Environmental and Social Review Summary

Lauca Hydroelectric Project, Angola

This Environmental and Social Review Summary (ESRS) is prepared by MIGA staff and disclosed prior to the date on which MIGA’s Board of Directors considers the proposed issuance of a Contract of Guarantee. Its purpose is to enhance the transparency of MIGA’s activities. This document should not be construed as presuming the outcome of the decision by MIGA’s Board of Directors. Board dates are estimates only.

Any documentation that is attached to this ESRS has been prepared by the project sponsor, and authorization has been given for public release. MIGA has reviewed the attached documentation as provided by the applicant, and considers it of adequate quality to be released to the public, but does not endorse the content.

Country: Angola
Sector: Energy
Project Enterprise: Lauca Hydroelectric Project
Environmental Category: A
Date ESRS Disclosed: 16 October, 2014
Status: Due Diligence

A. Project Description

Deutsche Bank S.A.E. (DB) has approached MIGA seeking guarantees against Non-Honoring of Sovereign Financial Obligations (NHSFO) for a loan to the Ministry Of Finance (MOF) of Angola for the purpose of funding an EPC contract for phase three (MIGA Project) of the three phased construction of the Lauca hydroelectric project in Angola (the Project or Lauca). The project bears many similarities with the Cambambe Hydroelectric project in Angola supported by MIGA in June 2013.

The Project will be located on a section of the Kwanza River between the existing Capanda Hydroelectric and Cambambe Hydroelectric projects. The project footprint without the reservoir will cover 1.4 km² and the land awarded through a concession by the Government of Angola. With an installed capacity of 2,070 MW, Lauca will be the largest generation project on the Kwanza River and will more than double Angola’s current hydro electricity generation capacity. The river is the longest river in Angola (960km) and with significant power generation potential, which is estimated at 7,000 MW. Of this, only a fraction is currently utilized, with Cambambe (960 MW) and Capanda (520 MW) the only plants in operation.

The Project will include the construction of a 132-meters-tall dam and a crest length of 1,075 meters. Power will be generated primarily by six generating units, totaling 2,004 MW of hydroelectric power, with capacity to supply power to an estimated 750,000 people. A second power house will be constructed to take advantage of the ecological flow remaining in the river (65.5 MW). Damming the river will create a reservoir that is 36 km long and 15 km wide, covering an area of 185.4 km².

The construction of Lauca will be completed in three phases: Phase I involves the construction of the Kwanza river diversion. Phase II corresponds to the main civil works, including the roller-
compacted concrete dam, the coffer dam, the spillway, the adduction channel, six gravity water intakes, six 2,000 m long adduction tunnels to the underground power house, equipped with six turbine sets of 334 MW each, six evacuation tunnels with gate structures, and the two powerhouses, of 2,004 MW and 65 MW respectively. Phase III corresponds to the supply, installation and commissioning of the electro mechanical equipment (the MIGA guaranteed project). Odebrecht has been selected by the GoA as an EPC contractor for all three phases, and has selected Bardella of Brazil and Andritz of Austria & Germany as sub-contractors/suppliers for the sub-project under MIGA consideration to supply the electromechanical equipment. Ancillary infrastructure will consist of contractor camps, accommodation blocks, access road, spoil disposal areas and quarries. A switch yard will also be constructed on 96,000 m² of land. Transmission lines will be constructed and as yet, these are still being planned, but will be considered an associated facility by MIGA and a separate ESIA will be developed.

MIGA has been informed that the Lauca dam will be publically owned by Gabinete de Aproveitamento de Medio Kwanza (GAMEK), on behalf of Ministerio de Energia e Aguas (MINEA). At this point the role of the state-owned utility ENE in the Project is unclear as the sector is undergoing restructuring. However, based on Cambambe’s experience, it is expected that post construction, the ownership of Lauca will be transferred to the entity who will be responsible for operations and maintenance (PRODEL – E.P. Company on behalf of MINEA). Engineering consulting was contracted by GAMEK through a consortium led by COBA in partnership with Lahmeyer International. Their services include the analysis and approval of basic and final design and providing technical assistance to GAMEK. The basic and final design on behalf of the contractor Odebrecht is the responsibility of Intertechne.

The construction of the Project started in 2012 and is estimated to last for 5 years. The river diversion is already completed and civil works including the construction of the dam are in progress. The work under the electromechanical EPC will commence once financing from DB is in place. Lauca is expected to begin operating in September 2017.

MIGA’s environmental and social review includes all phases of the project – the river diversion; civil works; electromechanical installations; and transmission lines as an associated facility for which a separate assessment will be submitted to MIGA.

As a result of the inundation, 3 villages with a total of approximately 250 people will require physical resettlement. Some economic resettlement will also be required. A resettlement action plan is currently being developed. The closest village is 7km away from the construction site.

