



NGONYE FALLS HYDROELECTRIC PROJECT

Environmental and Social Impact Assessment
(ESIA)

VOLUME I: NON-TECHNICAL SUMMARY

November 2019

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1 Introduction and Background

The Ngonye Falls Hydropower Project (the “Project”) is a 180 MW run-of-river hydropower scheme located on the Zambezi River near Sioma Town in the Western Province of Zambia (Figure 1). The Project’s objective is to generate clean, dependable and affordable power to deliver to the Zambian national electricity grid. Average gross electricity generation will be approximately 830 gigawatt hours per annum which, using an average household consumption of 4,600 kilowatt hours per annum, is sufficient to supply approximately 180,000 households or 990,000 people.

An Environmental and Social Impact Assessment (“ESIA”) has been undertaken by DH Engineering Consultants (“DHEC”) on behalf of Western Power Company (“WPC”). An ESIA is a detailed study that assesses how the Project will affect the environment and people and how these impacts will be addressed and managed. In Zambia it is a legal requirement that an infrastructure project of this type prepares an ESIA, and thereby obtains an environmental permit. The ESIA has been completed in accordance with Zambian regulatory requirements and also the International Finance Corporation’s (“IFC”) Performance Standards on Environmental and Social Sustainability (2012). These IFC standards are applied widely in international finance by Development Finance Institutions (“DFIs”) and other investors.

This Non-technical Summary (“NTS”) provides a summary of the ESIA using non-technical language. It describes the ESIA process and presents the main findings and conclusions. The full ESIA reports will be made available online in June 2019 to receive comments. The process for giving comments is described on the last page of this NTS.

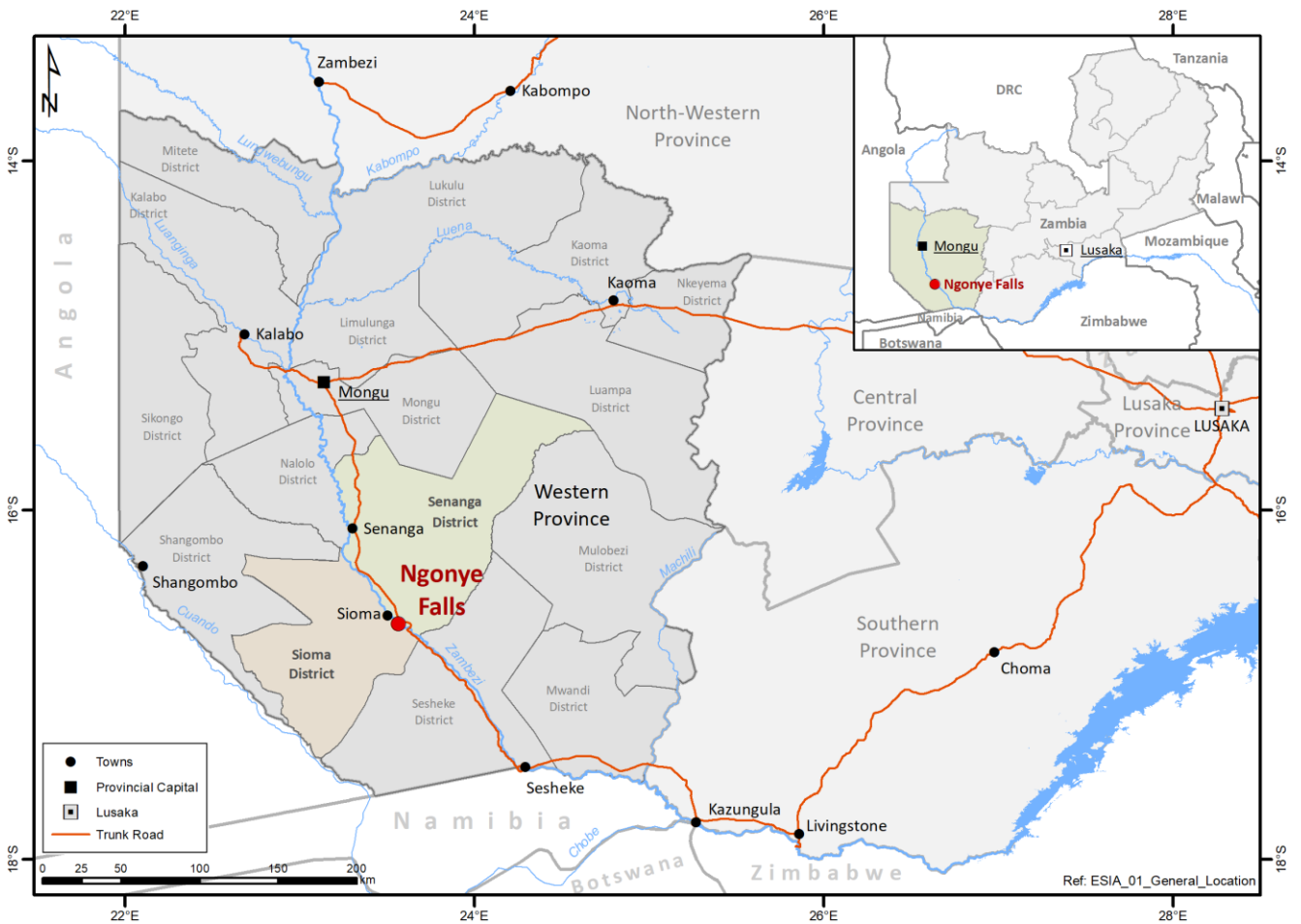


Figure 1: Project Location

Who is the Project developer?

Western Power Company (“WPC”) is a Zambian independent power producer based in Lusaka and is the developer of the Project. WPC is majority owned by African Power Projects, the Zambian founders of the Project. The other main shareholder is InfraCo Africa, a member of the Private Infrastructure Development Group, a donor funded organisation that finances infrastructure projects in low-income countries. African Power Projects and InfraCo Africa own 94% of the Project.

The remaining shareholders are the communities of Western Province. WPC agreed a Community Participation Agreement in 2015 with the Barotse Royal Establishment (“BRE”) that establishes a 6% shareholding in the Project that will be held in trust on behalf of the communities. This is in recognition that the Project will use their natural resources (water and land). Two Community Trusts will be established, one for the local project-affected communities and another for the wider Western Province communities that will fund community development initiatives (further details presented in Section 8).

Why is the Project Needed?

Demand for electricity in Zambia is increasing at 6% per annum and is expected to reach about 3,500 MW by 2020.¹ Zambia’s installed capacity has not increased significantly in the last 20 to 30 years and there is now a significant drive to invest in power production to manage power shortages and meet future demand growth. The development of the energy sector is critical to the economic growth of Zambia and is a key element in the government’s future plans. The government is prioritising power generation as part of the National Development Plan for 2017-2021 with a primary objective “to expand and improve electricity generation, transmission and distribution [and] promote investment in hydro, nuclear, geothermal, wind and solar energy generation”. The Project will also contribute significantly towards the stabilisation and improvement of power supply to the Western Province of Zambia, and enable additional generation plants such as solar farms to be added to the grid in Western Province.

Figure 2 illustrates the expected shortfall in energy production in Zambia up to 2024.

