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**AFRICAN DEVELOPMENT
BANK GROUP**

PROJECT: ACHWA II HYDRO ELECTRIC POWER PROJECT

COUNTRY: UGANDA

SUMMARY OF ENVIRONMENTAL AND SOCIAL ASSESSMENT (ESIA)

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Project Title: **ACHWA II HPP**

Project Number: **P-UG-FAB-007**

Country: **UGANDA**

Department: **OPSD.3**

Division: **OPSD.3**

Project Category: **1**

1. INTRODUCTION

The proposed project consists of design, construction and operation of a 42 MW (4x10.5MW turbines) turnkey Run-of-River hydropower plant (HPP) with an annual output of 281 GWh along the Achwa River, in Gulu district, Northern Uganda. It also includes a 38km access road and a 9km of service roads and interconnection facilities to the grid substation and a construction camp for the workers. The generated power will be evacuated by a 140km interconnected 132kv transmission line (“t-line”) to Lira substation to be constructed by the Uganda Electricity Transmission Company Limited (“UETCL”) which is outside of the scope of this Project and does not meet the requirements of an *Associated Facility* under Bank’s Operational Safeguards Policies.

In accordance with the Bank’s Integrated Safeguard System (ISS) and Ugandan national requirements, this project has been categorized as 1. Accordingly, this Environment & Social (E&S) summary has been prepared based on AfDB environmental and social (E&S) assessment guidelines and procedures for Category 1 projects.

The E&S summary starts with a presentation of a brief summary of the rationale and description of the project, followed by the legal and institutional framework within the host country, Uganda. A brief description of the main environmental and social baseline conditions of the project area is given for the project components, focusing on the physical, biological and human and wider environmental receptors. Project alternative analysis have also been in terms of technical, economic, environmental and social feasibility which is followed by the most significant positive and negative impacts on the biophysical and human (socio-economic) environments. Mitigation measures proposed to boost project benefits and/or prevent, reduce, mitigate or offset any negative impact, as well as the monitoring programme has also been proposed. The public consultations held, as well as additional initiatives implemented under the project, are also presented. The document concludes with a summary of climate change-related risks and the proposed adaptation and mitigation measures.

2. POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

The applicable national, international lender group and international conventions applicable to the project are summarized in the following sections.

2.1 Ugandan Policies and legislation of relevance to hydropower development

2.1.1 *The National Environmental Management Policy, 1994*

The National Environment Management Policy for Uganda (1994): The National Environment Management Policy gives the overall policy framework, which calls for sustainable development that maintains and enhances environmental quality and resource productivity to meet human needs of the present generation without compromising ability of

future generations to meet their own needs. **This provision helps to meet the Bank's Operational Safeguard (OS-1) requirements.**

2.1.2 The National Energy Policy, 2002

The policy goal in the energy sector is to meet the energy needs of the Ugandan population for social and economic development in an environmentally sustainable manner.

2.1.3 The National Water Policy, 1999

The National Water Policy 1999, promotes an integrated approach to manage the water resources in ways that are sustainable and most beneficial to the people of Uganda. The policy emphasizes the need for an EIA for projects that traverse water areas and streams as is the case in this project. **Bank's OS-4 requirements will be met.**

2.1.4 The Resettlement/Land Acquisition Framework, 2002

The Resettlement/Land Acquisition Framework, 2002 is an institutional safeguard against severe or adverse impacts of planned project activities on the social welfare of communities and proposes mitigation measures by minimizing displacement of potentially affected project persons during project implementation and ensuring that the project affected persons (PAPs) are adequately compensated.

The policy framework outlines measures to be taken with respect to land acquisition matters in tandem with existing national and international provisions governing land acquisition. This provision will ensure that **Bank's OS-2 requirements will be met.**

2.1.5 The Constitution of the Republic of Uganda, 1995

The Uganda Constitution of 1995 (Articles 39 and 41), provide that everyone has a duty to maintain a sound environment. Every person in Uganda has a right to a healthy and clean environment and as such can bring legal action for any pollution or disposal of wastes.

2.1.6 National Environment Act, Cap 153

The main law relating to the protection of the environment in Uganda is the National Environment Act (NEA), Cap 153 of 1995. Under the National Environment Act, **Cap 153**, NEMA is the principal agency for the management of the environment and shall coordinate, monitor and supervise all activities in the field of the environment. The Act provides tools for environmental management including EIAs. The Act imposes a mandatory duty on a project developer to have an EIA conducted and approved before embarking on a project. The EIA Regulations, 1998 specifies the types of projects to be subjected to EIAs. Specifically Section 4 refers to dams, rivers and water resources including – (a) storage dams, barrages and weirs (b) river diversions and water transfers between catchments and (c) flood-control schemes.

Part V (I) of the Act provides for environmental standards for air quality, water quality and discharge of effluents into water or on land.

The Act requires a developer to obtain a permit from the Department of Water Development (DWD) before the developer can undertake any construction on water resources and that an EIA be carried out before the DWD will issue a permit to construct a hydropower project.

2.1.7 The Environmental Impact Assessment Regulations, 1998

Environmental Impact Assessment Regulations, 1998 provides for implementation of the NEA. These Regulations require that all projects of the third schedule in the NEA should be subject to an impact assessment before implementation.

Regulations 5 (1) of the Environmental Impact Assessment Regulations (1998) require the developer to prepare a project brief. The Guidelines also stipulate that the ESIA process should be participatory, that is, the public should be consulted widely to inform them and get their views about the proposed investment.

2.1.8 The National Environment (Waste Management) Regulations, 1999

These regulations provide for the management of waste. Regulation 4 describes the sorting and disposal of domestic waste and provides that the generator of domestic waste may, without a license issued under these regulations, dispose of non-hazardous waste in an environmentally sound manner in accordance with by-laws made by a competent local authority. The Regulations also directly mention the application of cleaner production as a means to minimize production of wastes.

2.1.9 The National Environment (Wetlands, River Banks and Lake Shores Management) Reg, 2001

These regulations provide for the management of wetlands, river banks and lake shores. Section 23 (1) (a) of the regulations points out that a person who intends to ‘use, erect, reconstruct, place, alter, extend, remove or demolish any structure or part of any structure in, under, or over the river bank or lake shore, shall make an application to the Executive Director (*of NEMA*); in Form A set out in the First Schedule to these regulations. A permit has therefore been applied by the developer from NEMA to use the river banks.

2.1.10 The National Environment Regulations (noise Standards and Control), 2003

Section 7 of these regulations requires that no person shall emit noise in excess of permissible noise levels, unless permitted by a license issued under these regulations. This project is obliged to observe these regulations by instituting measures to minimize noise in the project and such measures will include proper maintenance of equipment and providing workers with Personal Protective Equipment (PPEs).

2.1.11 The Water Act, Cap 152

The Water Act, Cap 152 of 1995 provides for the management of water in Uganda under the mandate of the Directorate of Water Resources Management in the Ministry of Water and Environment. Section 31, subsection (1) of the Water Act deals with prohibition of pollution to water. In Part II of the Water Resources Regulations (1998), procedures for applying for a water abstraction permit are detailed. An abstraction permit has been obtained by the project to comply with this legal provision.

2.1.12 Electricity Act, 1999

The Electricity Act, 1999 provides for the establishment of the Electricity Regulatory Authority (ERA) whose functions include: issuing licenses for the generation, transmission, distribution or sale of electricity. Sections 29 and 33 places mandatory impact assessment duties on the developer which shall be complied with by the developer.

2.1.13 The Roads Act, 1964

The Roads Act of 1964 has legal provisions for the construction of access roads to energy generating facilities. It defines a road reserve as that area bounded by imaginary lines parallel to and not more than fifty feet distant from the centre line of any road. The road authority is will be consulted to seek authorisation prior to construction works.

2.1.14 The Local Government Act, 1997

The Local Government Act, 1997 provides for decentralization and devolution of government functions, powers and services from the central to local governments. Local governments shall be consulted on projects to be located within their jurisdiction and on matters that affect their environment.

2.1.15 The Land Act, Cap 227 of 1998

The Land Act, 1998 provides for the ownership and management of land. It provides for four different types of land tenures (Customary, Leasehold, Mailo and Freehold) and the procedure for applying for grant of any of the tenures. The Act states that non-citizens of Uganda may only be granted leases not exceeding 99 years.

The Act *inter alia* provides that the construction of electricity transmission and distribution lines, construction of dams and hydropower plants are public works and any person authorized to execute public works on any land may enter into mutual agreement with an occupier or owner of the land in accordance with the Act.