B. Environmental and Social Categorization

This project is Category A according to MIGA’s policy on environmental and social sustainability, as it has potentially significant adverse social or environmental impacts that are diverse, irreversible, or unprecedented. The construction of a new dam, reservoir and associated infrastructure, could potentially result in diverse negative environmental and social impacts related to: landscape, water quality, air quality, noise levels, waste water, solid waste, hazardous waste, biodiversity, worker health and safety and communities health and safety during construction and operation and resettlement. Cumulative impacts of this Project in addition to existing and planned development of the Kwanza River catchment, is also considered.
C. Applicable Standards

While all Performance Standards are applicable to this investment, our current information indicates that the investment will have impacts which must be managed in a manner consistent with the following Performance Standards (PS):

- PS1: Assessment and Management of Environmental and Social Risks and Impacts
- PS2: Labor and Working Conditions
- PS3: Resource Efficiency and Pollution Prevention
- PS4: Community Health, Safety & Security
- PS5: Land Acquisition and Involuntary Resettlement
- PS6: Biodiversity Conservation & Sustainable Management of Living Natural resources
- PS8: Cultural Heritage

The findings of MIGA’s due diligence confirmed that there are no Indigenous Peoples, as defined by PS7, affected by the project, and therefore, PS 7 does not apply to this Project.

The World Bank Group (WBG) General Environmental Health and Safety (EHS) Guidelines and EHS Guidelines for Electric Power Transmission and Distribution, also apply to this Project.

D. Key Documents and Scope of MIGA Review

MIGA’s social and environmental development specialist conducted a site visit in September 2014, and met with the guarantee holder (DB); Odebrecht; Andritz; Euler Hermes (Export Credit Agency of the Government of Germany); OeKB (Export Credit Agency of the Government of Austria); Holisticos, (the environmental consultant of the Environmental Impact Statement (EIS)); SRK Consulting South Africa (the environmental consultant commissioned by DB to carry out the additional environmental and social due diligence); and the Angolan Ministry of Environment. DB is committed to applying the Equator Principles and Performance Standards to their investments. The following documents were reviewed by MIGA:

- Environmental Impact Study, The Lauca Dam Construction Project, Holisticos, for GAMEK May, 2013;
- Environmental Impact Study, The river diversion for Lauca dam construction project, Holisticos for GAMEK, January 2013
- Lauca Hydro Power Project Environmental and Social Due Diligence, SRK, September 2014 for DB, incorporating the Corrective Environmental and Social Action Plan;
- Environmental License for construction, Ministry of Environment, Angola 9th June, 2014;
- Environmental License for river diversion, Ministry of Environment, Angola 19th February, 2014;
- Environmental Management Power Point Presentation, Odebrecht, September, 2014;
- Odebrecht, Lauca Dam site visit presentation, September, 2014
- Andritz Lauca Dam electrical equipment installation presentation, September, 2014
- Odebrecht Social Responsibility presentation, September, 2014
- Standard Operating Procedures for Environmental and Social Integrated Sustainability; Occupational Health and Safety; Emergency Response; Auditing and Monitoring;
E. Key Issues and Mitigation

PS1: Assessment and Management of Environmental and Social Risks and Impacts

MIGA’s assessment considered the Odebrecht consortium’s (Construtora Norberto Odebrecht Sucursal Angola and Odebrecht Angola Construção e Projectos de Energia Lda) management of its environmental, health and safety performance in the establishment of the facilities; compliance with national and local permitting requirements; and engagement with local communities regarding physical and economic resettlement and environmental, health and safety performance.

Environmental and Social Assessment:

An EIS was completed by an Angolan environmental consulting company (Holisticos) in May 2013. The EIS was developed to meet the environmental standards of the Angolan Ministry of Environment. An independent environmental and social consultant was appointed by DB to undertake the pre-financial close Environmental and Social Due Diligence (ESDD) according to the Performance Standards; the World Bank Group Safeguards Policy on safety of dams (OP 4.37, 2001); Core Values and Strategic Priorities of the World Commission on Dams; and the Equator Principles. During the initial EIS process, a comprehensive baseline study was undertaken and impacts related to physical and chemical; ecological/biological; social/cultural and economic/legal, impacts were assessed. An EIS was also developed for the river diversion works in January 2013 and potential impacts were included in the EMP for this work, as well as in the overall EMP for the whole project.