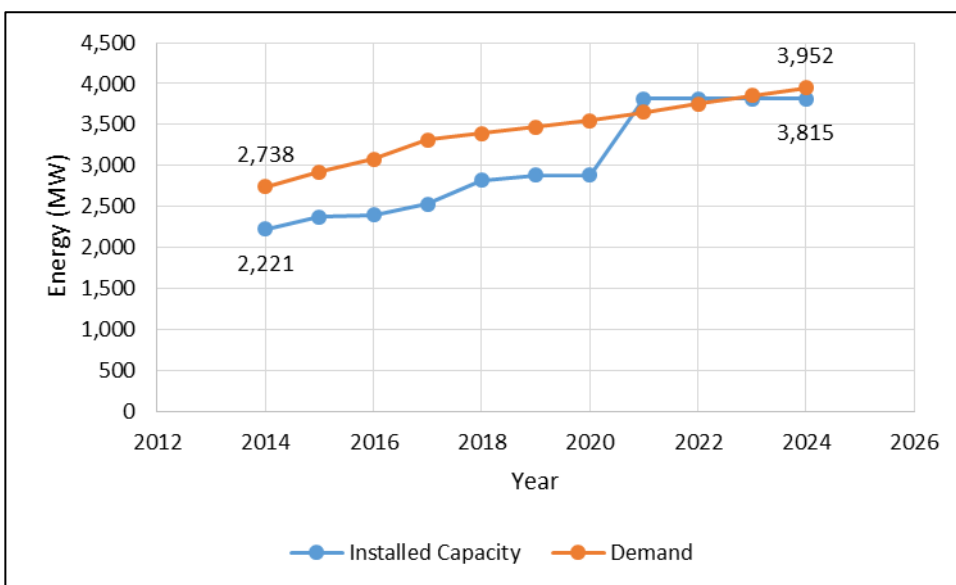


Figure 2: Zambia Energy Supply and Demand Forecast

¹ Southern African Power Pool (SAPP), *Annual Report 2014*, pp. 42

2 ESIA Process

The purpose of the ESIA is to understand how the environment will change as a result of the development of the Project and how people may be affected (these changes are called 'impacts'). The ESIA also describes how these impacts will be managed to ensure that people and the environment are not harmed, and to ensure that the benefits (or positive impacts) that will result from the Project are maximised.

The main steps in the ESIA study are shown in the Figure 3 .

During the ESIA, WPC and its consultants held meetings with local communities and stakeholders to share information, answer questions and understand and respond to concerns about the Project. This is termed stakeholder engagement will continue throughout the life of the Project, as outlined in Section 10.

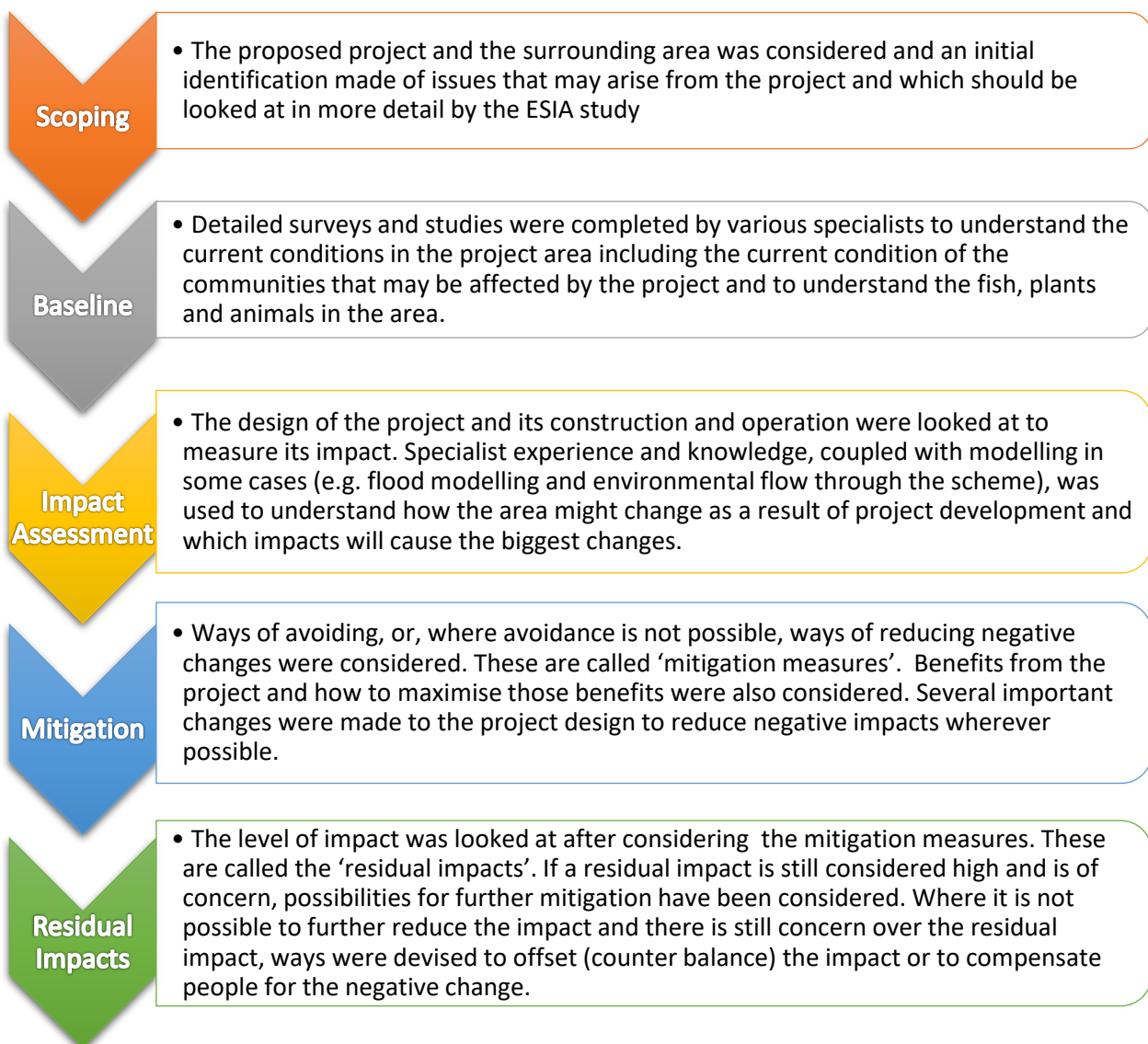


Figure 3: ESIA Process Followed

3 Project Description

The Project will operate as a ‘run-of-river’ hydroelectric scheme (see the box ‘What is a Run-of-River Hydropower Station?’ on the next page) and will use the change in height of the river at Ngonye Falls to generate power. Water will be diverted from above Ngonye Falls into a power canal and will flow to the power station where it turns the hydropower turbines before returning to the river in the gorge downstream of the falls. Figure 2 presents the layout of the Project infrastructure.