The developer of an energy project should seek to enter into mutual agreement with the occupier or owner of the land. The Act creates a series of land administration institutions consisting of Uganda Land Commission (ULC), District Land Boards (DLB), Parish Land Committees (PLC) and land tribunals. Section 78 of the Act gives valuation principles for compensation. Section 40 requires the written consent from the spouse(s) and children before the household head transfers, sells or enters into contract of land where the household derives its livelihood. The District Land Tribunals have power to determine any disputes arising out of compensation for land. This provision will ensure that **Bank's OS-2 requirements will be met.**

2.1.16 The Historical and Monuments Act, 1967

The Act provides for the preservation and protection of historical monuments and objects of archaeological, paleontological, ethnographical, and traditional interest. The Act prohibits any person from carrying out activities on or in relation to any object declared to be preserved or protected. Section 10 of this Act spells out the procedures and a requirement to declare and inspect newly discovered sites that may have archaeological, paleontological, ethnographical, historical and traditional significance for purposes of protection. The project will undertake chance find measures in addressing possible encounters of any archaeological resources during project implementation. This provision will ensure that **Bank's OS-1 requirements on cultural heritage preservation will be met.**

2.1.17 The Fisheries Act Cap 197

The Act makes provisions for the control of fishing, the conservation of fish and related matters. Under the Fish Act, the Fish (Quality Assurance) Rules 2007 in Schedule 5 and 8 set standards for portable water for use in fish processing and for fish products. Monitoring of

upstream activities that could cause pollution is therefore a requirement. This provision will ensure that **Bank's OS-4 requirements will be met.**

2.1.18 The Occupational Safety and Health Act, 2006

The Occupational Safety and Health Act of 2006 consolidate, harmonize and update the law relating to occupational safety and health and repeal the Factories Act of 1964. It makes provisions for the health, safety, welfare and appropriate training of persons employed in work places. This provision will ensure that **Bank's OS-5 requirements will be met.**

2.1.19 The Public Health Act, Cap 281

Section 7 of the Public Health Act Cap 281 provides local authorities with administrative powers to take all lawful, necessary and reasonable practicable measures for preventing the occurrence of, or for dealing with any outbreak of, any infectious communicable or preventable disease in order to safeguard and promote the public health. This provision will ensure that **Bank's OS-4 requirements will be met.**

2.1.20 The Workers Compensation Act, CAP 225 of 2000

The Act outlines matters of compensation for injuries and accidents as well as responsibility of employees to take care of their health and safety while on the project. The Act also provides for the provision of financial compensation for work related injury or illness. This provision will ensure that **Bank's OS-5 requirements will be met.**

2.1.21 The Employment Act, 2006 and other related Acts

The Employment Act 2006 shall be the governing legal statutory instrument for the recruitment, contracting, deployment, remuneration, management and compensation of workers. The Act also provides for the freedom of association of workers permitting workers to 'join labour organizations. This provision will ensure that **Bank's OS-5 requirements will be met.** Other related laws requiring P.A.C. S.p.a. to ensure workers' safety, social security and protection include The Labour disputes (Arbitration and settlement) Act, 2006; The National Social Security Act Cap 222 and the Labour Unions' Act, 2005.

2.2 International Treaties and Conventions

Uganda has signed and /or ratified several regional and international agreements relating to the environment such as:

- *Convention concerning the Protection of the World Cultural and Natural Heritage* (World Heritage Convention). Two sites in Uganda feature on the World Heritage List: Bwindi Impenetrable National Park and Rwenzori Mountains National Park. The Murchison Falls have been proposed to be included on the World Heritage List.
- *Convention on Biological Diversity (CBD)* - This Convention's main objective is to ensure the conservation of biological diversity and the sustainable use of its components.
- Signed but not ratified the *Convention on the Conservation of Migratory Species of Wild Animals (CMS)*. The objective of the Convention is to conserve those species of wild animals that migrate across or outside national boundaries.
- *Convention on Wetlands of International Importance (Ramsar Convention)*.
- *The African Convention on the Conservation of Nature and Natural Resources (1968)*, signed the Protocol Agreement on the Conservation of Common Natural Resources (1982).

2.3 Donors and Financing Institutions

The project will benefit from syndicated loan facility from African Development Bank (AfDB) and other Equator Principle financing Institutions (EPFIs). The IFC Performance Standards and applicable Environmental Health Safety (EHS) Guidelines will be consulted as applicable standards.

For the *African Development Bank*, the Integrated Safeguards System (ISS) through five operational safeguards (OS):

- Operational Safeguard 1: Environmental and Social Assessment;
- Operational Safeguard 2: Involuntary Resettlement, Land Expropriation, Population Displacement and Compensation;
- Operational Safeguard 3: Biodiversity and Ecosystem Services;
- Operational Safeguard 4: Pollution Prevention and Control, Greenhouse Gases, Hazardous Materials and Efficient Resource Use;
- Operational Safeguard 5: Working Conditions, Health and Safety.

Other relevant policies and guidelines which have been triggered and remain applicable under the ISS include:

- the Bank's Gender Policy (2001);
- the Framework for Enhanced Engagement with Civil Society Organizations (2012);
- the Disclosure and Access to Information Policy (2012);
- the Handbook on Stakeholder Consultation and Participation in Bank Operations (2001)
- the Bank Policy on Population and Implementation Strategy (2002)
- Environmental and Social Assessment Procedures for African Development Bank's Operations (2014).

2.4 Institutional Framework

At the national level the project will involve several regulatory bodies such as the Ministry of Water and Environment, NEMA, Directorate of Water Development, Electricity Regulatory Authority

Uganda is divided into more than 120 administrative districts. The districts are further sub-divided into counties, sub-counties, parishes and villages

At the regional and local level, the main institutional players for the project will be Pader Gulu Districts. Technical Officers at the district level who were consulted during this EIA process included the District Environment Officers, the District Forest Officer, the District Fisheries Officer and the District Agricultural Officer.

3. PROJECT DESCRIPTION AND JUSTIFICATION

3.1 Project Description

The proposed project consists of design, construction and operation of a 42 MW (4x10.5MW turbines) turnkey Run-of-River hydropower plant (HPP2) with an annual output of 281 GWh along the Achwa River, in Gulu District, Northern Uganda. It also includes a 38km access road and a 9km of service roads and interconnection facilities to the grid substation. The generated power shall be evacuated via an interconnected 140km 132kv transmission line (“t-line”) to Lira substation to be constructed by the Uganda Electricity Transmission Company Limited (“UETCL”) outside of the scope of this Project. Furthermore, the t-line does not qualify as an Associated Facility under the Bank’s ISS.

Administratively, HPP2 is located in Burlobo Village, Burlobo Parish, Angagura Sub-county, Aruu County, Pader District.

Achwa Ranch is owned by Uganda Livestock Industries and is presently in the custody of the Privatization Unit of the Ministry of Finance, Planning and Economic Development. A Land Title, Lease Agreement and Deed Plan to have been procured to confirm the land acquisition for the project works (see Annexes 2, 3 and 4 respectively of the ESIA for Achwa 2 HPP, 2013).

The west bank (Gulu side), where almost no activity will take place except for anchoring one side of the weir foundation, is bordered by Medde and Labworumor Parishes, Palaro Sub-county in Gulu District.

3.2 Project Location

The project area is located on Acwha River about 19 km north-west (downstream) of the new bridge on the Gulu-Kitgum road. The new bridge is found almost half way between Gulu and Kitgum (40 km North from Gulu and 60 km South from Kitgum as shown in Figure 3.1)



Figure 3.1: The general location of Achwa Hydropower Project (HPP2)

3.3 Justification for the Project

The three most common sources of energy in Uganda are biomass, petroleum and hydro-electricity, providing 96.5%, 1.5%, and 2% respectively, of the total energy consumed in the country. Use of biomass energy, in particular fuel wood and charcoal, has detrimental environmental consequences for Uganda. Uganda’s per capita energy consumption is one of the lowest in the world. The modern segment of the energy sector, electricity and petroleum, is also one of the lowest in sub-Saharan Africa.

Uganda has a population of approximately 35 million, with an annual increase of 3.5%. The level of electrification in Uganda is still very low with only about 8% of the total population connected to the national grid.

In order to ensure sufficient supply of energy for the development of the country, the Ministry of Energy and Mineral Development (MEMD) has commissioned an investment plan for the Power Sector (Power Sector Investment Plan-PSIP). The PSIP is based on information obtained from a series of correlated studies which forecasts an average growth of 7.2% in electricity demand for the period 2008-2020. In order to meet this growing demand for electricity, other low cost power plants must be built. The proposed Achwa HPP 2 Project in Pader District will therefore be a timely contribution to improving energy availability for the socio-economic development of the country.

4. DESCRIPTION OF THE PROJECT ENVIRONMENT

The project area has been divided into two zones (i) The Direct Impact Zone (DIZ), covering areas that will be directly affected by the Project e.g. camps, access roads, reduced river flow and (ii) The Indirect Impact Zone (INDIZ), covering areas that will be indirectly affected by the Project (e.g. surrounding areas affected by human activities induced by the Project).

4.1 Physical Baseline Environment

4.1.1 Noise levels

Noise levels were found to be low and generally within the set limits for noise in the general environment with some mild noise coming from the resultant wind from plants and from the flow of the River downstream.

