



Deliverable D01b: Outline Business Case

FP20, KAZA Water Infrastructure for Livelihoods: KAZA Zambia Bankability (Phase III)

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List of Acronyms

Acronym	Long-Form
CBA	Cost-Benefit-Analysis
CLTS	Community Led Total Sanitation
CRIDF	Climate Resilient Infrastructure Development Facility
GBP	Great British Pound
GMA	Game Management Area
HWC	Human-Wildlife Conflict
KAZA	Kavango Zambezi
KII	Key Informant Interview
KM	Kilometre
MLGH	Ministry of Local Government and Housing
NWASCO	National Water Supply and Sanitation Council
O&M	Operation and Maintenance
OBC	Outline Business Case
TFCA	Trans Frontier Conservation Area
TNC	The Nature Conservancy
VAC	Village Area Committee
WASH	Water, Sanitation and Hygiene
WASH	Water Supply and Sanitation
ZAWA	Zambian Wildlife Authority

Executive Summary

This Summarised Outline Business Case (OBC) outlines a preliminary assessment of the KAZA Zambia project sites with the aim of identifying and, where possible, addressing significant risks to the successful implementation of water supply and associated livelihood-related infrastructure. It also serves to ensure that economic and financial considerations are explicitly considered in the conception, design and development of the project.

The KAZA Zambia portion of the project forms Phase III of the work that CRIDF is undertaking in support of the Kavango Zambezi Trans Frontier Conservation Area (KAZA TFCA). The Trans Frontier area spans Angola, Botswana, Namibia, Zambia and Zimbabwe and covers approximately 444,000 km². While it is an important area for tourism and wildlife conservation, the area also houses an estimated three million people, many of whom depend on natural resources for their livelihoods. In the Zambian portion of the KAZA area, communities are particularly isolated and have almost no access to public services such as formal water supply or electricity. These communities face serious vulnerability to climate shocks and are reliant upon rain-fed agriculture to support their livelihoods.

The KAZA Water Infrastructure for Livelihoods projects aim to pilot a new approach to building resilience by providing small-scale irrigation and livestock watering in addition to securing a safe water supply for these communities. It is anticipated that this infrastructure should be able to provide income-generating livelihoods to the beneficiary communities who in turn are expected to maintain and operate the infrastructure.

Five pilot project sites had previously been identified within the Zambian portion of KAZA area during a scoping trip in March 2015. These sites, all small villages within the Moomba Chiefdom, face significant challenges with regards to access to water and have limited livelihood opportunities. While the aim of this project is to provide better conditions for these communities, it also serves to unlock further funding to expand such an approach in the KAZA TFCA through its successful implementation.

While this project design is expected to result in improved livelihoods and in turn provide an important example of an approach to building resilience in the KAZA area, the design of the project is sensitive as will be explained below.

Key risks:

Ability to pay

Communities currently have significantly limited ability to pay for infrastructure, although they demonstrate strong commitment to contributing to on-going costs of the project. However, if they are able to convert the gains from the infrastructure into cash, then their ability to pay will increase dramatically. Marketing constraints are a challenge for most of the villages, as the villages are remote and sometimes a six hour walk to the nearest market. Thus, the infrastructure design should endeavour to keep on-going costs of operating and

maintaining the infrastructure low. Additionally, marketing opportunities should be investigated and supply chains strengthened in order to facilitate cash-generation in the communities.

Site location and community buy-in

Community buy-in is an integral part of the success of a project of this nature, where successful utilisation and maintenance of the infrastructure depends on community collaboration (at least in terms of funding its on-going costs). This is only possible if community members take ownership of the infrastructure. Four out of the six locations visited showed clear community buy-in for the location of the project site, whilst two of them were more challenging:

- 1) The first site which requires careful consideration of the precise location of the infrastructure is that of Kamwi. What was previously identified as Kamwi is actually Mpengu. However, Kamwi itself seems to be a more suitable site as it is the centre of the four beneficiary communities. Mpengu, on the other hand, is on the outskirts of these other communities.
- 2) Secondly, the site for Mabwe, one of the original five villages identified in March 2015, proved to be contentious within the community, and the proposed site, which falls between three other villages, is not appropriate for the envisaged design of these pilot projects. While it is suggested at this time that the site is put in Mudobo village this decision must be made with full institutional buy-in.