The key Project components are:

- **Weir and barrage** – a 3.5 km long headworks comprised of low variable-height adjustable weirs, fixed weir sections, embankments across the head of the islands, and a gated barrage (in the far-left channel) that will divert water through the canal intake;
- **Canal** – a 2.9 km long concrete-lined power canal;
- **Forebay** – a 600 m long forebay lake immediately upstream of the powerhouse;
- **Powerhouse** – which is situated 6.5 km downstream of the Falls;
- **Outdoor switchyard** – located immediately to the southwest of the powerhouse;
- **Transmission line** – a 4.5 km 220 KV interconnection to the planned ZESCO 220 kV line; and,
- **Associated project infrastructure** – including access roads, access bridges, operation-stage accommodation/facilities and a visitors’ centre.

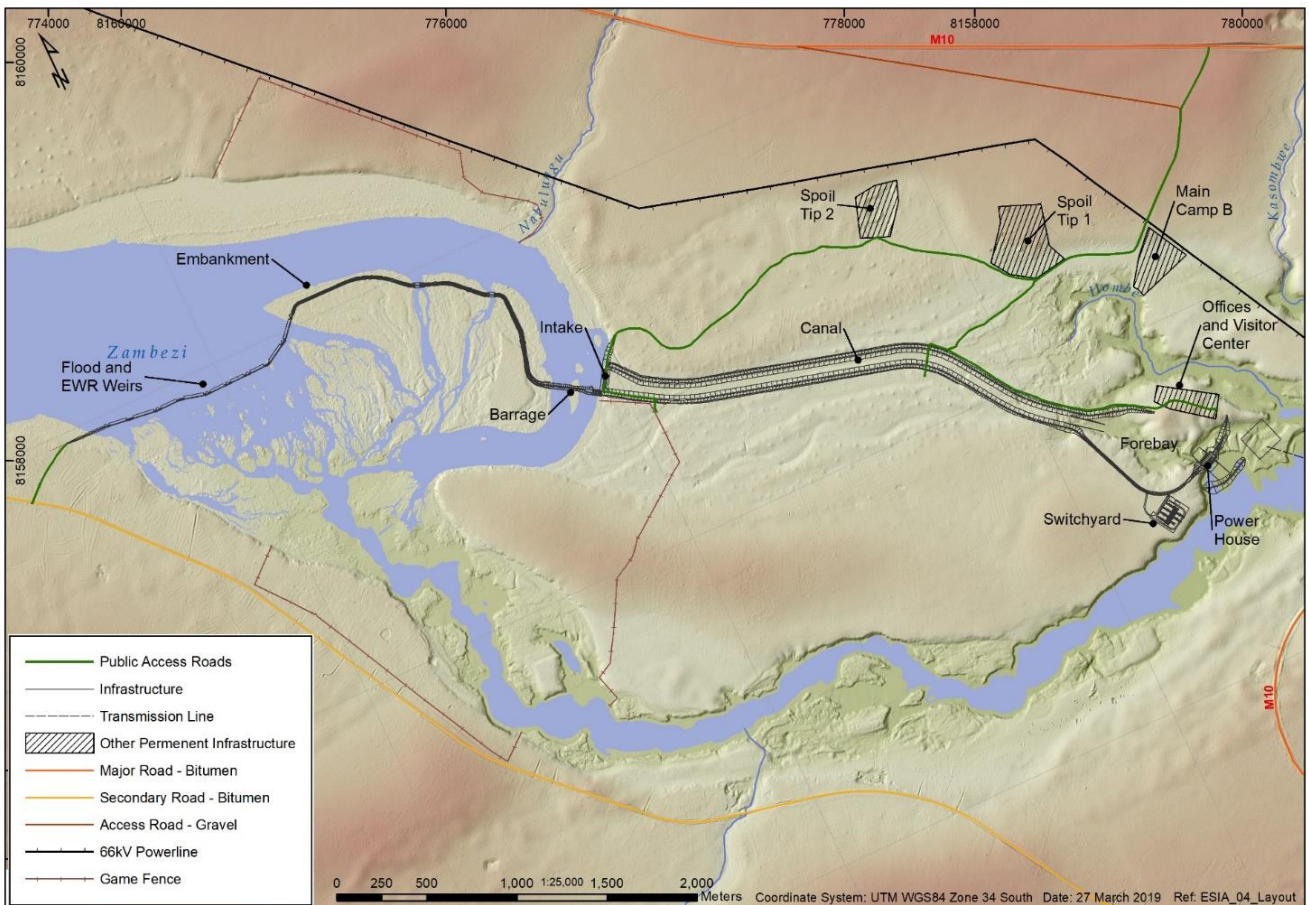
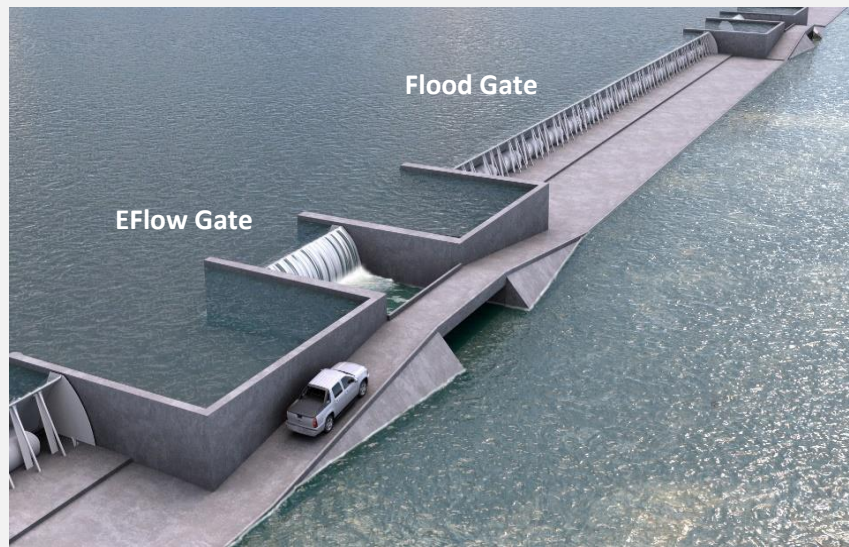


Figure 4: General Project Layout

What is a Run-of-River Hydropower Station?

A hydropower station uses water flowing in a river to generate electricity. In a run-of-river power station, the natural flow of the river is used to generate electricity and no storage reservoir (lake) is created. The Livingstone Power Station at Victoria Falls is a good example of a run-of-river power station. In contrast, the Kariba power station is not run-of-river project, and is a good example of a traditional storage hydropower scheme with a large dam and reservoir that can store water from year-to-year, and release it on a varying basis to generate power in response to varying demand.

The Project, via the headworks, diverts water into a power canal. The headworks raise the level of the River by 3-4 m in the immediate vicinity of the infrastructure which creates a headpond. The headpond is like a small reservoir, but it has no capability to store water for more than a few hours. The weir, including the flood and EFlow gates (illustrated on the right), control the headpond at a stable level and provide flows to the immediate downstream river reaches.



Other Associated Facilities

A number of temporary and permanent facilities will be established to support the construction and operation of the Project. Most of the temporary construction infrastructure will be located on the east bank, close to the permanent infrastructure. The majority of temporary facilities have been located on modified areas in consultation with a Community Liaison Committee established for this area. For example, the worker accommodation and spoil tips are located on inactive quarries. Post-construction uses for this land have been discussed with the community with the objective to design and leave behind as much useful infrastructure as possible. Remaining areas will be rehabilitated.