4.1.2 Air Quality

Baseline Air quality monitoring shows no exceedances above the general background levels within the project area.

4.1.3 Soil Studies

Soil studies were carried out with the objective of monitoring future soil composition changes. The results showed that there were only a few minor differences in soil chemical composition between the intake and outlet of HPP2. The soil chemical components were generally higher at the intake than at the outlet. The reason for this was not quite clear and the differences need to be investigated further.

4.1.4 Water quality:

Of the water quality parameters measured, there were only a few minor differences in water quality between the intake and outlet. The water was also found to be safe for both human and animal consumption.

4.2 Biological Baseline Environment

4.2.4 Terrestrial vegetation/habitats

In general, the DIZ of HPP2 has not been much affected by human activities presumably because people lived far away from the area during the insurgency in the north. The vegetation in this area is therefore relatively natural although there is some charcoal burning activity in the area.

The IDIZ of the HPP 2 within Achwa Ranch has been abandoned for over twenty years due to the Lord's Resistance Army (LRA) insurgency. Although the area was predominantly grassland, it has since been invaded by woody species such as *Combretum* spp. Evidence of rampant tree cutting especially for charcoal is rampant in the area. Similarly, intensive harvesting of vegetation for construction is evident.

4.2.5 Terrestrial fauna

Evidence of the presence of small and large mammals, reptiles and amphibians was recorded both in the DIZ and INDIZ. The population of large mammals such as bush bucks in the project area seems to be minimal due to heavy hunting pressure. For large mammals the primates, ungulates and carnivores encountered included the Velvet monkey, Black and

White Colobus Monkey, Olive Baboon, Uganda Kob, Bushbuck and spot necked Otter respectively. All primates recorded are on the CITES Appendices as of local conservation concern. However, none of the species are endangered. A total of 24 bird species was recorded within HPP2 and these are common ones known everywhere in Uganda. None of the recorded species is included in the national or regional and international conservation concern.

4.2.6 Aquatic ecosystem

Various aquatic species were identified in the water around the HPP2 area. The area had limited diversity of aquatic macrophytes with *Kyllinga* as the dominant species while the dominant aquatic macro-invertebrates and amphibians included mosquitoes, earthworms, dragon flies and tadpoles on the fringes of the River and toads and frogs. Phytoplanktons were dominated by *Microcystis spp* and *Merismopedia spp* with *Scenedesmus spp* and *Ankistrodesmus spp* in small traces. These are species adapted to fast flowing water. A wide variety of fish species were also recorded including Alestes, bagrus, Tilapia, Nile Perch, Elephant snout fish, African catfish and Lungfish. Due to the isolated nature of the Project site, there was little evidence of intense fishing in the area.

4.3 Human Environment

The proposed (HPP2) Project is located approximately 30 km downstream of the new Achwa Bridge on the Gulu-Kitgum road and about 18km off Angagura Trading Centre. Apart from a few illegal encroachers inside Achwa Ranch, no settlements were observed anywhere near the site for the proposed power plant. Nearest local communities in the INDIZ will be at least 10 km away and these would be indirectly affected by vehicle movements and a few other inconveniences.

Restriction to assets such as lands, farms and other properties could occur from some of the project components such as the construction and expansion of the access road. No physical displacement is envisaged hence no resettlement will be necessary. Any compensation for economic necessary for economic displacement will be between the developer and the owners of Achwa Ranch. The nearest Parish to the Project area on the Angagura side is Burlobo. On the Gulu side of the River, the nearest settlements were reported to be at least 3 km away and the two neighbouring Parishes were in the vicinity, namely Medde and Labworumor in Palaro Sub-county.

4.3.1 Ethnic groups:

The majority of the population of the four surrounding villages are Acholi and a few Langi. However in nearby Angagura Sub-county headquarters there are soldiers and entrepreneurs who come from outside the project area.

4.3.2 Archaeology and cultural heritage:

The ancient history of this region is not yet fully documented and there appears to have been no archaeological work done in the project area. However, it was reported during the study that there is a cultural site around HPP2 belonging to the Pungole clan. It is used for making sacrifices that are geared towards avoiding accidents during fishing, enabling them catch enough fish and catching enough animals during their hunt.

4.3.3 Resource Use

Outside Achwa Ranch, the majority of the population consists of subsistence-oriented farmers who sell a small amount of produce on the local markets in order to purchase manufactured goods. Most of the land in the area is communally owned with no land documents. The inhabitants practice a combination of rotation cropping patterns of staple crops and cash crops combined with limited small livestock raising. The sandy loam soils of the area combined with ample rainfall result in fairly good harvests and some surplus produce for sale.

Accessibility to safe drinking water in the area is very low. The majority of the population depends on unprotected wells and a few springs which promote high incidences of sanitation related diseases and conditions. The villages have some boreholes that provide access to clean water. However, these boreholes are few in number and are also far from some homes making it difficult to access and thus promoting consumption of unsafe water from the river.

The majority of villagers use wood fuel for cooking while charcoal burning is common to raise cash for the family.

4.3.4 Local Economy

The standard of living in the project area is also low. People live in mud-brick huts with thatched roofs and own very little in the way of utensils, furniture or material goods.

The improved security situation in the district has encouraged the return of people to their traditional land. This has resulted into increased accessibility to land for agricultural production, increased rearing of poultry and livestock, fishing on Agago, and hunting for wild animals such as squirrels and edible rats in the woodlands of these areas as well as cutting and selling bamboo stems. It has also led to the development of trading centres which have promoted the sale of produce and other commodities. The area has only one main trading centre known as Angagura Trading Centre found near the Sub-county headquarters. This trading centre is composed of permanent, semi-permanent, and temporary structures.

4.3.5 Health

Health facilities are generally poor in the Project area. Angarura Sub County has only two health centres namely Angarura HC II and Achwa Ranch HCII. Common diseases in the area include malaria, cough, flue, diarrhoea and nodding disease. Flue, cough, nodding disease and diarrhoea are the most common diseases amongst the children.

4.3.6 Education

Very few schools are found in the Project area. The conditions of these schools are poor, materials are lacking and teachers are hard to come by given the lack of adequate housing for them and the low standard of living in the area. The result is that there are few people with skills and higher education in the project area.

4.3.7 Infrastructure

The infrastructure in the Project area is also generally poor but there is an access road to the site from Angagura Trading Center passing through Burlobo before entering Achwa Ranch. This is a new road so fairly well maintained. The Project plans to extend this road to the Project site through Achwa Ranch.

4.4 Project Alternatives

A project alternative analysis has been undertaken for the Achwa 2 HPP against different power generating designs (for instance petroleum verses hydropower), locations of one energy source (e.g. different hydropower sites along a river) or alternative development options at one site (e.g. a project based on dam/reservoir verses run-of-the-river scheme).with details of the contributory environmental and social impacts associated with each option. , (for instance petroleum verses hydropower), alternative

4.4.1 Hydropower

Despite Uganda's large hydropower potential (of over 2,000 MW), less than 50% of this potential has so far been exploited. Several small scale hydropower sites have also been identified elsewhere, especially in the hilly parts of western Uganda. Most of the potential sites for hydropower developments are located along the Nile River. While no definite studies have been undertaken to compare hydropower potential in these locations in terms of environmental and socio-economic challenges, the Achwa-Agago hydropower scheme is located in this Greenfield River complex, which presents itself as a suitable area for development.

4.4.2 Dam versus weir

Because of the unique nature of the geology of the Agago-Achwa River complex, the run-of-the-river scheme alternative has been selected in preference to the traditional dam. The run-of-the-river is created using a technique of a mobile dam (rubber dam- See Figure 4.1 and 4.2 below) on a concrete foundation. During flood flow events, the rubber dam will be completely deflated and will allow the entire hydraulic section to be restored. Due to these flexible adjustments, it is envisaged that the dam will cause inundation of a much smaller area compared to traditional dam and reservoir.

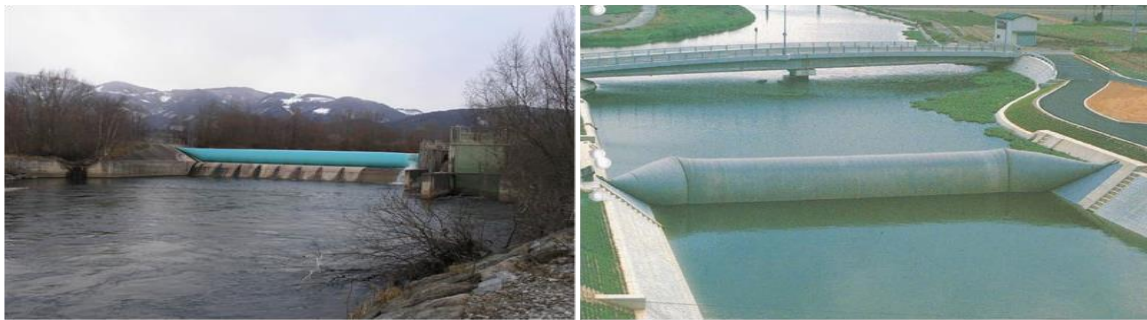


Figure 4-1: Adjustable rubber dam Figure 4-2: Rubber dam at another angle (both courtesy of PAC S.p.A.)