The ESDD assessment resulted in a number of action items related to for example: the development of a Resettlement Action Plan; dam safety and review; improved assessment and management of biodiversity impacts; grievance mechanisms; cumulative impacts and social communication plan. These recommendations and actions will be included in the revised Environmental Management Plan (EMP) for construction and operation, which Odebrecht and the operator will have joint responsibility of implementing. An Environmental and Social Action Plan (ESAP) has been developed by the lender’s consultant who will regularly monitor progress against actions. MIGA has reviewed and provided input to this ESAP to ensure that all identified gaps in compliance with PS and WBG EHS guidelines are included in the Plan and will be addressed by the EPC and operator. Transmission lines will be constructed and as yet, these are still being planned, but will be considered an associated facility by MIGA and an ESIA will be included as an action item in the ESAP. Environmental licenses were issued by the Ministry of Environment for both the river diversion and the civil works. A number of conditions regarding social and environmental compliance were applied to these licenses which Odebrecht has applied to their EMP.
The potential cumulative impacts of the Project in conjunction with existing and planned hydropower and other development projects in the Kwanza River catchment are being considered in a separate study commissioned by the Ministry of Energy and Water. This is due for completion in June 2015. Feasibility studies were carried out by the GoA and optimization of the energy potential of the Kwanza river was assured when the locations and installed capacities of all hydro power projects were defined. The three current and any future hydro power projects in the Kwanza River will be operated independently, but the new electrical generation company PRODEL, will be the common owner of all dams, and consequently, energy generation shall be maximized through general operational rules. In addition to that, MINEA plans to install a Center of Operations near Luanda to remotely control its electric generation and transmission installations.

Management Program and Monitoring:

A framework Environmental Management Program (EMP) for construction was included in the impact assessment, which provided an outline of plans and procedures to be developed by Odebrecht prior to construction. Odebrecht has since developed a detailed construction environmental and social management and monitoring plan (ESMMP) which is comprised of five sub-programs (social communication; education and environmental awareness; social support; construction support and bio-physical monitoring) and includes a series of policies, plans and operating procedures to guide the construction of the dam and facilities in line with international good practice. The ESMMP, including all policies, plans and procedures, will be regularly reviewed and updated, as required. Comprehensive monitoring of ambient conditions of air and water quality occurred during the EIS and continues. Odebrecht’s Integrated Environmental Management Plan includes monitoring requirements and EHS procedures and policies. All of these plans will be updated to ensure compliance with World Bank Group (WBG) Environmental Health and Safety (“EHS”) guidelines and World Health Organisation (WHO) guidelines. Resource use efficiency aspects will also be incorporated into management plans where possible.

Mechanisms for internal review of compliance with HSE policies and procedures include weekly feedback to management and completion of a monthly checklist. In addition, internal inspections of facilities are conducted by HSE staff on a weekly basis.

The ESMMP for operations will be developed by Odebrecht prior to the Project’s commissioning, and the relevant authority will be responsible for its implementation. Odebrecht will remain on site for three years during operations to ensure the plant is being managed in line with international standards.

Odebrecht, Andritz and Bardella will implement management systems consistent with their own corporate social responsibility policies, which include commitment to management practices in line with ISO 14001 (International Standard for Environmental Management Systems), ISO 9001 (International Standard for Quality Assurance) and OHSAS 18001 (British Standard for Occupational Health and Safety) certified. Sub-contractors will follow the construction EMP and will be obliged to comply with MIGA’s Performance Standards (PS), overseen by Odebrecht.

For the construction phases, Odebrecht has developed a legal compliance register to be used as the basis of regular legal compliance and will ensure annual external audits are completed. The Ministry of Environment will monitor the project regularly to ensure it is in compliant with the conditions stipulated on the environmental license.
Odebrecht will manage the construction phase of the project and the relevant authority will manage the operations of the power station. Prior to commissioning, Odebrecht will conduct a skills needs assessment of the operators HSE team. Odebrecht has committed to carry out capacity building activities to ensure the operator has the appropriate systems and staff in place to manage the project during operations. In association with the relevant generation authority, Odebrecht will operate the power plant for a period of three years after the first turbine start-up. The lenders will contract an independent environmental consultant to review progress of the operators management performance for the first few years of operations measured against the operators compliance with the EMP. Implementation and compliance of the EMP are contractual obligations. The Ministry of Environment will also monitor the project regularly via site visits and reports which are a condition of the environmental license.

Based on the review of the environmental management system Odebrecht is expected to manage the project’s environmental impacts in line with the Performance Standards and EHS guidelines.

**Organizational Capacity and Competency:**

Odebrecht has demonstrated capacity of managing large hydroelectric construction projects throughout the world, as well as in Angola (most recently, Odebrecht is managing the construction of the Cambambe Hydroelectric Project). Ongoing monitoring of the Cambambe Project indicates that the environmental and social impacts have thus far been managed appropriately, and it is expected that Odebrecht will show the same level of commitment during the construction of Lauca.

Odebrecht has established an environmental and social management unit which includes a senior manager for environment, a senior manager for health and safety and a senior manager for social responsibility. Under these managers are three teams of technicians including 32 staff responsible for the environment, 110 staff responsible for workers health and safety and 9 staff responsible for community health and safety, including resettlement and development activities. Key social and environmental responsibilities are well defined within the organization. Sufficient financial resources are available for adequate implementation of Health Safety Environment (“HSE”) policies, plans and procedures during operations.

A very comprehensive training plan has been developed for all Odebrecht, the operator, Andritz and Bardella staff with regards to occupational and environmental health and safety as safety is a major focus of Odebrecht’s operations. The training plan includes an assessment of training needs, delivery of training to cover topics such as safety at work, safety in electrical services, emergency procedures, ergonomics, solid waste management, etc., followed by an evaluation of the effectiveness of training. Members of Odebrecht’s environmental and social management team are on site daily to monitor safety.

