme has been documented in the detailed **ESMMP** (Volume C). The **ESMMP** also includes a range of Standard Operating Procedures that provide general environmental and social management measures to manage Project impacts.

The Company aims to offset any residual impacts on biodiversity values, to achieve at least no net loss, as outlined in the **Biodiversity Action Plan** (Volume C). With the implementation of this offset programme and the other biodiversity management and mitigation measures outlined in the Project management plans, the Project is not expected to result in a significant adverse impact on the biodiversity values.

A stand-alone **Livelihoods Restoration Plan** (Volume D) has been prepared as part of the ESIA and provides the necessary strategic framework for the social planning of the Project and encompasses livelihood restoration and improvement strategies. It sets out the objectives, eligibility criteria for Project Affected Persons, entitlements, legal and institutional framework, modes of compensation, participation and consultation procedures, and grievance redress mechanisms which will be used to compensate and restore the livelihoods and living standards of Project Affected Persons. Other social management plans prepared as part of the ESIA include a **Local Economic Participation Plan** (Volume D), and **Stakeholder Engagement Plan** (Volume C).

In addition, the following specialist plans and manuals will be prepared/updated in preparation for Project construction and operation, as appropriate to support the implementation of the environmental and social management strategy:

- Emergency Preparedness and Response Plans;
- Environmental and Social Monitoring Manual;
- Construction Environmental Management Plan;
- Transport Management Plan (for transport contractors);
- Blast Management Plan;
- Waste Management Plan (inclusive of hazardous wastes);
- Waste Rock Management Plan;
- TMF and WSD Operating and Monitoring Manual; and
- Community Safety Plan.

16.3 Rehabilitation and Closure

The Project has been designed to enable it to be closed in a safe and stable manner once mining and mineral processing has been completed. Mine closure will include the restoration of disturbed drainages, revegetation of most affected areas and removal of infrastructure that will not be transferred to the Government. The Company has committed to conducting rehabilitation in a manner which ensures community safety and that benefits the local communities where possible. A **Rehabilitation and Conceptual Mine Closure Plan** (Volume E) has been prepared as part of the ESIA. During the operation of the Project further consultation with Government and community will be required to refine this Plan.

16.4 Implementation

To facilitate the implementation of the environmental and social management program for the Project, the Company has committed to establishing an Environment Department and Community Relations Department at the Mako Gold Project. The primary responsibility of these departments will be the implementation of the **ESMMP** (Volume C) and other environmental and social management plans developed for the Project. Resources have been allocated to ensure that these departments are established prior to construction and have sufficient capacity and resources to undertake the required environmental and social management and monitoring activities. Technical assistance from specialists will also be sought where required to fulfil the Company's commitments.

Implementation of the detailed monitoring strategy prepared as part of the **ESMMP** will be important to allow assessment of the effectiveness of the existing management measures, and to identify the need for improved or additional measures. The Company will also provide support for the Government of Senegal, via the Regional Environmental Monitoring Committee, to monitor the Company and associated activities in the Kedougou Region. In addition, regular internal and independent external audits of the environmental management system will be commissioned by the Company.

Successful environmental and social management for the Project will require ongoing community and Government engagement over the life of the mine in accordance with the **Stakeholder Engagement Plan** (Volume C). As part of this process, the Company is committed to ensuring genuine participation and dialogue with the affected communities, relevant Government departments and other stakeholders.

With careful implementation of the proposed management and livelihoods restoration measures, the Project is expected to be able to be developed in a way which provides a net socio-economic benefit to local

communities and to Senegal without compromising the integrity of the Gambia River, Niokolo-Koba National Park or the broader environment.