4.4.3 Comparison of Achwa2 HPP with other energy sources using multi-criteria decision tool

A detailed evaluation of the different energy sources (Hydro, Geothermal, Heavy Oil, Wind Power, Biomass Cogeneration, Nuclear and Energy import) by JICA for the Uganda Energy Master Plan using different criteria (neutral case, environmental priority case, technical and economic case) shows that from the technical and economic perspective, hydropower scores very highly so that its development should take priority. The Achwa hydropower project conforms to the findings of this study. In the same study, solar PV power is shown to be the most suitable from the environmental point of view but from a technical and economic point of view, solar PV power is shown not to be the most suitable. While Geothermal power scores highly in all cases, it is still not yet developed in Uganda. Considerable time and

funding is required to determine capacities of thermal power and bring them to implementation stage. Hydropower therefore still remains the best option for Uganda including the Achwa plant

5. POTENTIAL IMPACTS

The ESIA for HPP2 considered positive and negative impacts in the pre-construction, construction (about 3yrs) and operational phases (>30yrs) of the Project works.

The most serious negative impacts of the HPP2, both environmental and social, are related to the anticipated rapid growth of the population in the vicinity of the Project area which could cause a ‘boom-town’ phenomenon, a common characteristic of large-scale development projects resulting in a sudden increase in the demands and needs for all kinds of goods and services, both physical (e.g. housing, food supply, energy, transportation, waste disposal) and social (e.g. health, education, law enforcement, entertainment). Consequently, significant assistance from Government and the developer will be needed to cope with these demands. Given the minimal physical and social infrastructure presently existing in the project area together with the limited financial, managerial, administrative and organizational capacities in the area, the need for this kind of assistance will be imperative. The following paragraphs summarises some of the impacts.

5.1 Impacts on the Physical Environments

All earthmoving construction activities as well as weir construction and water diversion from the River into the penstocks will have the potential for increasing erosion and sediment load in the River Achwa. Handling of large amounts of fuel, oil, lubricants and other chemicals implies a risk of spills and accidents, which could have significant negative impacts on soil and water quality during construction in particular.

It is expected that population influx and poor sanitary conditions could also result in reduced water quality. Impacts on water quality are expected to be of short-term duration. Population influx is also likely to result in land use changes, soil degradation and increased erosion and contamination.

5.2 Impacts on the Biological, Physical and Human Environment

5.2.1 *Environmental Flow*

The weir structure is designed to leave a minimum of 10% of River water as environmental flow to allow for normal aquatic activity (equivalent to the volume in the dry season under natural conditions) or equivalent to dry season flow. During the dry season, when natural flow reduces to only 10%, the hydropower machines will be shut off for maintenance, generating very little electricity.

An environmental/ecological flow rate of 1.5m³/s has been adopted following of review of six best international practise calculations and adoption of a precautionary approach¹. However, this does not mean that this flow rate will be maintained permanently downstream of the river. From the monitored average daily flow of Achwa River, even with a maximum discharge of 100 m³/sec into the penstocks, there will be additional water released into the River by the movable dam during the wet season between April to October depending on the year. Therefore the minimum flow of 1.5 m³/s (environmental flow) will be for only a few

¹ ESIA for Agago-Achwa River Hydropower Project (HPP2), by Greenbelt Consult, 2014. 120Pages

months in a year, but not long enough to significantly change the ecology and other biodiversity downstream of the River.

The overall impact on downstream ecology and groundwater resource is deemed minimal.

5.2.2 *Terrestrial vegetation/habitats*

There will be clearance and disturbance (permanent and temporary) of vegetation during project construction as well as for cultivation and fuel wood collection by people moving into the area. Project related population influx implies an increase in harvesting of all kinds of natural resources, possibly exceeding sustainable levels. Overall, the impacts may be considered to be 'medium negative' and will, to a great extent, be of long-term duration.

5.2.3 *Terrestrial fauna*

Project construction will result in habitat change which will mostly be confined to already highly degraded natural habitats with low species diversity and abundance. The general disturbance during construction phase will cause at least temporary avoidance of the area by some of the animal species. In addition, population influx may change more valuable habitats in the INDIZ and also increase hunting of some animals. Reduced river flow along the 4 km long stretch of River Achwa will change habitat characteristics which could be favourable for some species and unfavourable for others. Overall, the impacts are expected to be 'negatively minimal' during project construction and 'negatively minimal' impact during project operation.

5.2.4 *Aquatic ecosystem*

An increase in sediment load and other pollutants (nutrients, chemicals, bacteria) is likely to affect aquatic life during project construction. However, the large flow of Achwa River could significantly dilute this potential pollution source. Species adapted to rapid flowing waters will decrease in diversity and abundance and species adapted to slow flowing water will increase in diversity and abundance during project operation along the 4 km long stretch of the River that will carry reduced river flow. Not much of the water in this 4km stretch was observed to be used by local communities during the ESIA site walkover. The eastern bank (Pader District) is bordered by the Government owned Achwa Ranch whilst the nearest community activity on the western bank (Gulu District) is almost 3 km away from the River bank. It is also possible that some local livestock could be brought for drinking along this stretch but the overall impact on this water use is minimal as alternative locations can easily be found elsewhere along the banks of the river. All aquatic species will, however, remain abundant upstream and downstream of the DIZ.

Population influx might increase fishing pressure. Overall, impacts are expected to be medium negative during project construction and 'small negative' during operation phases.

5.2.5 *Biodiversity*

Biodiversity values identified in the HPP2 area are very low. Consequently, no major negative impacts are expected on species of conservation concern.

5.2.6 *Positive ecological impacts*

Change in the physical, chemical and environmental conditions in the project area will change competitive relationships between various species. For instance, some bird and fish

species will benefit from a more slow flowing 4 km long section of the River. Such impacts will likely be ‘small positive’ and of long-term duration.

5.2.7 Social and Health Impacts

No land take will be required from the local communities for the construction of HPP2 structures and consequently there will be no direct compensation to or resettlement of the communities regarding HPP2. However, the Project will require approximately 315 ha for HPP1 and HPP2 project areas, for access roads and for camp area. This land will be carved out of Achwa Ranch after concluding all negotiations between the developer and the Ranch owners.

Although the influx of people as an indirect result of the Project will provide a large market for local produce and business opportunities for some individuals, it will strain the already weak public infrastructure resource base of the area (water, food and wood fuel) and weaken health and educational facilities. Malaria and STDs, especially HIV/AIDS, will be of particular concern. The increase in traffic, pollution and general social disturbance will also be important impacts to be considered.

Overall, the impacts are expected to be ‘medium to high negative’ during project construction and ‘medium negative’ during the operation phase if mitigation measures are not implemented.

5.2.8 Visual impacts

Excavation, deposition of rock spoils as well as excavated soil will cause changes in topography and other landscape characteristics. Such impacts will however be small and negative but also short term.

5.3 Cumulative Impacts

The developer intends in the next 4-5 years to establish 3 power plants on Rivers Agago and Achwa in Pader and Gulu Districts in Northern Uganda. The power plants are HPP5 on Agago River and HPP1 and HPP2 both on Achwa River. **HPP2, which is the subject of this E&S summary report**, is planned to generate 42 MW of electricity (i.e. a relatively small power plant)

The cumulative impact assessment indicates an overall moderate impact on all identified receptors which could easily be managed with the adopted ESMP.

5.4 Positive impacts

5.4.1 Jobs and Social economic

Significant direct positive impacts from project construction are mostly related to the employment activities during project construction and operation, both directly through the Project but also as a consequence of an increase in economic activity in the area. It is currently estimated that about 280 job positions will be generated; 250 during construction and 30 during operation phase.

Of the 280 positions, 20 are anticipated to be from the SPV and 230 will be from the EPC and Civil Work during construction. Out of 20, we assume 11 people will expats with director and managerial functions. Out of 230 EPC and Civil work, we assume 5% are from expats with similar high skill levels which translates into a total expat number of 23. Therefore 227 local position will be created during the construction works.

During Operation, it is estimated 2% out of 30 people (6 positions) will be expats and the rest 24 positions shall be available to local population.

Construction of access roads (about 18.5 km) will result in improved access. This will be a 'small positive' impact during project operation. The most important positive impacts are related to the mitigation measures and utilization of development opportunities rather than impacts directly from the Project. These measures are discussed briefly in the following section.

5.4.2 Gender

The project will offer positive impacts on women and other vulnerable groups within both the surrounding villages and wider communities. It is estimated that about 20% of the jobs to be generated by the project will be for women and vulnerable groups which translates into 50 people during construction and 6 people during operation.