**Emergency Preparedness and Response**

Odebrecht has an Emergency Response Plan (ERP), and accidents, incidents, near misses and diseases are documented and reported. On-site health care facilities are considered excellent with a large team of medical staff on hand to deal with all illnesses and emergencies. Provision is made for medical evacuation where necessary. The ERP will be revised to include emergency response assistance to surrounding villages for emergency situations associated with the project and details of the ERP will be disclosed to external stakeholders.
Reporting:

The project will report to the Ministry of Environment per regulatory requirements and its permit conditions (every six months) as well as provide annual monitoring reports to MIGA. The project will undergo annual external audits as well as internal audits every 12 months. A system for internal review, investigation of non-conformances and amendment of policies and procedures will be integrated into the management procedures.

PS2: Labor and Working Conditions

Odebrecht has an integrated HSE policy and a project-specific Occupational Health and Safety (OHS) Plan/System in line with PS 2, which apply during the construction and commissioning phases of the project. Areas of high risk and hazards are known and general protective and preventive measures implemented. A strong safety culture is evident, with particular emphasis on working at heights, which is one of the key occupational safety risks. Workers are required to use Personal Protective Equipment (PPE) and working areas are evacuated during blasting. Daily Safety Dialogue (DSD) talks are carried out to reinforce safety culture, as are the information boards. Safety signage is apparent throughout the site and speed bumps are in place. In April 2013, one fatality occurred at the site when a staff member was working on removing small rocks from the rock face following blasting in the diversion tunnels. A full review of the accident was completed and necessary steps including adjusting procedures to safeguard against this happening in the future.

A Human resources policy and manual as well as a formalized recruitment plan is in place for the 4,475 workers currently employed for the construction phase with the vast majority of them hired locally. A further 1,600 will be hired for the peak of construction. The breakdown of staff is as follows (October 2014):

<table>
<thead>
<tr>
<th>Description</th>
<th>Workforce</th>
<th>National</th>
<th>Expatriates</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Specialized</td>
<td>Non skilled</td>
</tr>
<tr>
<td>Odebrecht - Women</td>
<td></td>
<td>49</td>
<td>85</td>
</tr>
<tr>
<td>Odebrecht - Men</td>
<td></td>
<td>2,140</td>
<td>511</td>
</tr>
<tr>
<td>Subcontractors - Women</td>
<td></td>
<td>7</td>
<td>0</td>
</tr>
<tr>
<td>Subcontractors - Men</td>
<td></td>
<td>594</td>
<td>329</td>
</tr>
<tr>
<td>Owners Engineer</td>
<td></td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Owner staff</td>
<td></td>
<td>8</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total Geral</strong></td>
<td></td>
<td><strong>2,802</strong></td>
<td><strong>929</strong></td>
</tr>
</tbody>
</table>

All workers are full time employees.

Odebrecht has a policy against the use of forced or child labour, not employing anyone under the age of 18. Approximately 125 people will be employed during the operations phase, considering Operations & Maintenance team and administrative support staff. Recruitment for both
construction and operations phases is done on the basis of qualifications and skill with the same conditions applied to local and migrant workers. The recruitment policy commits Odebrecht and sub-contractors to the principles of equal opportunity and fair treatment in compliance with Angolan law. Odebrecht staff and sub-contractors are paid above minimum wages. A service order defining workers’ rights and working conditions is included in each individual’s employment contract with Odebrecht. A newly formed workers union exists and has approximately 300 members at this stage with new members continuing to join. The company has a collective agreement with the union that sets out working conditions in line with Angolan law. The union is quite active and has negotiated working hours and health care with Odebrecht to the satisfaction of all workers.

Andritz and Bardella have their own OHS procedures which Odebrecht will review to ensure they are in line with PS 2. Odebrecht will also review their primary suppliers to ensure they are also compliant.

As mentioned above, Odebrecht will carry out an assessment of the operators’ capacity to manage HSE and develop a capacity building program to address deficiencies, as well as revising the operators OHS procedures to comply with international best practices, WBG EHS Guidelines and with the requirements of PS2.

For the construction phases, four types of accommodation are available for staff who do not live locally, including workers from Odebrecht, Andritz and Bardella. The type of accommodation is based on the staff position within the company and maintained in accordance with Angolan and Brazilian law, and adherent to IFC / EBRD Guidance on Workers Accommodation policies. Staff who live on site are provided three meals per day and those who live locally are provided two meals per day. At the end of employment, Odebrecht will offer all employees positions on other contracts in Angola. Odebrecht have a communication procedure in place which includes a grievance mechanism for workers and sub-contractors. This will be improved to comply with PS2.

Malaria is prevalent in the area, but daily spraying occurs in accommodation, work sites and offices. Mosquito repellent is widely provided at site, supported by an awareness and monitoring campaign. To date the incidence rates are fairly low.