Migration and natural resource damage

The Mulobezi GMA is a sensitive ecosystem – bordering the Kafue National Park, the area has pristine natural beauty, including wetlands and forests. However, these attributes are already attracting migration into the area, which is accompanied by land clearing, deforestation and poaching. While the local communities are in desperate need of improved water supply and a means of improving their livelihoods, there is the real risk that these improvements will encourage faster migration into the area. Until now, migration has been limited by water shortages, hot climates and disease; however, investments may signal a means of overcoming these difficulties. Without adequate management of this ecosystem, the effect would be devastating.

Institutional arrangements

The successful implementation of the scheme involves the establishment of a water committee to oversee operation and maintenance of the infrastructure. Additionally, the communities must decide who is allocated land within the irrigated garden and how this should operate (as individual plots or collaboratively). There must also be land set aside for the project which should be done without causing displacement in the communities.

Recommendations:

There is an urgent need for improved water in the area, as well as increased investment into improving the livelihoods of the communities within the Mulobezi Game Management Area (GMA). This project will help in addressing the domestic water deficit in the area as well as improve livelihoods, health and productivity,

particularly for women and children and enhance community resilience to climate change. In turn it is expected that the project will reduce the dependence of the communities on wild meat and should reduce poaching as well as human-wildlife interactions. In conclusion, it is recommended that the project proceed to a feasibility study. The project should progress to full feasibility. However, the key risks identified in this OBC should be addressed in further project development.

Purpose

A key component of the project is a preliminary assessment to ensure that economic and financial considerations are explicitly considered in the project conception, design and development. This preliminary assessment takes the form of a high-level Outline Business Case (OBC).

Specifically, the OBC serves to assess the project in terms of the following parameters:

- Demand risk;
- Expected scope and level of investment;
- Expected benefits; and
- Institutional arrangements necessary for sustainability
- Feasibility for cost recovery during the operation and maintenance (O&M) stage

The OBC therefore provides an outline justification of the project as well as a means to flag and highlight any context specific economic, financial or institutional issues that may impact the viability of the project. The OBC can also inform and guide the full feasibility study including the technical design and economic Cost-Benefit Analysis (CBA).

This OBC report includes the following key sections:

- Section I presents a brief project background;
- Section II presents the socio-economic context in which this activity is being undertaken;
- Section III presents a demand analysis;
- Section IV provides an overview of the preferred technical solution and expected investment;
- Section V examines the proposed institutional arrangements;
- Section VI outlines the expected project impacts, key risks and financier engagements
- Section VII details the engagements that have been held with financiers until now for this activity;
- Section VIII provides recommendations for next steps.

Section I: Project Background

Covering approximately 444,000 km², the KAZA TFCA encompasses 36 formally proclaimed protected areas, comprising national parks, game reserves and game/wildlife management areas as well as conservancies and communal areas. It is also home to an estimated three million people, many of whom live in poverty and most of whom are dependent on agriculture and other natural resource use for their livelihoods.

In the Zambian portion of the TFCA, all five of the beneficiary sites are near to the Kafue National Park and experience some level of human wildlife conflict (HWC). The villages surrounding Mabwe are particularly vulnerable to the effects of wild animals due to their location adjacent to the buffer zone of the National Park. Those living in or near these areas are often badly affected by wild animals attacking people, eating their crops and killing their livestock. Water resources are inadequate, and in a dry year like 2014-15, crop damage by wildlife is exacerbated as animals move closer to human settlements near water sources.

In addition to the HWC challenges facing these communities, people and their livestock must often travel great distances to obtain water, especially in the dry season. While these constraints have kept the population within the area somewhat limited, its virgin land is increasingly attracting migration into this sensitive area.

The KAZA Water Infrastructure for Livelihoods projects aim to provide domestic water supply for vulnerable communities through boreholes, while building resilience to climate change through livelihood investments in small-scale irrigation equipment and livestock watering troughs. They also aim to increase climate resilience through agriculture and WASH training which accompanies this infrastructure.