Women have a subordinate position in society and few hold official positions. Women are obligated to serve their husbands and perform a large number of tasks. The project will also lessen the overall burden on women and young girls who would have to fetch firewood for cooking and exposed to air pollution from wood and charcoal burning. The project will improve community security and livelihoods for women through the provision of electrical power. Women especially young girls will be able to study and be engaged in more social activities at night.

These impacts will be 'medium positive' during project construction and 'small positive' during project operation.

6. Land Acquisition and Involuntary Resettlement

6.1 Project components

6.1.1 HEPP Dam and Ancillary facilities

Majority of land required for the project (location of the HPP and ancillary facilities) was acquired from the Uganda Livestock Industries (ULI, a single owner) who owns the land of the Ranch. No physical displacement resulting in resettlement was required due to the remote and hard to reach location of the site.

6.1.2 Access Roads

The construction and widening of the access roads resulted in economic displacement and restriction on use of assets such as land and crops by the members of the surrounding communities.

6.2 Asset Valuation and Compensation

An independent asset survey and valuation firm (M/S Associated Engineering Surveyors Ltd) was appointed by the project developer on the 3rd of November 2015 to identify the Project Affected Persons (PAPs) due to the land acquisition from the proposed access road construction.

The purpose of the survey and valuation exercise was to provide the appropriate financial framework in which the PAPs shall get sufficient financial compensation for the loss of property in the form of crops and land. It also enabled the client and Government of Uganda to determine the compensation awards, and draw up a compensation plan so that the PAPs can receive full compensation for assets and properties they may lose due to the execution of the project.

Various stakeholder engagement consultations (district, sub-county, village LC Chairperson and PAPs) were followed to ensure concerns of PAPs are taken and national land acquisition requirements have been met.

Strip Maps

Strip maps have been prepared to show the project areas where people are affected. All land areas are obtained through measurements and computations carried out by the Land Survey Teams.

Lost and Affected Properties

Compensation awards for lost and affected property (land, crops and structures) has been presented in the form of a Valuation Report. The Valuation Report includes location of land, property owner, description and type of property affected (land, crops, fences etc.) and individual amounts attached to each item. The Valuation Report also includes Disturbance Allowance and total awards for each affected person. The valuation report form the basis of compensation for lost and affected property of the PAPs

6.2.1 Method of Valuation

The following method was adopted in the evaluation of the assets affected by the independent valuation consultant;

a) Land

All of the land involved in the compensation exercise is under customary ownership. Customary land is valued in accordance with market value of comparable land. Where **Market value** is defined as "the estimated amount for which a property should exchange hands on the date of valuation between a willing buyer and a willing seller in an arm's-length transaction after proper marketing wherein the parties had each acted knowledgeably, prudently, and without compulsion".

Current recorded actual sales are not readily available, as persons who buy or sell land never disclose or give agreements to outsiders. The valuer relies on enquiries from Local Councils (LC'S) Land Agents in the neighbourhood and data from the CGV'S Office.

b) Crops and Trees

Crops and trees are assessed using District compensation rates provided by the relevant District Land Board. The rates are normally submitted to the office of the Chief Government Valuer for consideration and approval for each particular year.

Summary of the Valuation

Table 6.1 provides a summary of the valuation undertaken for the PAPs.

Table 6.1: Summary of Valuation

DESCRIPTION	VALUATION (UGX)
Customary Land Owners	1,017,969
Crops	5,604,388
Other Improvements	220,000
Disturbance allowance @ 30%	2,052,707
Total	8,895,064

6.2.2 Compensation Approach

Strip Maps

Strip maps have been prepared to show the project areas where people are affected. All land areas are obtained through measurements and computations carried out by the Land Survey Teams.

Lost and Affected Properties

Compensation awards for lost and affected property (land, crops and structures) has been presented in the form of a Valuation Report. The Valuation Report includes location of land, property owner, description and type of property affected (land, crops, fences etc.) and individual amounts attached to each item. The Valuation Report also includes Disturbance Allowance and total awards for each affected person. The valuation report form the basis of compensation for lost and affected property of the PAPs.

Eligibility for Compensation

The following categories are eligible for compensation.

- Persons with structures located in the project area.
- Persons with seasonal crops
- Persons with perennial crops
- Customary landowners whose plots are in the project area

NB: Persons who encroach on the proposed project area after the survey (census and valuation) are not eligible for compensation.

Disturbance Allowance

As guided by S.77 (2) of The Land Act-Cap 227 (Computation of Compensation), disturbance allowance of 30% shall be awarded on top of the assessed amount. This is on the assumption that the project affected persons shall be required to leave immediately (inside the statutory period of 6 months) to give up their interests in the land and relocate elsewhere.

Table 6.2 below gives a brief overview of the size of land parcels and other assets acquired and fully compensated for under a ‘willing buyer, willing seller’ mechanism prior to the commencement of the construction works. Samples of payment notes (signed/thumbprint from four of the PAPs) have been provided to acknowledge receipts and validate payment of the agreed compensation arrangements.

Table 6.2: Details of economic displacement and compensation offered.

	Land [acres]	No. of Trees	Crops [m ²]	Fence [m]	Compensation Land	Compensation Trees + crops	Compensation Fence	land + crop + trees + fence+ 30% disturbance fee	Physical Resettlement	Farmers affected through land acquisition	Total persons affected (assuming 5 persons per family)
Access Road	1.02	244	4023.4 (0.99 acres)	110	1,017,969UGX	5,604,388 UGX	220,000 UGX	8,895,064 UGX	0	17	85
Dam Site	0	0	0	0	0	0	0	0	0	0	0
Camp Site	0	0	0	0	0	0	0	0	0	0	0

6.2.3 Appeals Procedure

PAPs shall be given an opportunity to review the survey and valuation outcomes as well as the compensation policies prior to the commencement of the compensation exercise. It is anticipated that a number of issues will come up among the affected communities and landowners. If an individual is not satisfied with the compensation assessment, he could raise his complaint in writing to the client by filling a Complaint Registration Form and then forward it through the mechanism that is suggested as below:

- **Arbitration procedure:** Initiated by the client and supervised by the Chief Government Valuer. It is aimed at bridging the gap between the amounts assessed in the approved Valuation report and the amount the project affected person contends is his entitlement.

- **Administrative Review:** In case the above (arbitration) fails, the client) may address the dispute administratively in the interest of not delaying the project or otherwise making it more costly to the project (e.g. through contractors claims or other reason).
- **Judicial process:** If the complaints have not been solved through arbitration or administratively, then the complainant can proceed to the various civil courts for a ruling on the valuation process.

7. MITIGATION/ENHANCEMENT MEASURES AND COMPLEMENTARY INITIATIVES

Mitigation measures have been proposed to eliminate or reduce the magnitude (duration and extent) of potential negative impacts. Thorough consultations with the affected populations and relevant stakeholders have been held and their input should continue to be sought during the detailed planning, implementation and follow-up on the environmental and social mitigation and monitoring activities proposed in this report.

A central aspect to the mitigation and monitoring is an ongoing public consultation with the affected peoples in the project area. A thorough presentation of the Project with its various components and a time schedule needs to be made as soon as plans are finalized. During the pre-construction phase, when a number of activities will be starting up, constant contact will be required and a feed-back process set up to monitor adjustments, grievances and allow for participation throughout. Strengthening existing institutions will form an important part of the process.

A framework for an Environmental Management Plan (ESMP) has been made and the ESMP allocates administrative and financial responsibility for mitigation and monitoring activities, with estimates of costs of the various activities. An ESMP Manager and an Environmental Social Review Committee shall be appointed prior to commencement of construction works.

Pre-construction activities in the fields of health, agriculture, energy supply, institutional capacity building and other interventions should receive particular attention and would prepare the affected populations in the project area for the influx of people and changes the Project will bring. This will be of vital importance to reduce potential negative impacts on both the biological and human environment as well to optimize the potential positive impacts of implementing the Project.

Some of the mitigation measures for the various impacts identified in the ESIA include the following:

- Soil erosion prevention/control
- Appropriate location of a dumping site
- Improving scenic beauty
- Re-vegetation of cleared area
- Pollution control
- Improved welfare of the workforce
- Awareness creation among the population
- Monitoring the Environmental flow over a trial period of three years
- Fencing of open ditches
- Reducing acid mine wash
- Improving air quality
- Noise control measures
- Preventive health measures
- Adequate Occupational Safety and Health measures
- Support to Agricultural Intensification programmes
- Support for the provision of safe drinking water
- Enhancing opportunities for accessing Electricity in Angagura

- Capacity building and institutional strengthening
- Affirmative Action to access Employment Opportunities
- Support to improved Security in the Project area
- Introduction of Traffic safety measures
- Compensation for any land take

7.1 Environmental Social Management Plan (ESMP)

The recommended mitigation measures and their constituting activities are presented in Table 7-1 overleaf. The stakeholders responsible for each activity and other participants are also indicated.