Table 1 outlines the key temporary and permanent support facilities that are envisaged. These facilities will be confirmed during the award of the construction contract and in consultation with the affected communities.

Table 1: Temporary and Permanent Support Facilities

Temporary Facilities:	Permanent Facilities:
<ul style="list-style-type: none"> • Worker accommodation (up to 3,100 employees) • Contractor offices • Four contractor work areas • Quarries • Support facilities including water and wastewater treatment plants 	<ul style="list-style-type: none"> • Operator’s accommodation • Spoil disposal sites (located on disused quarries) converted to community uses if feasible • Contractor facilities that are retained for community use, such as a clinic on the east bank

4 Project Alternatives

An ESIA study requires the developer to assess the environmental and social impact of alternatives.

“No Project” Scenario

The ‘no project’ scenario considered not developing the Project at all. As discussed in the introduction, the Project will help meet growing energy demand and stabilise the network in the Western Province which is subject to disruption due to long transmission lines and low capacity. In this scenario, the environmental and social impacts associated with the Project, including the positive impacts, would not occur. Overall, it is considered that the national and local benefits the Project brings outweigh the negative impacts, and that the latter can be effectively managed with only minor residual impacts remaining (see Section 6).

Other Forms of Generation

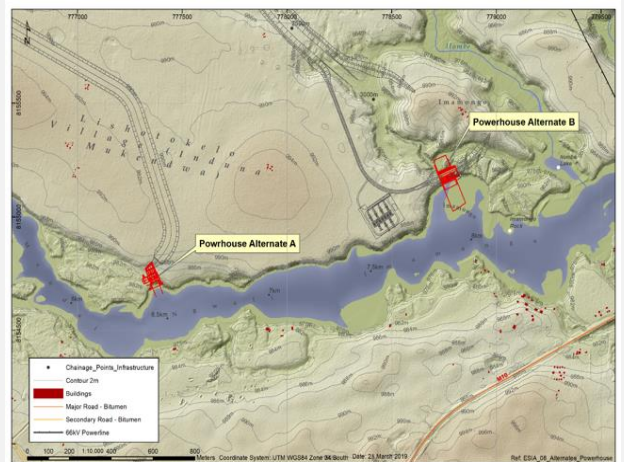
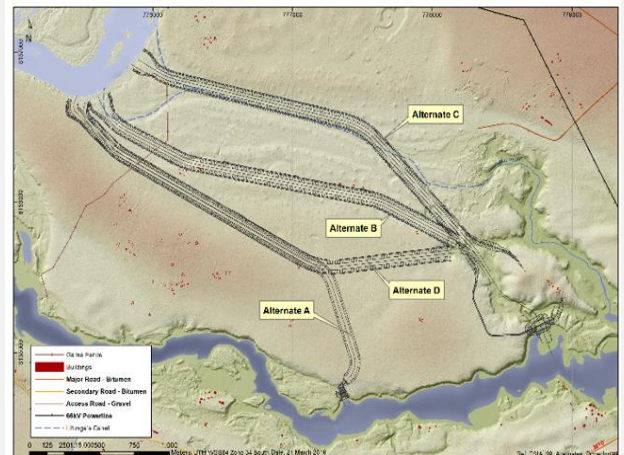
The main alternative source of generation is solar photovoltaic power. Solar holds some promise for Zambia as the country has abundant sunlight hours. However, its disadvantage is that it does not work at night, and the amount of power varies with sunlight intensity through the day. Currently the Zambian grid has limited capacity to include such variable power. This is especially so if the existing supply in the grid is unreliable, as it is currently in Western Province. The establishment of significant new continuous synchronous generation by a hydro station in western Zambia will enhance grid stability and capacity, and improve the possibility for the grid to include variable sources such as solar. In this way hydro and solar are complementary sources of power rather than alternatives.

Alternative Layout and Design

WPC considered several alternatives to the design and layout during the development of the scheme, including the location of the powerhouse, the route and width of the canal (see image to right), and the route of the transmission line interconnector.

The height of the weir was another important decision, as this influences the amount of power that can be generated but adds cost to the scheme, and results in greater changes in floodplain inundation upstream with effects on people and their land, plants in the floodplain, and fish in the river.

The upstream changes due to flooding were assessed through hydraulic (computer) modelling and aerial photography. This resulted in floodplain inundation maps for various weir heights ranging from 2.5 to 5 meters. The object of this exercise was to find the optimum height, balancing the need for electricity generation whilst keeping potential upstream impacts within acceptable limits. It was determined that a weir height of 3 m is the best balance..



5 Construction and Operations Activities

Pre-construction Activities

The main pre-construction activity will be acquiring the land and completing any resettlement from this land (see Section 7). The EPC Contractor (see box to right) will finalise the detailed design of the Project during this period.

Construction Phase Activities

Construction will be the responsibility of the EPC Contractor, and is expected to last three years. Construction of all project components will be undertaken simultaneously. Key activities will include:

- Site preparation and enabling works including vegetation clearing, upgrade and establishment of access roads, installation of temporary workers' accommodation, contractor workshops and storage areas;
- Earthwork excavation for the canal and power house;
- Localised, temporary diversion of water flows for instream construction works;
- Foundations and construction of the headworks, power canal, intake, forebay, powerhouse and tailrace channel;
- Installation of the turbines and generators and associated electrical work;
- Completion works including rehabilitation of disturbed land.

What is an EPC Contractor?

An engineering, procurement and construction (EPC) contractor is an organisation that will be appointed by WPC to undertake the detailed design, construction and commissioning of the Project. It is likely that the Project will be built under a 'turnkey' contract. This means that only one organisation will be contracted for the Project and they will have responsibility for any sub-contractors they require, for example a specialist to install the generating equipment.

The construction phase will require a peak workforce of approximately 3,100 people to complete the works, the vast majority of which will be housed in temporary accommodation on-site (meeting the specifications of IFC and national legal requirements).

Operations Phase Activities

The main activity during operations is the diversion of a portion of the river's water along the power canal and then passing this water through the turbines in the powerhouse to generate electricity, before returning it to the river some 6.5 km below the falls.

The operations phase requires a much smaller workforce of approximately 30 engineers for the core operating team and a further 40-60 support staff (security, catering, cleaning etc.). The key consideration during operation will be the management of the headpond and stretch of the river with lower flows between the headworks and the powerhouse, particularly for impacts on fishers and biodiversity (see Section 7).

End of Project and Decommissioning

With careful operation and maintenance, the Project will have a life span of at least 90 years. Given that the Project is designed to operate for such a long period, there is no firm decommissioning plan in place at present. When it does take place, the infrastructure components will be dismantled and disposed of. As such, the impacts and activities that will be undertaken are most comparable to the construction phase.

6 Key Impacts for Decision Making

Impacts were assessed by specialists to understand their significance or importance for those affected by the project. The significance levels used for this assessment are described in the box to the right.

The key impacts and topics assessed in the ESIA and their significance are outlined in

Table 2. The significance of the pre-mitigation impact, i.e. without any measures being taken to reduce the impact, is presented on the left, and the significance of residual impact, which remains after mitigation measures have been applied, is on the right.