**PS3: Resource Efficiency and Pollution Prevention**

**Resource Efficiency**

Application of resource efficiency principles is evident through reuse of materials such as excavated rock and waste minimization. The project aims to reuse 8% of water and recycle 30% of waste. Sustainability performance indicators, including environmental criteria form part of staff performance targets. A greenhouse gas ("GHG") emissions study will be completed to include loss of carbon sequestration and emissions from biodegrading vegetation. Additionally, a Clean Development Mechanism ("CDM") Project Design Document will be completed which will estimate the quantity of CO2 which will be reduced from the baseline scenario over 7 years of crediting period as a result of the project. GHGs will be emitted during construction; however, these will be offset during operations as well as during rehabilitation and re-vegetation of degraded areas. An action plan, following recommendations in the CDM report will be developed to ensure GHG emissions are reduced. The operator will follow up with UNFCCC on the process.
River flow is regulated by the existing Capanda dam upstream from Cambambe, which guarantees a minimum flow of 350 m³/s. A simulation model was conducted based on the information available in terms of water flow, main water extraction activities for irrigation and human consumption and water flow from the Capanda Dam. This was done to calculate the ecological water flow that needs to be maintained in order to minimize any downstream effects both on human activities and the environment. The model indicated that the proposed activities for Lauca will enable the minimum 350 m³/s water flow to be maintained, and an ecological minimum flow of 122 m³/s. The EIS concludes that this is considered sufficient to ensure there is no impact on fish species and other biodiversity in the river.

**Pollution Prevention**

Key pollution risks related to construction include sewage, unmanaged domestic and industrial waste disposal, hydrocarbon spills from storage facilities and workshops, inappropriate storage of chemicals and hazardous substances, dust/particulates from blasting, quarrying, earthworks, erosion and sedimentation.

**Liquid waste management**

A wastewater treatment plant is in place along with systems and procedures to treat domestic and industrial effluent (which is discharged to the Kwanza River upstream of the dam). Water quality in the Kwanza River is monitored at a number of points upstream and downstream of the dam and also upstream of the effluent discharge point. Samples are tested both on site as well as at Ambiafrica laboratory in Luanda. Water quality monitoring is undertaken by Ambiafrica and will be carried out monthly for the first three months and thereafter every three months to ensure compliance with Angolan Water Law 261/11 and local standards. Once the reservoir is full, water quality will be tested every month in the first 6 months and then every semester to determine the impacts of decomposition of submerged biomass and potential methane emissions amongst others.

**Solid Waste management**

A detailed waste management plan is in place for solid waste, hazardous residues, vegetation residues and metal residues (scrap). The plan includes the following measures:

- Waste separation and recycling area
- Landfill
- Composting facility
- Short-terms waste storage area
- Incinerator for Class 1 waste
- Area for storage of scrap metal
- Chipping of waste wood for use during rehabilitation

A landfill in line with local and international waste facility design standards is in operation. The landfill will be used for the disposal of non-hazardous solid waste which cannot be recycled. Recyclable wastes are separated and collected at the designated recycling facility on site where they are compacted for efficient transport. Odebrecht has identified recycling companies who will dispose of the materials. They will collect the waste from site and take it to Luanda for processing. Odebrecht is in the process of ensuring all contractors have the necessary permits and
facilities to process the waste to international standards. An incinerator is used to burn acceptable waste such as medical waste from the health facility. Emissions from the incinerator are monitored regularly and within acceptable limits.

**Hazardous waste management**

Hazardous wastes such as used oil, lubricants, fuel, batteries, light bulbs, etc., are generated at mechanical workshops, fuel stations, lubricant stores, concrete mixing site, etc. Based on recent works, approximately 150 m³ of used oil are produced annually along with approximately 3,000 used filters. Odebrecht has identified certified third parties, ProCeramica, Biorremediação and Kaba Maka, who dispose/recycle/process hazardous waste in Luanda as appropriate. They come directly to the site and transport the waste to their disposal facilities in Luanda. Odebrecht has installed an onsite hazardous waste facility approved by the Ministry of Environment. Generators are housed appropriately and fuel, oils, solvents, additives and lubricants are suitably stored in lined and bunded facilities to prevent soil and water contamination. A vehicle maintenance unit has been established on site for maintenance and repairs of the several hundred vehicles. The unit has been designed to international standards. A liquid waste separation plant is under construction which will separate water from oil and lubricants. Pesticides used for deterring mosquitoes and tsetse fly are handled, stored, applied and disposed of in accordance with Good International Industry Practice (GIIP) and no banned substances are used. Cement waste and tar are disposed of in an authorized area on site which will be licensed by the Ministry of Environment.

**Air and noise pollution**

During construction, the most significant air quality issue is dust emissions. Dust suppression measures such as water sprinkling are implemented and air quality is monitored on site (particularly in the access tunnel). Temperature is monitored on site for occupational safety purposes. Noise is monitored by Odebrecht during the day and at night for 30 minutes both on site and noise levels during operations are within the EHS guidelines. Explosions take place once a day at specified times (07:00 or 17:30) and usually last approximately 30 minutes. The need for explosions will cease in 2015.