Five sites were originally identified during a consultative meeting in March 2015, held at the palace of His Royal Highness Chief Moomba. The second Scoping Visit in December 2015 aimed to finalise the locations of the proposed project and to assess the need and thus design of the infrastructure. Intensive meetings were held at all of the five sites, along with assessment of the location of each infrastructure. As a result of these meetings, one site was added to the suggested sites, while one site has been flagged as unsuitable and not included. The following are the proposed sites:

1. Silangi village
2. Munego village (Namuse area)
3. Chinyama (Stondo area)
4. Lyoni village
5. Kamwi
6. Mabwe/Mudobo

Section II: Socio-Economic Context

The Mulobezi GMA, coterminous with the Moomba chiefdom, has an area of about 3,430 square kilometres and lies south west of the Kafue National Park.

Figure 1: Typical Mulobezi GMA landscape



The communities in this region are currently found to be facing the following economic challenges:

- Low incomes: Current maize yields are in the region of 10-20 bags/ha.¹ The local selling price of maize is ZMW 90/bag, implying a gross crop income of roughly ZMW 900-1,800/ha. To put this in perspective, local school fees per year are ZMW 2,220 for boarders and ZMW 846 for day scholars.²
- A lack of irrigation: Farmers indicated that they are not able to cultivate every year because of water challenges.
- A lack of market linkages: The closest significant markets are at Mulobezi, Sesheke and Livingstone; but transport remains a challenge because there are few vehicles, making the cost of public transport high (around ZMW40 per trip to Mulobezi from some of the communities).
- Human-wildlife conflict: Human wildlife conflict (with elephants and kudu in particular) is also an issue in the Moomba chiefdom. The area lies within the Kavango-Zambezi Trans frontier Conservation Area (KAZA) and various wildlife corridors. There is the need for greater engagement between the former-named Zambian Wildlife Authority (ZAWA) and the community in order to mitigate the hardships felt

¹ Interview at Munego village, December 2015

Indicated in Key Informant Interviews (KIIs) and Focus Group Discussions (FGDs) with the Malombe community in 27 & 28 November 2014

² CRIDF (2015). Sioma OBC

by human wildlife conflict. Communities expressed frustration for the fact that if they experience conflict with a wild animal, such as injury, crop damage or even death, they receive no support from ZAWA, but when a wild animal is killed, ZAWA will intervene.

Population

The 2010 census counted a human population of 2,343 in 533 households in the chiefdom. Population density is low and homesteads are scattered in low-density settlements. In terms of the beneficiary communities, household numbers range from 22 to 60, as presented in Table 1 below.

Table 1: Number of beneficiary households per site

Site location	Estimated number of beneficiary households	Beneficiary villages and associated number of households
Silangi village	23	Silangi (23)
Munego village	65	Munengo (40) Lyomboko (25)
Chinyama village	39	Chinyama (15) Muka (6) Kakoko (4) Myuni (8) Sachaba (6)
Lyoni village	44	Lyoni (19) Kasempa (11) Sidambi (4) Mudenda (8) Chipangole (2)
Kamwi village	60	Kamwi (17) Mpengu (16) Kabwaya (10) Simuendengwe (17)
Mabwe/Mudobo	34	Mudobo (6) Munchindu (14) Chijumba (13)

Economic activities

The economic activities of the villages are centred primarily on subsistence agriculture. Soils in the area are sandy and infertile, and at best produce a crop of maize for three years in a row before needing to lie fallow. None of the communities visited in the area use fertilizer or certified seeds, due to limited ability to pay for

such inputs as well as the distance to Mulobezi. As a result, forest clearance is taking place at a rapid rate for new agricultural fields.

Eighty-four per cent of households surveyed in the GMA by a The Nature Conservancy (TNC) study in 2014 reported that they had experienced food shortages in the previous 12 months, a finding that was corroborated during this site visit where all the villages visited reported food shortages. As coping mechanisms, communities rely on wild fruits, roots and casual labour in exchange for payments in produce, although this too is limited in the area. They would also reduce the amount of food eaten by the family by decreasing the number of meals and portion sizes eaten per day. Drought, a lack of training and no farming inputs were all reasons cited by the communities for food shortages in the area.