As can be seen, the significance of almost all impacts can be reduced to minor or negligible with effective mitigation measures. However, some significant residual impacts remain (those denoted as moderate or major adverse post-mitigation). These residual impacts are related to the reduced flows over Ngonye Falls and its associated tourism potential and also to the risks of influx of opportunistic job seekers to the area which brings adverse social impacts.

Significance Definitions	
Negligible	There will be no or very limited impact.
Minor	There will be a small impact of limited concern or interest.
Moderate	There will be a moderate change to the environment and people that will be of some concern. Management of moderate impacts requires less effort than major impacts.
Major	There will be a very large change to the environment or people which will be of great concern. Management of major impacts requires considerable effort, in some cases in the long term.
Positive	There will be a positive impact.

Table 2: Summary of Key Impacts

Key Impacts	Significance		Key Impacts	Significance	
	Pre - Mitigation	Post - Mitigation		Pre - Mitigation	Post - Mitigation
Climate change Resilience	Minor	Minor	Social infrastructure and networks	Major	Minor
Greenhouse gas emissions	Negligible	Negligible	Disruption to traditional fishing practices	Major	Moderate
Air Quality (dust)	Major	Minor	Natural resources harvesting	Moderate	Minor
Noise and vibration	Major	Minor	Social infrastructure and networks	Major	Negligible
Soils and erosion	Major	Minor	Cultural heritage sites	Major	Minor
Sedimentation and pollution of river water	Major	Minor	Existing tourism industry	Minor	Minor
Aquatic biodiversity (plants and animals in the river)	Major	Minor	Tourism industry potential	Major	Moderate
Terrestrial biodiversity (plants and animals on land)	Major	Minor	Landscape visual impact (infrastructure)	Major	Moderate
Traffic and transport	Major	Minor	Visual amenity Ngonye Falls	Major	Major
Waste generation	Major	Minor	Influx opportunistic job seekers	Major	Moderate
Community health, safety and security	Major	Minor	Creation of employment	Positive	Positive
Occupational health and safety	Major	Minor	National power development	Positive	Positive
Loss of people's homes and land	Major	Negligible	Benefit sharing (community trusts)	Positive	Positive

7 Important Adverse Impacts

Risks to Community Health, Safety and Security

The Project Area has a low population density, but there are villages in the area and people practice dryland and flood recession farming and fishing. Whilst the M10 Highway was recently completed in close proximity to the Project, the area is rural, sparsely populated and affected communities are largely unaccustomed to projects of this size and nature. As such, risks to community health, safety and security (“HSS”) will be particularly high during the construction phase due to the presence of a large workforce and heavy construction plant. Risks include:

- Accidents involving construction plant and trucks moving around the site;
- Worker-community relations including risks of gender-based violence (“GBV”) and sexual exploitation and abuse (“SEA”);
- Influx of opportunistic job seekers and associated impacts including increased incidence of sexually transmitted infections (“STIs”) and pressure on local infrastructure and services; and
- Pressure on community infrastructure and services including healthcare and education.

During operations these risks will be significantly reduced since there is a smaller pool of permanent employees (less than 100) and only occasional vehicle movements, largely on private roads within the infrastructure footprint. Risks during operations are primarily related to the very small risk of infrastructure failure or unplanned shutdowns which if left unmitigated present a particular risk to fishers active in the Ngonye Falls area. However, the design of the plant has foreseen these eventualities and an Emergency Response Plan will be developed prior to operations to include warning measures and community training on what to do during such an event. The Project will also alter the flood regime in some areas beyond the permanent headpond increasing risks for local homesteads. For safety this may require the relocation of certain households (see ‘Loss of Land and Structures’ below).

The Project will publish and enforce a Project Code of Conduct that is applicable to all employees that will clearly spell out rules for personal conduct. Disciplinary action will be taken against those in breach of these rules, including in the most serious cases dismissal and prosecution. The EPC Contractor will be required as part of construction management to develop specific plans to address risks for communities including a Community Health, Security and Safety Plan (including a HIV prevention and treatment programme), a Transport Management Plan, and an Influx Management Plan. These plans will all be made publicly available for review. The EPC Contractor will install a workforce clinic to ensure there is no additional pressure on community health facilities.

Impacts on Biodiversity (Wildlife and Vegetation)

The ESIA studied the natural environment in the Project Area. Eight types of natural vegetation occur in the Project Area, which include Kalahari and miombo woodland, riparian forest, tall and low thicket formations, shrub lands, and grasslands. Parts of the Project Area are modified as they have been cleared for agriculture or quarries and consist of a patchwork of secondary woodland in various stages of recovery.

The ESIA aquatic ecology survey found that the majority of the aquatic habitats are in an unmodified or natural state. The fish sampled were dominated by *Labeo* species and other ‘rheophilic’ species (which like rocky areas with fast flowing water). Approximately 89% of the fish found in surveys have some requirement for migration. Most of the sections of the river provide suitable nursery and spawning habitat for fish to some extent. Potential significant impacts are outlined overleaf.

- **Loss of terrestrial natural habitat**

There will be a loss of natural habitat due to site preparation and clearing of land for various components of the Project. This is likely to be most significant for the weir embankments across the islands which will affect riparian forest and tall thicket, while only small amounts of natural habitat are likely to be impacted at the power canal (Kalahari woodland, tall thicket) and power house site (low shrubland on rock scree).

To reduce this impact there will be no unnecessary clearing of natural vegetation, and construction camps and work areas will be located in modified areas such as disused quarries as far as possible. Disturbed areas will be rehabilitated as soon as possible after construction, and seedlings of dominant plant species will be kept in a holding nursery for replanting.

- **Changes to natural habitat in the river**



Aloe esculenta



Crinum verdoorniae

The creation of a permanent headpond will result in a change in the aquatic environment from a flowing river (lotic environment) to a deeper and slower moving water body (lentic environment). This will favour species of fish and organisms that prefer deeper water rather the current species which are typically riffle and rock dwelling species. To reduce this change, the location of the weir has been set back to avoid the sensitive rapids in the right channel.

During operations, the reduction of flows below the weir and barrage will result in the partial loss of aquatic habitat and spawning grounds for fish in the affected river reaches between the headworks and the powerhouse. This may also result in a change in the assemblages of fish and other aquatic organisms. Environmental flows (EFlows), which are the minimum flows that the Project has to release into these reaches (i.e. not used for generation), have been defined to maintain the biodiversity present in the affected reaches. However, some localised loss in abundance is expected to result from reduced habitat availability.

- **Prevention of fish migration**

Without providing passages for fish movement, the headworks would restrict the upstream and downstream migration of fish. Upstream migrations occur at the onset of the wet season when flows in the river start to rise, and downstream movement occur when the flows start to recede. None of the migrating fish species recorded are endangered. However, maintaining connectivity between downstream and upstream reaches of the river is important to enable them to reach spawning grounds and maintain abundance.

Fish passages will be constructed on the weir and barrage in every channel at Ngonye Falls to allow for continued migration. The type of fish passage – “vertical slot” – has a high success rate on similar infrastructure projects in Southern Africa. In addition to fish passages, a rock ramp will be constructed in a downstream reach (*Bwajoge*) that is important for early season migrators (late Nov-Dec).