**Quarrying residues and Erosion**

Waste rock from quarrying activities related to above and below ground excavations is being stock piled and used in construction activities such as for roads and concrete production. Approximately 6,607,330 m³ of rock is being excavated in total. In order to minimize erosion in the river from excavation works, temporary drainage systems have been constructed in areas of work to divert any run off away from the river. Exposed banks created after quarrying are sprayed with stabilizing material to prevent erosion. An adequate drainage system is installed along roads to control run off during the wet season. These measures are included in the construction phase EMP.

**PS4: Community Health, Safety & Security**

The Lauca plant is located on the border of the North Kwanza, South Kwanza and Malanje provinces on the middle stretch of the Kwanza River, 47 km downstream of the Capanda hydroelectric scheme, 70 km above the Cambambe hydroelectric scheme and 75 km east of the city of Dondo. There are 11 villages (793 inhabitants) in the area of influence of the project (the
nearest village is approximately 7km from the site) and three villages (254 inhabitants) directly affected by the Project.

Key community health and safety risks associated with the Project include health impacts associated with in-migration, infectious disease transmission (e.g. STIs, malaria), traffic, risks related to unauthorized site access and associated with blasting and the use of explosives. A grievance mechanism is in place and Odebrecht’s social development staff raise awareness of the system with the communities to ensure everyone is aware of how to lodge a complaint if necessary. The grievance mechanism will be made accessible to the wider community, not just those directly impacted by the project.

The transport, storage and use of explosives are guided by an explosives management handbook managed by trained experts. Adequate safety and security is provided during the transport of explosives to the site and within the site, such as police escorts and unmarked vehicles. An explosives store allows for separate storage of explosives and detonators. All blasting activity is carefully controlled and managed by a team of experts.

Measures are taken to control malaria and tsetse flies on site through indoor residual spraying. The EIS notes the risk of an increased incidence in sexually transmitted diseases, such as HIV/AIDS. An education and environmental awareness program will target workers and the local population with a focus on health and hygiene. Health and safety risks will be addressed within the stakeholder engagement plan as well as other existing programs such as the community development program. Odebrecht is aware of the potential impacts on the local communities of in-migration and is monitoring this to ensure there are no negative impacts as a result of this influx.

Odebrecht commissioned a review to carry out an evaluation of the dam design and safety and it was concluded that the design will meet international safety standards. DB also commissioned an independent review of the dam design and initial results indicate some technical concerns which are being discussed with Odebrecht and will be resolved shortly. These include issues with generators, surge tanks and headrace tunnels. A dam break analysis is currently being completed and results should be available in November. A dam failure emergency response plan has not yet been developed by Odebrecht; however, the Angolan Government is expected to develop a national Emergency Response Plan (ERP) which will include dam failure measures. The timeline for this is unclear. In the meantime, Odebrecht’s ERP will be revised to include emergency response procedures in the case of dam failure once the analysis has been completed. The current ERP provides procedures for life, fire, safety events but it does not make provision for the involvement of local government agencies and the communities in case of an emergency. The ERP will therefore be revised in consultation with authorities and communities to ensure that there are sufficient resources to deal with dam failure and other catastrophic events.

The project site has been surveyed for land mines and deemed clear. A land mines certificate issued by the contracted company and countersigned by Odebrecht, will be issued by the end of the year 2014.

Security

The project site is fenced and has one main entrance which is controlled by private security personnel. Odebrecht security protects equipment and facilities procured by Odebrecht. Security arrangements are guided by principles of proportionality and Good International Industry Practice.
(GIIP). A community grievance mechanism will be developed and implemented for all external stakeholders and a procedure will be in place to investigate incidences of unlawful or abusive acts of security personnel. During operations the site will be secured by GAMEK/PRODEL staff and its contractors.

**PS5: Land Acquisition & Involuntary Resettlement**

The project footprint without the reservoir will cover 1.4 km² and the land was awarded through a concession by the Government of Angola. No one was using this land prior to the project. The land was dry savanna with fairly dispersed shrubs and trees with riparian forests along the river. An area of 185.4 km² will be inundated by the project as a result of the construction of the dam wall. A limited number of ecosystems services have been identified in the inundation area including fishing charcoal production, water provision recreation and use of medicinal plants, however, these are not fully understood from a function and livelihoods perspective. Further assessment will be carried out on ecosystems service and included in the Resettlement Action Plan (RAP) which is being developed by an independent consultant in line with the Performance Standards and local law. Based on surveys undertaken by Odebrecht and Holisticos, three villages (254 inhabitants) are located in the directly affected area and will require physical resettlement. One village will be completely inundated and the other two will be resettled as they are deemed as at risk of inundation. There will also be some economic displacement experienced by a large farmer as well as two cemeteries which will be relocated. Two bridges across the Luenga River connecting villages to pastures and access across the Kwanza River connecting villages will also be inundated. The relocation site for the resettled villages is as yet to be determined; however the communities are closely involved and engaged in the process. Odebrecht social development staff visit the villages each week to engage the communities in the process. A resettlement committee has been established and includes members of the communities, the local authorities and Odebrecht.