An approximate cost is also presented with each main mitigation measure. In order to implement the recommended mitigation measures effectively and in a timely manner, it is considered important that adequate organizational and managerial bodies are in place. The first group of measures (i-iii) listed in Table 7-1 refers to these administrative arrangements.

7.2 ESMP Manager

A suitably qualified ESMP manager should be recruited to lead the detailing and implementation of the Environmental Social Management Plan (ESMP). This person should be appointed as soon as possible after the Project is ready for implementation. The ESMP Manager should have a broad background in environmental management including experience in EIAs, with respect to environmental, socio-economic, health and cultural issues. The ESMP Manager should have experience in hydropower projects and have work experience from Uganda. The developer should provide financing for this position for up to 6 months after construction is completed.

The main tasks for the ESMP manager will be related to co-coordinating the detailing and implementation of the ESMP including the following:

- Coordination of detailing and implementation of the mitigation measures
- Coordination of detailing and implementation of the monitoring activities
- Compilation of data from monitoring activities
- Monitoring how project activities conform with the analysis, conclusions and recommendations of the ESIA
- Monitoring and follow-up of the implementation of measures set as conditions and requirements for the Government license to develop the Project.
- Internal and external reporting on the implementation of the mitigation measures and monitoring activities, including monthly internal reports for the Environment Review Committee (ERC) and quarterly as well as annual external reports to NEMA and other relevant agencies.
- Acting as contact person for the people in the DIZ and INDIZ, the general public, the LCs, District authorities, NEMA, ERA and other central government bodies. NGOs, the Contractors and the financiers.

7.3 Closure Plan

It may be desirable that some facilities are left in place and others removed and the land reclaimed after the construction period is over. All temporary buildings, machinery and vehicles should be removed from the project area upon completion of construction in order to reduce visual intrusion. If needed, a Closure Plan should be prepared for abandonment or for permanent use of temporary facilities or the transfer of some of the facilities to Local Authorities. The Plan should be made by the ESMP Manager in conjunction with district and local authorities.

7.4 Restoration/Decommissioning Plan

All projects are finite. Time comes when they have to be decommissioned. This section describes procedures and plan for closure and post operation so that the environment is restored to the "No project" status or as much as possible.

On completion of the project e.g. 30-50 years from now, the site should be rehabilitated to as close as possible to its original state. This will involve a lot of demolitions, etc. Inspection of the site should be carried out before decommissioning. This will eliminate regeneration of particulate matter and mineral dusts produced during the active days of the project. Demolition equipment must also be tested to ensure that it does not pollute the environment. Any contractor to undertake the decommissioning works must involve competent staff including if possible an Engineer, Environment Management Specialist and Occupational Health and Safety Specialist, among others. These Specialists will have to follow the Environment, Health and Safety procedures for such facilities. These will include the following:

- Inspection of the site to identify any new compounds that have formed and could be allergenic;
- Inspection and evaluation of the structures and equipment before dismantling them;
- Disconnection of all services such as electricity, water and telecommunications, making sure that utility companies and concerned institutions are informed. These include UMEME, National Water and Sewerage Corporation and National Environment Management Authority
- Disposal of all wastes in areas approved by NEMA
- Planting trees and grass to restore vegetation cover so as to minimize any soil erosion
 - The developer should make sure that he creates a safe environment that can be put to another use
 - All recyclable materials to be kept safely for proper usage
 - It is important that the developer fences all pits and trenches that are not covered and puts a post-warning sign of the danger of falling in a hole or trench
 - The site can be turned to another use provided that another Environment Impact Assessment is undertaken and approved by relevant authorities.

7.5 Institutional Capacities and Strengthening plan

Capacity building is an important element in ensuring effective implementation of the ESMP throughout the project development cycle. In the case of the HPP2, efforts to maintain the environment and improve social conditions will be greatly enhanced by improving the

capacity of local and district organizations to manage the environmental control plans. LCs will have a role to play in many aspects of the project including monitoring social and economic factors and coping with the influx of workers and followers. Regular meetings and workshops will be needed to discuss ongoing concerns, and improve understanding. Regular interactions between the Developer, the ESMP Manager, LCs and other implementing organizations will be important.

The District and local authorities will also be involved in a number of activities that will require training and capacity building such as the agricultural intensification programme, monitoring of environmental concerns, health improvement and other development activities including credit schemes. Some of these programmes could be run with the involvement of experienced NGOs.

7.6 Public Awareness Campaigns

The implementation of mitigation measures can be greatly enhanced by appropriate public information campaigns. Informing the public about the project itself, the components, timing, impacts, etc. is important in terms of maintaining good relations with the community, ensuring broad community support for the project. Most of the mitigation action plans will also benefit from associated awareness campaigns such as information and advice on health and sanitation issues, natural resource utilization and business opportunities. Improving the availability of information to the local community is often the first step in implementing successful mitigation measures.

Table 7-1 Responsibilities, participants estimated costs for mitigation measures for HPP1 together with HPP2 & HPP5 over 4 years

Mitigation Measures – Organizational framework	Monitoring indicators	Frequency	Responsibility	Stakeholders involved	Estimated Cost (USD)
i. Hire Manager for EMP (incl. housing, offices, transport, etc.)	EMP Manager hired and working	Throughout	Project Developer	N/A	200,000
ii. Capacity building and co-operation with local and district authorities, LCs and residents	Number of meetings and workshops	Regularly	EMP Manager	LCs, District Authorities, Local population, , NGOs,	25,000
iii. Awareness raising campaigns for local population regarding all major issues including: <ul style="list-style-type: none"> • The Project (components, timing, impacts etc.) • Natural resources, conservation areas and biodiversity • Socio-economic and social security issues • Health • Traffic 	Number of awareness campaigns undertaken; Sensitization pamphlets prepared; data on relevant aspects available	Regularly	EMP Manager	LC, District Authorities, Local population, NGOs, Police, UPDF	25,000
Provision of water and sanitation facilities at the site <ul style="list-style-type: none"> • Put in place adequate provision for drinking water • Put in place sanitation facilities to cater for workers employed at the site 	Number of water sources and sanitation facilities in place	During pre-construction	Developer	LCs	Mostly included in construction cost. Additional 20,000 for water treatment and sanitation facilities
Establishment of data on the strength of the soil <ul style="list-style-type: none"> • Test the ability of the soil to hold the foundations for the weir and power house 	Data available on soil strength on the River banks	During pre-construction	Developer	NEMA	Part of project cost
Prevention and control of erosion and sediments <ul style="list-style-type: none"> • Acceptable construction techniques in terms of drainage and erosion prevention • Institute a re-vegetation programme • Restrict vegetation clearing • Installation of settlement ponds/sediment traps • Confine vehicles to access roads • Avoid using herbicides 	Number and area of trees/grasses planted Soil erosion control measures in place	Regularly	Contractor	EMP Manager, Vegetation expert	Mostly included in construction cost. Additional 20,000 allocated mainly for re-vegetation programme
Reduction in Visual Intrusion <ul style="list-style-type: none"> • Destruction of aesthetic features should only be done where this is not avoidable. • In areas where vegetation is likely to be lost, restoration should be undertaken. • Undertake slope stabilization in some areas where access roads and the Power Station infrastructure will be constructed • Use of environmentally friendly slope stabilization methodologies such as grassing • Site restoration and landscaping in work areas should be made part of the construction contracts • Disposal of stock piles of debris both marram and rocks 	Number and area of trees/grasses planted; Contracts with site restoration conditions	Regularly	Contractor	EMP Manager, Vegetation expert	Mostly included in construction cost. Additional 20,000 allocated mainly for re-vegetation programme

Mitigation Measures – Organizational framework	Monitoring indicators	Frequency	Responsibility	Stakeholders involved	Estimated Cost (USD)
<p>according to NEMA guidelines</p> <ul style="list-style-type: none"> • Use rock piles for construction purposes e.g. building, road construction/rehabilitation; allow local people free access to the rocks 					
Establishment and protection of dumping site	Record of area where the dumping site will be located and measures taken for its protection	Regularly	Contractor	EMP Manager, Pader DEO	Mostly included in construction cost. Additional 20,000 allocated mainly for re-vegetation programme
Minimum bypass flow along the 3.908 km stretch to carry reduced river flow	Relevant information to this effect available; a three year trial period to monitor the impact of reduced flow on aquatic biodiversity instituted	Throughout	Project Developer	EMP manager, Aquatic Ecology Experts, NEMA	Included in construction cost. Additional 10,000 allocated for inspection
Protection of the River banks through river bank scoring	Assess baseline condition of relevant sections of the river banks and continue monitoring	At project initiation and at annual intervals	Project Developer	EMP Manager, DWRM, NEMA	Included in construction cost. Additional 10,000 allocated for inspection
Measure to reduce river sediment deposition	Assess baseline condition of sediment deposition in relevant sections of the river and continue monitoring	At project initiation and at annual intervals	Project Developer	EMP Manager, DWRM,	Included in construction cost. Additional 10,000 allocated for inspection
Ensuring appropriate soil quality in strategic areas	Assess baseline condition of soil quality in strategic areas of the river and continue monitoring	At project initiation and at annual intervals	Project Developer	EMP Manager, DWRM,	Included in construction cost. Additional 10,000 allocated for inspection
Maintaining acceptable water quality	Assess baseline water quality in strategic areas of the river and continue monitoring	Baseline data available but continue monitoring at annual intervals	Project Developer	EMP Manager, DWRM,	Included in construction cost. Additional 10,000 allocated for inspection
<p>Flora and fauna protection</p> <ul style="list-style-type: none"> • Sensitization and awareness programmes on the value of conservation • Regular monitoring of the status 	Awareness programmes available Monitoring data on flora and fauna available according to methodologies above	Regularly	Project Developer	EMP manager, Biodiversity Experts, NEMA	Included in construction cost. Additional 20,000 allocated for inspection
Pollution Control Programme in place	Measures to reduce organic and inorganic waste from the Project; Appropriate disposal of waste; regular measurements of water and soil quality parameters according to methodologies above; Restrictions on blasting; Appropriate location, methods and information regarding handling, storing and	Regularly	Contractor	EMP Manager, LC, DEO	Mostly included in construction cost. Additional 20,000 allocated mainly for waste handling