- **Barrier effect of headworks and canal for wildlife**

The headworks could restrict animals, particularly crocodiles and hippopotamuses, from accessing the Ngonye Falls islands. The embankments across the top of the islands have been designed with a 2:1 slope to maintain access for animals and these will be monitored for their effectiveness. If they prove to be a barrier, further ramps will be implemented. There are two elephant corridors that are noted as ‘less active’ in the Sioma Ngwezi Development Plan leading to Sikuka (headpond) and Malombe (above the headpond) where elephants come to the river to drink. It is not expected that the Project will present a barrier to elephants accessing the river via these routes but monitoring will establish this and corrective actions implemented if required. WPC will work with DPNW on this issue.



Floodplain wetland (Source: Ecotone 2018)



Riparian forest and boulders (source: Ecotone, 2018)

Local people’s homes, land, and livelihoods

- **Loss of land and structures due to land acquisition**

The installation of the canal and power station and creation of a permanent headpond will result in the loss of land and any fixed structures on that land:

- Temporary acquisition – approximately 40 hectares (ha) will be required to locate temporary construction infrastructure (worker accommodation, offices etc) and work areas. The majority of this land has been selected on the basis that it is modified and community land (i.e. not individual households’ land) so that the affected communities receive the benefit of lease payments and conversion of the land post-construction into an improved state;
- Headpond – approximately 203 ha will be permanently inundated and a further 175 ha is required for a buffer area around the headpond. This will result in the physical displacement of approximately 20 households and the economic displacement of households practicing flood recession farming and cattle grazing;
- Changes in floodplain inundation– Beyond the headpond the Project will alter the frequency, extent and duration of seasonal flooding in areas immediately around the headpond. This may improve the benefits

of seasonal flooding for agriculture in some areas but increase the negative impacts of occasional severe floods in other areas. To ensure the safety of households and continued use of land, some households may require resettling (up to 27 households, from 106 ha) and others will be included in a Project-supported flood resilience programme to improve the resilience of households to the existing and increased extent and reQUENCY of floodplain inundation.

- Project Infrastructure – approximately 140 ha will be acquired to accommodate permanent infrastructure resulting in the physical displacement of seven households and approximately 50 fields.

Figure 5 presents the extent of the pre- and post-project impact upstream of the headworks. WPC has prepared a Resettlement Policy Framework setting out the approach to resettlement, in advance of a full Resettlement Action Plan (RAP, – see box below). WPC will begin to undertake detailed surveys in Q3 2019 with a view to commencing implementation of the resettlement programme in 2020 ahead of construction.

- **Traditional fishing and natural resources:**

The establishment of the Project will result in disruption to traditional fishing practices and loss of fishing grounds (for *Maungwe* and *Limbelo*) due to the creation of a headpond upstream of the weir, and reduction of flows between the headworks and the powerhouse. WPC has already undertaken a detailed survey of Maungwe and Limbelo sites around Ngonye Falls, and will conduct a detailed survey of Maungwe sites upstream of the weir as part of the RAP surveys. A fisheries monitoring programme will commence in Q3 2019 for a full season to establish a baseline for the productivity of these fisheries.

Where there is loss of productivity or complete loss of fishery, the Project will provide suitable transitional support and compensation under the RAP. Fisheries development in the Project Area will be promoted via a Sustainable Fisheries Development Plan developed and supported by the Project, and special provision will be made for livelihoods restoration or alternative livelihood development for affected traditional fishers.



Example of Flood Recession Garden

What is a Resettlement Action Plan (“RAP”)? A RAP is a plan that is developed where a Project results in the physical displacement (loss of dwelling) or economic displacement (loss of an asset, for example a fishery) due to the activities of the Project, mainly from land acquisition. Under the RAP, affected households are surveyed to gather information on their assets and other household data such as the make-up of the household and how it functions (revenue, expenditure etc). This information is used to determine what type of compensation packages and livelihood restoration measures are appropriate. For each affected household or person, an individual compensation agreement is developed and signed and the resettlement activities are implemented (moving households and livelihood restoration measures).

The changes to the lives of those affected by resettlement is significant and permanent. Therefore, resettlement activities, in line with the objectives of IFC Performance Standard 5, are undertaken as a development opportunity to improve the existing living standards of the affected households.