Mapping of the area has been completed, the registration of affected assets process has been conducted and communities are aware that a cutoff date will be determined as part of the RAP. Following a visit to the affected communities by MIGA’s environmental and social specialist, it can be concluded that there is broad community support for the relocation. All three villages will be relocated to one larger village where necessary amenities will be provided, along with agricultural land, houses, water and electricity. An economic development/livelihoods restoration plan will also be developed and Odebrecht will work with the communities to provide training and capacity building to encourage new economic activities such as aquaculture. The relocation process will be completed in 2016 before the area is inundated in 2017.

Along with the three villages which will be relocated, 11 villages are within the area of influence of the project. They will not require relocating, however; Odebrecht is committed to working with these communities to improve their living conditions as they are living close to the project (not less than 7km away) and are affected by an increase in traffic during construction and some noise and dust pollution. They will not suffer land loss and are not downstream of the dam, but are part of Odebrecht’s commitment to social improvement of local communities. The community development program has already begun and includes education; health; water and sanitation; and economic activities such as agriculture, aquaculture, horticulture nurseries, etc., for close to 800 inhabitants. As these communities cover a wide geographic location, discussions are ongoing to determine the benefits of consolidating smaller communities to create fewer larger villages and benefit from economies of scale. This discussion is yet to be concluded and a detailed assessment report and RAP would be required by MIGA before any decisions or resettlement will take place.
Following a visit to these villages, it was concluded that there is broad community support for the project.

The location of transmission lines has yet to be determined and an ESIA will be required by MIGA along with a RAP if any resettlement is deemed necessary.

**PS6: Biodiversity Conservation & Sustainable Management of Living Natural Resources**

A biodiversity assessment for local requirements was carried out as part of the EIS. The area to be inundated is not located in a legally protected or internationally recognized area and includes a combination of modified and natural habitats comprising dry deciduous forest and dry savannah.

**Flora:** The vegetation of Lauca comprises dry savanna with fairly dispersed shrubs and trees, forest areas composed of dominant trees and some shrubs, riparian forests along the river characterised by large trees, shrubs, palms and vines extending over the canopy (including a number of edible varieties), and communities of aquatic plants directly dependent on the river. Certain habitats are rich and diversified in botanical taxa. Although the ESIA does not highlight any International Union for Conservation of Nature (IUCN) Red List species, some are likely to occur in the Project area. A number of plants are used by local communities for clothing, food, fuel and medicinal purposes.

**Fauna:** The Laúca region has a considerable diversity of fauna as it is located at the transition between the coastal dry savannas that extend into the hinterland, forest ecosystems typical of the Angolan escarpment and the Miombo forest biome that covers a large part of the Angolan plateau and is dominant in the area affected by the Project. No fauna is considered endangered in this area.

**Fish:** 42 species of fish were identified from the families: Mormyridae, Kneriidae, Cyprinidae, Alestidae, Hepsetidae, Amphiliidae, Claroteidae, Mochokidae, Schilbeidae, Clariidae, Cichlidae, Mastacembelidae and Poeciliidae. The Cyprinidae and Cichlidae families display the greatest diversity and abundance. Undocumented endemic species may occur in the area, noting high species diversity in the area and the limited knowledge of the biodiversity of the Kwanza River basin.

**Herpetology:** Six amphibian and 11 reptile species were identified in the area, the latter including the Leopard tortoise (Geochelone pardalis), Black mamba (Dendroaspis polylepis), African rock python (Python natalensis), Tree agama (Acanthrocercus atricollis) and Nile crocodile (Crocodylus niloticus). None of the recorded species is listed as endangered.

**Birds:** 92 avian species, belonging to 43 families and 17 orders, were identified in the area, including eight species of predatory birds. The identified species correspond to approximately 10% of the known species in Angola. All identified species are common to Angola and Laúca. The White-head vulture (Trigonoceps occipitalis) is classified as Vulnerable on the IUCN Red List, while the Red-crested turaco (Tauraco erythrolophus) and the Red-backed mousebird (Colius castanotus) are endemic to Angola, albeit not of particular conservation concern.

**Mammals:** Mammals potentially occurring in the study area encompass 40 species belonging to 24 families from the following eight orders: Chrioptera, Rodentia, Primates, Soricomorpha, Macroscelidea, Tubulidentata, Hyracoidea and Artiodactyla. Mammals sighted during surveys
conducted for the ESIA include rats, bats, genets, monkeys and warthogs. There are no mammals of conservation significance in the project area.