Mitigation Measures – Organizational framework	Monitoring indicators	Frequency	Responsibility	Stakeholders involved	Estimated Cost (USD)
	disposing of oil product and other chemicals				
Provision of water supply and sanitation in the DIZ & INDIZ <ul style="list-style-type: none"> Chart estimated needs Install pumps or other supply system Sewerage system 	Number of water sources and sanitation facilities in place	During construction	Project Developer	EMP Managers, Contractors, LCs, NGOs	20,000
Social conflicts and crime issues	Employment laws in place; Give priority to locals when recruiting skilled and unskilled labour; Offer training in special areas to local people; workers' accommodation decent; Minutes of meetings with law enforcement agencies in place	Regularly	EMP Manager	Police, UPDF, LCs, Intelligence Agencies	20,000
Occupational Health and Safety for workers and provision of general health services in Angadura: <ul style="list-style-type: none"> Establish a clinic for construction staff Establish/renovate clinics for DIZ/INDIZ communities Construction of new buildings Support awareness raising and preventative health campaigns (for malaria, safe water, sanitation, nutrition, STDs etc.) Training of local health workers Acquire and distribute treated mosquito nets and other health care items Periodical medical checks for workers Provide workers with appropriate PPE such as dust masks, ear muffs, leather gloves, hard helmets, heavy duty boots, eye goggles and waist bands and their usage should be enforced Train workers on the importance of using PPE and proper handling of equipment and machinery Ensure that there is always a well stocked First Aid Box and train workers on how to administer First Aid Develop and enforce a policy on accident reporting and investigation Ensure prompt compensation of accident victims 	Number of clinics in place or supported; Number of building constructed; awareness materials; number of training delivered to health workers; number of mosquito nets distributed; adequacy of PPE given to workers; Policy in place for accident reporting; evidence of compensation of accident victims	During construction	EMP Manager	District Authorities, LC, NGOs	80,000
HIV/AIDS interventions in place Periodic HIV/AIDS testing Awareness programmes in place	An HIV/AIDS service provider in place; HIV/AIDS intervention programme in place; Reports of HIV/AIDS sensitization available	Every six months	EMP Manager	NEMA, DEO	30,000
Monitoring of ambient Noise & Air Quality Control dust by: <ul style="list-style-type: none"> Regularly sprinkling water at the site using bowsers 	Noise and Air quality Measurements; Number of patients treated for respiratory diseases	All the time	Contractor	EMP Manager	10,000

Mitigation Measures – Organizational framework	Monitoring indicators	Frequency	Responsibility	Stakeholders involved	Estimated Cost (USD)
<ul style="list-style-type: none"> Covering haulage trucks with canvas Ensuring all vehicles and construction machinery are properly operated and maintained according to the manufacturers specifications Control noise by: <ul style="list-style-type: none"> Ensuring vehicles are properly maintained and in good mechanical condition according to the manufacturers specifications Providing workers with appropriate PPE 					
Improvement of educational facilities: <ul style="list-style-type: none"> Improvement of existing school facilities & construction of additional building where necessary Recruitment of teacher Support for schools (materials, furniture etc.) 	Evidence of contribution of the Project to schools	During construction	EMP Manager	District Authorities, LCs, NGOs	20,000
Compensation programme <ul style="list-style-type: none"> Public consultation programme Detailed evaluation of productivity and land assessment of losses Detailed recording of property and ownership for compensation or replacement Support to District and LC involvement 	Number of consultation meetings held with stakeholders; property evaluation records; records of compensations	Pre-construction	Project developer	EMP Manager, LEC, Local Councils, Pader and Gulu District Authorities, local residents, NGOs	80,000
Gender mainstreaming in project activities	Reports of gender mainstreaming in place	Regularly	EMP Manager	NEMA, DEO	5,000
Protection of Cultural sites <ul style="list-style-type: none"> Properly handle the issue of cultural sites 	Record of consultation meetings held with the custodians of the cultural sites	As required	Project developer	Contractor, MEMD, Uganda National Museums	2,000
Protection of Archaeological Resources <ul style="list-style-type: none"> Protection of any archaeological artefacts and sites that might be discovered during construction 	Record of information provided to Uganda National Museum	As required	Project developer	Contractor, MEMD, Uganda National Museums	2,000
Agricultural intensification: <ul style="list-style-type: none"> Extension services, including establishment of office Improved inputs (seeds, fertilizers, equipment) Credit schemes Vaccination of livestock 	A special agricultural extension office established in Angagura Sub-county; evidence of inputs given to local farmers; Number of Credit schemes developed	Regularly	EMP Manager	District Agricultural Officers, LC, NGOs	10,000
Provision of energy <ul style="list-style-type: none"> Establishment of woodlots for fuel woods supply Extension activities Contact with private plantations and nurseries 	Area of trees planted in the area; names of private nurseries providing tree seedlings	Regularly	EMP Manager	LC, Local entrepreneurs and businessmen, private plantations, District authorities, NGOs	20,000
Electricity Supply in project vicinity by UMEME	Number of businesses supplied with electricity	After project completion	Project Developer	EMP Manager, Contractors, Local	-

Mitigation Measures – Organizational framework	Monitoring indicators	Frequency	Responsibility	Stakeholders involved	Estimated Cost (USD)
				Councils, UMEME	
Increase local employment and other business opportunities: <ul style="list-style-type: none"> • Compulsory for contractors to hire labour from DIZ and INDIZ when required skills are available • Support to village authorities to organize list of people available for work • Training programmes for certain selected professions • Rotation credit schemes for business and local entrepreneurs • Orientation to community concerning impacts • Co-operation with local authorities in organizing renting land to newcomers 	Evidence of affirmative action taken to recruit locals; support to capacity building of locals for employment; support to alternative livelihood activities	Pre-construction and during construction	EMP Manager	LC, Local Entrepreneurs and businessmen , Contractors, Project Developer	20,000
Road safety measures: <ul style="list-style-type: none"> • Gentle slopes • Speed humps • Speed limits • Public Awareness Programmes 	Speed limit signs erected; speed bumps constructed; number of Road safety awareness programmes conducted	Throughout	Project Developer	Contractors, EMP Managers Road Authority	20,000
Security measures: <ul style="list-style-type: none"> • Patrolling project areas • Consult authorities, police and army units about project • Monitoring of population influx, housing and security issues • Strengthen police post in Angagura Trading centre 	Police Post in Angagura strengthened; record of security meetings in the area	Throughout	Project Developer	LCs, UPDF, District Authorities/Police	20,000
Contingency					100,000
TOTAL					<u>942,000</u>

8. MONITORING PROGRAM

The following monitoring program have been adopted to assess performance and compliance of the designed mitigation management plan. These have not been included in Table 7.1 for ease of clarity and user friendliness in information presentation.

8.1 Monitoring of the Physical and Chemical Environments

8.1.1 Monitoring noise levels

This should be done annually using the methodology described above and the results compared with the baseline.

8.1.2 Ambient Air Quality

Similarly levels of air quality should be measured annually with appropriate equipment to describe any changes with a view to putting in place appropriate mitigation measures where required.

8.1.3 Monitoring soil quality

This should be done annually and compared with the baseline values in the report. Soil composition should be closely co-coordinated with the aquatic ecology sampling.

8.1.4 Monitoring water quality

It is recommended that additional water quality samples be taken before the Project commences, including samples taken further upstream of the intake and downstream of the outlet. This will give a better basis for monitoring subsequent changes. A water quality monitoring programme should be implemented during project construction to document any water quality changes. The water quality monitoring programme should continue for at least five years, with sampling once a year. River flow will be monitored continuously.

8.2 Monitoring of the Biological Environment

Monitoring of the biological environment should focus on monitoring terrestrial vegetation, birds and aquatic ecology as these groups have been selected as indicators. However, it is also recommended that other animal groups should be surveyed occasionally for comparison with the baseline studies.