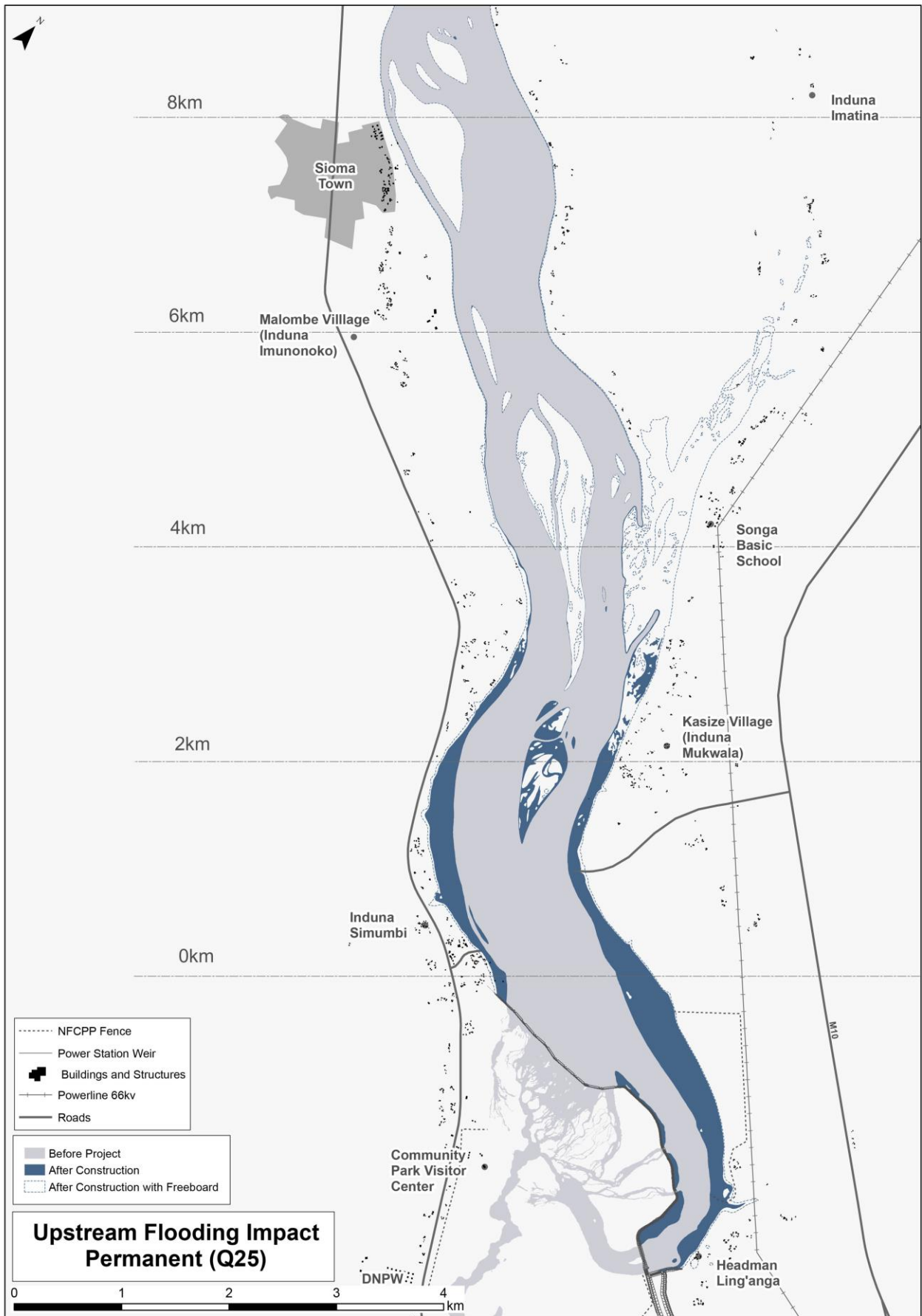


Figure 5: Upstream Inundation Pre- and Post-Project

Impacts on the Landscape Character and Cultural Heritage Resources

The Project will affect the landscape character permanently through the installation of key infrastructure components and localised changes to the river i.e. the formation of the headpond and reduced flows between the headworks and the powerhouse. Infrastructure components have largely been sited away from key viewpoints, but some will be visible from specific locations, including the powerhouse from the lodges directly opposite (approximately five lodges) and the barrage from Sioma village. Mitigation measures include further natural shielding and in the case of the powerhouse using traditional designs for the façade to blend in with other structures in the area.

The main landscape feature (and cultural heritage resource) that will be affected by the Project is the Ngonye Falls themselves. The falls will receive significantly lower flows than before the Project throughout the year. This will negatively impact visual amenity during the dry season but conversely improve both access to and views of the falls during the wet season. The falls themselves will never ‘dry up’ due to the provision of EFlows (see box below). When river flows are too low to provide the EFlows and generate power, then the power station will shut down.

Other significant cultural resources that are affected include the Litunga’s Canal, part of which will be destroyed in the location of the Power Canal, and the Litunga’s Historic Docking Point and Sacred Tree, that will be permanently inundated by the headpond. Note that the lower, hand-cut portion of the Litunga’s Canal will not be affected. In response to this, the Project will develop a Cultural Heritage Management Plan, in coordination with the National Heritage and Conservation Commission (NHCC), the Barotse Royal Establishment (BRE) and local leadership. Discussions to date with these stakeholders have concerned building a dedicated centre or using part of the Project’s visitors centre (see section below) to record these sites and other Barotse heritage resources in the area. In addition, a Chance Finds Procedure will be established by the EPC Contractor, to be used in the event that cultural heritage artefacts are discovered during construction.

Impacts on the Tourism Sector

The development of the Ngonye Falls Community Partnership Park (NFCPP) and tourism in the area is in its infancy and currently visitor numbers are low. Tourism is closely linked to the visual appeal of the Ngonye Falls as an attraction and also capitalises on tourists passing through the area to the Liuwa Plains National Park for the wildebeest migration. Visitor numbers are higher during the dry season when the falls are both accessible and at their most visually appealing, and very low during the wet season when the falls are largely inaccessible and drowned out. As previously described, the impact of the Project on the visual aesthetics of the falls is both negative (during the dry season) and positive (during the wet season).

The impacts on Ngonye Falls cannot be fully avoided, and the Project will seek to offset the impact by actively investing in local tourism and recreation as a means of realising local potential in tourism as well as supporting community development. A detailed tourism study and impact assessment carried out by an independent specialist will commence in May 2019 to work towards this objective and continued engagement with tourism stakeholders on this topic.

What are environmental flows (EFlows)? Eflows are the quantity, frequency, timing, and quality of water and sediment flows necessary to sustain freshwater and estuarine ecosystems and the human livelihoods and well-being that depend on these ecosystems. An EFlows assessment was undertaken during the ESIA and flows were defined to achieve the following objectives: 1) protect biodiversity including fish spawning and nursery habitats and maintain connectivity between upstream and downstream reaches (fish migration); 2) ensure flows to the Falls all year round (albeit reduced); and 3) preserve the Maungwe and Limbelo fisheries practice. An EFlows management plan, including monitoring of these aspects and adaptive management, will be developed to ensure these objectives are met.

8 Key Benefits of the Project

Employment

With a total cost of over 500 million USD, the Project will be the largest private investment in Western Zambia. Just 2% of the population surveyed as part of the ESIA are formally employed with most practising small-scale farming, harvesting of natural resources from the Zambezi River, and informal trade.

During the construction phase, the Project will have a peak direct workforce of 3,100 people, comprised of a mix of skilled, semi-skilled and unskilled labour. In addition, the indirect and induced creation of employment amongst suppliers and service-providers in the area is likely to be substantial. The EPC Contractor will be required to propose their local content plan to maximise local employment and procurement. This will include a skills identification and training programme to commence six months prior to construction.

Direct employment during the construction phase will be for a period of 3 years, and thereafter the workforce will reduce dramatically to less than 100 direct employees. To assist employees to obtain work elsewhere, the Project will issue skills certificates (from the training programme) and provide references.

Generation of clean, affordable and reliable energy

WPC has estimated the Project's carbon footprint which measures its impact on climate change by estimating the carbon dioxide equivalent it will emit was carried out for the operations phase. Using the G-res tool, developed by the International Hydropower Association, the tool calculates emissions from the creation of reservoirs (in this case a headpond). The Project will create net emissions of 1,045 tons of CO₂ equivalent (CO₂e) per year and have a carbon intensity of 1.25 gCO₂e per kilowatt-hour.

As discussed in the introduction, the Project will offer significant benefits to the national and regional transmission network by providing predictable energy supply which will complement the increase of renewables in the system.

Community Participation/Benefit Sharing

As briefly outlined in the introduction, WPC has signed a Community Participation Agreement (CPA) with the BRE which documents WPC's financial and non-financial commitments to communities. The communities of the Western Province will hold a 6% shareholding in the Project and receive a fixed annual community payment of 500,000 USD from the start of operations. An earlier one-off payment of 500,000 USD will be made at the start of construction.

From the end of the first year of operations, all shareholders of the Project - including the community - will be eligible for a dividend based on the revenues from generation. The community will receive an annual dividend proportional to their 6% shareholding and the maximum this is expected to be is 2.5 million USD in any given year.

WPC and BRE will establish two community trusts to receive and disburse these funds, the Barotse Community Development Trust for the wider Western Province, and the Sioma Community Benefit Trusts (SCBT) for the Project-affected communities. These trusts will fund community development initiatives such as education, sanitation and healthcare improvements. The set-up of the trusts will be the subject of separate meetings with communities in 2019 to determine their governance and objectives. WPC is hiring a trust adviser to assist with this work to ensure the process and functioning of the trusts meets international best practice.

9 Environmental and Social Management

Details of measures to manage the identified impacts are captured in the Project Environmental and Social Management Plan (“ESMP”). This provides a framework for how specific management plans for various aspects of the project will be developed according to the requirements of Zambian law and good international industry practice (“GIIP”).

The ESMP and other plans listed below will be implemented during construction and operation of the project. The ESMP takes each of the impacts identified in the impact assessment of the ESIA and sets out the management measures needed to deal with the impacts, and describes responsibilities for implementing them. Both WPC and the EPC Contractor will develop environmental and social management systems certified to international standards (ISO 14001 or equivalent) to implement the measures in the ESMP.