The predominant crop grown in the area is maize, which requires no irrigation. However, these yields are low due to low quality seeds, poor quality soil and no inputs being used. In the communities close to the *dambos*³, a number of much healthier food gardens were observed. These were fenced to protect the crops from livestock and wildlife, and crops included maize, Chinese cabbage, rape and sweet potato. These crops are most prevalent between April and August, after which time the water dries up.

With no formal employment in any of the villages and no welfare support, many of the women brew homemade beer which they sell to surrounding communities. They also used to sell a foraged root in Mulobezi which is used for beer brewing; however, ZAWA has subsequently made the harvesting of the root illegal to protect the remaining stock for elephants, which love eating the root.

Figure 2: Foraged root used for beer brewing, the harvest of which is now illegal



³ Term used to describe the shallow wetlands in Zambia

In normal years, yields from maize are only sufficient for home consumption without substantial surplus available to be sold. It is common for communities to keep chickens, ducks, cattle and goats, although the sale of these animals is usually only done to pay for large lump-sum payments such as school fees once a year. Women in Kamwi village were also involved in the sale of cow's milk.

Social Services

The Mulobezi GMA relies on Moomba for its health facility, which reports that the most common illnesses in the area are malaria, bilharzia, diarrhoea and dysentery and trachoma. The health official interviewed believed that these were all caused or related to poor water supply in the region, particularly those communities which rely on streams for their drinking water. The health facility serves 3,336 people, with an average patient intake of 500 per month.

There is a government school in Moomba which serves the surrounding villages, however all six sites visited rely on community schools due to the long distance to reach Moomba.



Figure 3: Moomba clinic which serves the Mulobezi GMA

Section III: Description of each site

Silangi village

The Silangi site consists of approximately 23 households and is located approximately 6 km from Chief Moomba's palace. Currently, the villages collect water from shallow wells in the stream about 0.75km away. During the months of November and December, the water quality deteriorates rapidly as water dries up, and is reported to be black in colour.

In terms of the livelihoods in the villages, households keep chicken and ducks and cattle if they can afford to. The main crop grown is maize, although they also grow a small amount of groundnuts each year. The community do not receive any extension support for their agriculture. Additionally, human-wildlife conflict was vocalised as a concern for the community, especially in the dry season. Currently the community does not sell any crops, but there is some informal beer-brewing taking place by the women.

The community expressed a desire for a community-run food garden as they were concerned that water would run out if everyone was using it independently.

Munego village

The Munego site (previously called Namuse in the Scoping Study) would cater for 65 households. It is near to a broken hand pump, which was funded by JICA in 2002. The community explained that the borehole broke due to it being too deep to handle the friction of a hand-pump. Currently the communities fetch their water from shallow wells in the stream about 0.5km away. The cattle also use the stream, although from further downstream.

Maize is the predominant crop grown, although sweet potatoes are also grown nearer to the stream where there is more moisture. The community seeks piece-work from the Kalombe area or Kasima, although these areas are a four hour walk away. Most years they are unable to grow sufficient crops for household use and report that three years ago was the last time they were able to sell excess crops. Munego is very isolated, being around a 6-hour walk to the closest hospital in Mulobezi. Moomba is even further away than this. Similar to Silangi, access to the area is served by a poorly maintained track.

Chinyama (Stondo area)

The Chinyama site was added to the project list during site visits in December 2015 after the team visited what had previously been called the Namuse site (see Munego above). It was obvious that there was a real need for improved water supply in Chinyama, but that this village would not be catered for by the Munego borehole. Chinyama has approximately 39 beneficiary households, all of which fetch water from the nearby stream. The closest borehole to Chinyama village is 7 kilometres away. It takes around two hours to walk to and from the stream to collect water.