There are a series of rapids on the Kwanza River located between the Capanda dam and the Cambambe dam which could be regarded as a unique ecosystem under threat from the dams on the river; however further assessment during the cumulative impacts assessment process will be carried out in order to determine how the rapids will be impacted by the dams and to identify mitigation measures as necessary.

In order to allow construction works to take place on the dam and spillway, the river has been diverted. The river flow is not being affected as the water is being diverted through the intake cleaner tunnel which is located close to the dam construction site and discharged just via the outlets at the bottom of the dam. An EIS was developed for the river diversion and indicated that the diversion will put pressure on air and water quality as well as plants and wildlife and will require careful monitoring and implementation of the EMP which includes conditions on the environmental license such as further biodiversity studies. As mentioned above, a minimum of 350 m³/s water flow will be maintained and the EIS concludes that this is considered sufficient to ensure there is no impact on fish species and other biodiversity in the river.

A Biodiversity Action Plan (BAP) will be developed by an environmental consulting firm hired by Odebrecht to decrease impacts and maintain biodiversity and ecosystem services, as well as to ensure adequate water flow. The BAP will include a more detailed base line study and mitigation measures to minimize any impacts identified for example impacts on ground nesting birds. Biodiversity offsets will be considered when developing this plan. Implementation of the plan will be carefully monitored by Odebrecht and the operator and activities adjusted as necessary.

PS8: Cultural Heritage

The project area is primarily uninhabited and consists of low altitude dry savannah and dry deciduous forest. To date there have been no significant archaeological areas identified for this region, although further archeological studies will be carried out, as conditions of the environmental license. Two cemeteries will be relocated as a result of the inundation of the southern villages. The relocation will be carried out in line with Ministry of Culture guidelines. A Chance Find Procedure will be applied in the event that items of archeological significance are unearthed in the course of construction and excavation activities. Staff will be trained on the implementation of the procedure during vegetation removal and earthworks.

F. Environmental Permitting Process and Community Engagement

Prior to the issuance of environmental licenses for the river diversion and dam construction, the Ministry of Environment reviewed the EIS, conducted a site visit and also held a public consultation meeting. Following their analysis, the Ministry also commissioned an independent review of the EIS. Once these activities had been satisfactorily completed, a three year Environmental License, based on the EIS of January 2013 for the river diversion for the construction of the dam, was awarded to GAMEK on 19 February, 2014 and stipulates a number of conditions such as water quality monitoring, further biodiversity studies, occupational health and safety training, community consultation and the development of a monitoring program. These conditions will be monitored by the Ministry on a regular basis.
A three year Environmental License, based on the EIS of 2013 for the construction of the dam, was awarded by the Ministry of Environment to GAMEK on 9 June, 2014 and stipulates a number of conditions such as developing a slope stabilization plan, conduct a modelling exercise to determine which vegetation should be removed from the inundation site in order to retain water quality, developing a nursery for plants and trees to be used in rehabilitation program. This license also included all the conditions on the river diversion license. These conditions will be monitored by the Ministry on a regular basis. The license is solely for the construction phase and a second application will be required in order to obtain a license to operate the power plant. Several additional activities will require further assessment given their potential impacts to the environment, such as on existing aquifers in the project area, further archeological studies and water quality studies. Following their assessment, the Ministry of Environment will be notified and if necessary the environmental permit will be adjusted accordingly. All other permits and licenses required during construction have been obtained. Further assessment reports will be provided to MIGA as they are available.

Community engagement during the EIS process involved several rounds of community consultation and a public hearing which was convened prior to submission of the final EIS. Community engagement is ongoing on a daily basis. Odebrecht has a team of 9 social development specialists, and specialized consultants, who work with the communities to implement the community development plan. A social communication plan is being finalized which also includes details of the social support programmes, education and environmental awareness. Training courses are offered on English and computers for the local community. Sports activities are organized as well as social action to clean up villages. In addition Odebrecht developed the “Acreditar” social responsibility program focused on training and qualification in specific construction skills which is available to local community members. As mentioned above, MIGA deems that the project has broad community support following its assessment and site visit.

G. Availability of Documentation

- Environmental Impact Study the Lauca Dam Construction Project, Holisticos, for GAMEK May, 2013; (Portuguese and English translation-Part1, Part2 and Part3)
- Environmental Impact Study for the river kwanza diversion, for approval of the Lauca Hydroelectric project, Holisticos for GAMEK, January, 2013, (Portuguese)
- Lauca Hydro Power Project Environmental and Social Due Diligence, SRK, October 2014 for DB, incorporating the Corrective Environmental and Social Action Plan

The above listed documentation is available electronically as PDF attachments to this ESRS at www.miga.org. The EIS is also available on the web site of Euler Hermes Deutschland AG (http://www.agaportal.de/en/aga/projektinformationen/a-projekte.html), the official Export Credit Agency of the Government of Germany, who is also providing support for the financing of the project. and the website of OeKB: http://www.oekb.at/en/export-services/projects/project-information/Pages/category-a-before-assumption-of-liability.aspx Austria's main provider of financial and information services to the export industry and the capital market.