Some of the key management plans, policies and procedures that will be developed are outlined in Table 3. All the plans will have specific monitoring requirements and there will be regular reporting intervals for Project stakeholders to access the monitoring results.

Who is responsible for implementing the ESMP?

Overall responsibility for the ESMP lies with WPC. However, during the construction phase, the EPC Contractor will have their own environmental and social management plan and system developed to meet the mitigation requirements during this phase. The role of WPC, with the assistance of an owner’s engineer, will be to monitor whether the EPC Contractor is complying with their commitments.

Once the construction phase is complete, the EPC Contractor will ‘handover’ the Project to WPC for operations.

Table 3: Summary of Key Policies, Plans and Procedures

WPC Plans, Policies and Procedures	EPC Contractor Plans
<p>Policies:</p> <ul style="list-style-type: none"> • WPC Sustainability Policy • WPC Health and Safety Policy • WPC Community Health and Safety Policy • Project Code of Conduct • Local Content and Equal Opportunities Policy <p>Long-term Plans, and Plans for Operations:</p> <ul style="list-style-type: none"> • Resettlement Action Plan • Biodiversity Action Plan (terrestrial and aquatic) • Stakeholder Engagement Plan • WPC Human Resources Management Plans • Tourism and Cultural Heritage Plan • Operator’s General ESMP • WPC Community Health and Safety Plan • WPC Occupational Health and Safety Plan • EFlows Management Plan • Flood Resilience Plan • Sustainable Fisheries Programme • Water Quality Monitoring Programme • Grievance Redress Mechanism • Dam Safety and Emergency Response Plans • WPC Sustainable Fisheries Development Plan • Community Development Plan 	<ul style="list-style-type: none"> • Commitment to WPC’s Policies and Community, Health and Safety Plans • EPC General ESMP including noise, air quality, spills etc. • Design Measures • Human Resources and Local Content Plan • Instream Works Management Plan • Water Resources Management Plan, including wastewater and stormwater • Waste and Spoil Management Plan • Erosion and Sediment Control Plan • Quarries and Borrow Areas Management Plan • Supply Chain Management Plan • Traffic Management Plan • Occupational Health and Safety Plan • Emergency Preparedness and Response Plan (incl. Spill Response Procedure) • Biodiversity Management Plan • Camp Management Plan

10 Stakeholder Engagement

Consultation and engagement with people that may be affected by the Project and other stakeholders has been undertaken as part of the preparation of the ESIA, in line with the laws of Zambia and expectations of DFIs and Good International Industry Practice (“GIIP”). As part of this process, a draft Project Stakeholder Engagement Plan (“SEP”) has been developed for the Project in conjunction with the ESIA.

To date, stakeholder engagement has taken place during the scoping phase of the ESIA as well as during the collection of baseline information during the specialist studies. Further public disclosure and feedback meetings have also been held in order to present a summary of the findings of the ESIA (and a non-technical summary) to all interested and affected parties prior to formal submission of the ESIA to ZEMA.

The methods of consultation have included: community meetings; Focus Group Discussions (“FGDs”) with specific groups (e.g. women’s groups, fishermen); questionnaires and semi-structured interviews with people during household surveys; and meetings with individuals or groups of individuals with authority or with knowledge and expertise about a specific subject area (e.g. government departments, NGOs, professionals) . A Project Liaison Committee (“PLC”) and Community Liaison Officers (“CLOs”) have also assisted with distributing information about the Project and receiving feedback/information from affected communities.

The first scoping meeting which started the ESIA process was held at Sankandi Basic School in May 2013. A new round of scoping meetings and consultations was carried out in August to November 2017 following a major design review of the project. Household surveys included a preliminary socio-economic survey carried out in August 2013, a survey of households affected by displacement in February 2016 (under the original scheme), a fishers’ survey and inventory in October 2016, and a new socio-economic household survey carried out for the revised and expanded scheme in October 2017. Public disclosure and feedback meetings were held with key stakeholders at national, provincial and local community level on the east and west banks of the Zambezi in May 2019. Numerous other consultations have also been held in between with groups and individuals. A full record of stakeholder engagement is presented in the main ESIA report and SEP.



Scoping Community Meeting, Sioma Village August 2017



Focus Group Discussion with fishers, Lenge Village, Oct.2016

Main Issues Raised by Stakeholders:

- Loss of land (fields, riverside gardens and grazing grounds) and structures (homes) due to the canal and upstream flooding; how people will be compensated;
- Impact of the project on traditional fishing grounds and other natural resources including access to these;
- How will community benefit from project? Will there be employment opportunities and training?
- Concern over success of Trusts and benefit sharing scheme; need for transparency and accountability in set-up, governance and running of trusts.
- Community health and safety – increase in sexually-transmitted infections (STIs), influx of foreign workers, increase human-wildlife conflict, dam safety including flood hazards;
- Noise pollution during construction and from the power station;
- Pollution due spillages during construction and how water would be purified;
- Lack of communication and the process taking a long time; mistrust through a bad previous experience regarding compensation and relocation when the Community Peace Park was formed;
- Impacts on heritage; how the project may affect the Litunga’s Canal which is a historical site; impact on graveyards near the river.
- Impact on aesthetic aspects of the Ngonye Falls and surroundings and subsequent impact on tourism;
- Biodiversity of river, effects on any endangered and/or endemic fish species, including those with traditional value; changes and loss of habitat due to upstream flooding and reduced flows;
- Headworks creating a barrier to movement of animals including fish and large animals (hippo, crocodile, elephant)
- Effect on breeding pattern of fish and wildlife in the Community Park due to flooding;
- High fish kills due to fish being sucked into the canal/power station and overfishing from improved access to the Falls;
- Requirements for EFlows, and what method was used to determine the flows necessary for ecological purposes.

What are the next steps in the stakeholder engagement process?

Further engagement will be conducted with affected stakeholders to separately develop and disclose the Resettlement Action Plan (RAP). During construction, on-going engagement will take place through Community Liaison Officers (CLOs). This will be frequent because there will be a great deal of activity that will affect people. During operations, after construction is complete, engagement will become steady and routine over the years with the project-based operations teams.

This Non-technical Summary will be made available to any person or organisation that is interested in or affected by the Project (Interested and Affected Parties (I&APs)) so they may review it and provide any comments. In addition, the full ESIA report will be made available in June 2019 on the WPC website to receive comments for a period of 90 days.

Is there an opportunity to comment on the Project?

In addition to the consultation activities that have already occurred, community members and other stakeholders can comment on the Project. If you would like to comment you can contact the Project Proponent at:

Project Proponent	Information
Name of Company:	Western Power Company Ltd
Address:	Fig Tree House, 17 Warthog Road, Kabulonga, Lusaka, Zambia
Telephone:	+26 0211 262 773
E-mail:	info@westernpower.org
Website:	www.westernpower.org (going live by June 2019)

Grievance Mechanism

This is a process by which anyone with a complaint or a concern about the project can raise it. WPC will distribute information on how to raise a grievance using telephone, email, writing a letter, submitting a form or verbally in person. Once the Project receives a complaint from an affected person, they will receive a response to confirm this information has been received, and a date by which they can expect a reply on the matter.