8.2.1 Terrestrial vegetation and Conservation Areas

Monitoring of terrestrial vegetation is important in measuring habitat changes and excessive exploitation of natural resources. Focus should be on the riverine forest and the vegetation close to HPP2. Monitoring on the east bank (Pader side) should include the presence and distribution of the riverine forest, including epiphytes and their host tree species.

8.2.2 Birds

Birds have often been suggested as an appropriate group to serve as bio-indicators of environmental conditions. It is proposed that monitoring should focus on selected bird species mentioned in this report especially the forest generalists and forest visitors. Monitoring should be based on the methodology described in this report.

8.2.3 Aquatic Ecosystem

Monitoring of the biological aspects should be carried out and based on the parameters used to determine the baseline conditions.

8.2.4 Monitoring river flow rates

A systematic review of the consequences of variations in the flow volumes and patterns of the bypass flow should be made in the wet and dry seasons, at the same time as water quality samples are collected. If, during the first three years of project operation, the hydrology of the Achwa River produces any adverse effects on aquatic life, then it is recommended that monitoring continues until sufficient data to evaluate the actual effects of the minimum bypass flow have been collected.

8.2.5 Monitoring aquatic life

Monitoring of plankton, macrophytes, macro-invertebrate and fish species diversity and abundance should be performed following the procedures employed during the baseline studies.

8.3 Monitoring of the Human Environment

Internal and external monitoring of health, economic and social conditions during and after construction phase is highly recommended as detailed within the following paragraphs.

8.3.1 Land Acquisition and involuntary displacement monitoring

Continuous monitoring of the PAPs from the Achwa 2 HPP will be carried throughout the construction phase of the project development works to assess their livelihood outcomes and needs for further assistance if required. Furthermore, monitoring for all compensation paid and lease agreement shall be undertaken to ensure greater community buy in and support for the project.

8.3.2 Monitoring of Other socio-economic impacts

The following action items are the most relevant and monitoring results will have to be compared with the baseline data collected:

- Available supplies of fuel and food so that inflation does not cause hardship for the resident population
- Adequate supply of drinking water in the DIZ and INDIZ
- Functioning educational facilities
- Monitoring of key health indicators, including regular testing for malaria, STDs and parasites based on the information from the health baseline studies
- Monitoring of economic activities to ensure that the resident population are able to participate and benefit through the working of credit schemes and training and by ensuring that unskilled workers come from the resident population
- Security and the ability of local institutions to patrol the area and deal with crime, conflicts and social problems
- Impacts of pollution, traffic and other disturbances on the population, including distances from machines and heavy traffic to the homesteads during the construction phase
- Monitoring for archaeological finds - that they are reported and the proper procedure is followed

Regular monitoring, especially of socio-economic and health conditions, should be ongoing during the construction period and should continue for up to five years after construction.

A framework for an Environmental Social Management Plan (ESMP) has been prepared and forms the link between the impact assessment and recommendations in the ESIA and the implementation of the mitigation and monitoring activities. The ESMP outlines mitigation and monitoring activities as well as financial and administrative responsibilities and schedules for implementation during the pre-construction, construction and operation phases.

It is proposed that an ESMP Manager be appointed at least six months before construction activities are initiated in order to update the ESMP and to harmonize any pertinent issues between the developer and the other stakeholders.

9. CLIMATE CHANGE

9.1 In the project area

Based on the vulnerability analysis conducted by the Bank's Climate Safeguard System, the project has been classified in Category 2. The main relevant characteristics of vulnerability in the project area are summarized as follows:

1. **Water availability in the catchment area** : Under current climatic conditions, there is an abundant supply of water to the project catchment area and water shortages are not considered to be a risk to the operational viability of the project;
2. **Asset life time**: The project involves the construction of new low-head hydroelectric facility/ facilities with a lifespan of about 20-30yrs.
3. **Critical infrastructure**: The project has generating capacity of 42MW (which is within the 10-50MW range) and will contribute to the economic developments of the area but is not a critical infrastructure for the government.

9.1.1 Greenhouse gas emissions:

Improving the state of the associated access and inter service roads will not generate greater additional traffic, which implies a negligible increase of greenhouse gas emissions that will remain the same as in the "without project" scenario.

Furthermore, the Run-of-River approach adopted (rather than the traditional large dam technology) to power generation will result in less area of water inundation which will prevent eutrophication (from inundated vegetation) and release of greenhouse gases.

9.1.2 Adaptation

The project took these challenges into account and have adopted adaptation approaches which designs out some of the potential climate change impacts above. Specifically;

1. The project has opted for the run-of-the-river low head weir scheme alternative in preference to the traditional dam approach. This approach will help to design out the risk of availability of water which is critical for the long term financial viability of the project. Furthermore a study of the reservoir (at the back of the rubber dam) has been undertaken in order to optimize the use of the water available during the dry season, when the flow of the river is less than the minimum required to operate a turbine. According to the analysis of a Duration Curve and the Achwa Hydrograph generated during the study, there are three critical months:
 - a) January with an average daily flow of 1,9m³/s;
 - b) February with an average daily flow of 1,3m³/s;
 - c) March with an average daily flow of 5,5m³/s;

In February, the flow is less than the estimated environmental flow, therefore all the water will be fully released as environmental flow and this period will be used for the yearly planned maintenance.

In March, given that there is an average excess flow of 4 m³/s with respect to the environmental flow, it is estimated that the average daily storage of water in the reservoir is equal to 345600 m³. This water can be used for power generation for 6 hours every day with a turbine discharge of 16 m³/s.

2. The run-of-the-river is created using a technique of a mobile dam (rubber dam) on a concrete foundation. During flood flow events, the rubber dam will be completely deflated and will allow the entire hydraulic section of the river to be restored (a flood discharge equal to 1,200 m³/sec corresponding to the 10,000 year flood probability has been considered in sizing the weir).
3. Due to these flexible adjustments, it is envisaged that the dam will cause minimal inundation of the surrounding areas compared to the traditional dam and reservoir approach which will have an overall minimal impact on communities both up and downstream of the River.

9.1.3 Mitigation

The construction of the access and connecting roads will help to increase average traffic speed within the area compared to the “without project” situation, leading to smoother traffic flow and generally lower emission ratios than at current speeds (atmospheric emission ratios are generally inversely proportional to traffic speeds).

10. PUBLIC CONSULTATIONS AND PUBLIC DISCLOSURE

Consultation with all relevant stakeholders and regulatory institutions was carried out by the ESIA Team in the course of preparation of this ESIA. The consultation process ensured public participation in the EIA process, as recommended by the National Environmental Act, Cap 153. In this context, meetings were held with relevant Government Lead Agencies, and the Local Governments of Pader and Gulu Districts as well as the local communities in the Project area.

The key concerns expressed by the District Political and Technical Leadership were that most of them had not attended any meetings related to Agago HPP5 and they expected full cooperation from the developer and involvement of the district leadership during Project implementation. They anticipated the following positive impacts:

- Improved standards of living due to increased incomes
- Job creation for local communities (casuals, masons, welders etc.)
- Development of the agricultural sector with variety of food to meet the demands of the increased population in the area
- Development of Small Medium Enterprises due to possible availability of electricity through connections by Electricity Distribution Company (UMEME)

Negative impacts were anticipated to be:

- Decreased water flow due to water diversion into canal
- Vegetation destruction may affect all components of the environment including biodiversity loss
- Increased air and noise pollution caused by heavy vehicles, machinery and blasting
- Soil and water contamination from chemicals, hazardous waste etc.
- Increased HIV/AIDS prevalence in society due to population influx
- Displacement of locals from areas where HPP5 activities may traverse

Local community consultations were also carried out in Burlobo village (Burlobo Parish). Key recommendations from local communities included the following:

- Massive sensitization of the community about the project before it starts
- Road signs should be installed at the road side to act as guides to the community
- Compensation of the PAPs should be done fairly
- The local community should be given priority when it comes to the recruitment of casual labourers
- The clan elders should be consulted first on the issue of the cultural site removal before the project kicks off
- Vices by foreign workers on the community should be controlled
- The politicians and the project officials should be transparent with any form of development arising from the project.
- Benchmarks should be installed to separate the project area from the rest of the areas

11. CONCLUSION

As presented in this study, the project will have negative environmental and social impacts that should be mitigated or optimized, as appropriate. The project's probable negative impacts during the works and operational phases are generally of average to high importance. If the proposed measures and recommendations made above are taken into account, this will allow for smooth integration of the various project components into their bio-physical and human environments, and this will guarantee the project's sustainability from the environmental, social and climatic points of view

REFERENCES AND CONTACTS

ESIA REPORT Environmental and Social Impact Assessment for Agago-Achwa River Hydropower Project (HPP2) in Pader and Gulu Districts of Uganda by Greenbelt Consult – 2014. 143 Pages.

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