Again maize is the primary crop grown and most of the community is involved in agriculture. Some of the women are able to grow groundnuts and beans in some years, and would take these to Mulobezi to sell on an ox-cart. From there it would cost ZMW40 to transport them to Livingstone, where better markets exist. Human-wildlife conflict is not prevalent in Chinyama area.

The Chinyama village makes use of Sashili clinic.

Lyoni village

The Lyoni site caters approximately 44 households. The beneficiary households currently access water shallow wells in the stream. Cattle are also watered in the same stream, although not many households have cattle. Water at Lyoni village is dark in colour and murky, and is difficult to boil due to the fact that it becomes thick and foamy. Water is therefore often consumed unboiled. Additionally, boiling the water requires wood which is labour intensive to collect.

Most of the community are involved in agriculture, farming around 0.5 ha per household in the absence of oxen, and 2 ha with oxen. The crops they produce do not last the full year, and many households must seek piece-work where possible to augment supplies. Access to the site is by unsurfaced and poorly maintained narrow tracks, making it very difficult and arduous. Additionally, Lyoni is located 15 km from Chief Moomba's palace.

It is important to note that people in Kasempa village, which is considered a beneficiary for the site, would have to cross the stream to get to the proposed borehole site and that this may be potentially dangerous during the rainy season when the river is in flood. It is important that this risk is investigated before detailed design of the proposed infrastructure is done and that the safety of the Kasempa village is ensured.

Kamwi village

Kamwi village was identified previously, although the actual site was previously located in Mpengu, one of the four beneficiary communities. While Mpengu functions as an informal meeting point for community meetings, it is one of the more distant areas. Kamwi, on the other hand, is central to the four beneficiary communities and was identified as a more suitable site. The site would cater for approximately 60 households.

The Kamwi community is 1.6 km from a broken hand-pump. The community reported that it broke after only one week of operation and was pumping up mud. They currently access water from the stream and small shallow wells which are around 1 km from the communities. Interestingly, the community was willing to contribute ZMW1 at the time, but were never required to pay as the pump broke. Kamwi doesn't experience significant HWC, although community members reported damage from cattle in the absence of fences as well as wildlife damage in the fields in the *dambo*.

There is some potential for political interference as a member of the Village Area Committee (VAC) was lobbying for the borehole to be sunk at Mpengu as it close to where most meetings are held. The community however were vocal in opposing this suggestion.

Mabwe/Mudobo

During the March 2015 scoping visit, community representatives identified a proposed borehole site in undeveloped bush at a point where a proposed new community school was to be constructed. The main village of Mabwe is located some 4 km north of this site and has an operational borehole and community school. There has reportedly been discussion about moving the Mabwe community school from there to the new site, which is some 750 m from Mudobo village. This seems impractical. Meanwhile, there is no clarity as to when a school might actually be constructed at the new site.

Mudobo village was identified as a suitable site for a borehole to serve that community, Chijumba (ten minutes' walk to the north) and Munchindu (15 minutes' walk to the south). The borehole would currently serve 34 households in these three communities, although new homesteads are reportedly being developed in the area.

Section IV: Demand Analysis

Population

As noted in Section II, the estimated combined household numbers of the five sites identified as beneficiaries is about 232. According to ZamStats, the average household size in the Southern Province is 5.4.⁴ Key informant (KI) interviews suggested that in Silangi, households sizes varied between a minimum of 5 and a maximum of 10, whereas in Kamwi, household size ranged from 4 to 10.⁵ It is thus likely that average household size may be slightly higher than that of the provincial average, but that 5.4 people household is considered a fair estimate.

According to the 2010 National Census Report, the average household size in the Southern province is 5.4, with an average rural population growth rate for the Southern Province for the period 2000-2010 estimated at 2.8%. This growth rate has been used for the projection of population at all the project sites over 20 years to 2035.

Table 2: Beneficiary population per project site

Village	Household size	No .of households		Population	
		2015	2035	2015	2035
Lyoni	5.4	44	69	238	373
Silangi	5.4	23	36	125	195
Munengo	5.4	65	102	351	551
Chinyama	5.4	39	61	211	330
Kamwi	5.4	60	94	324	508
Mudobo	5.4	34	53	184	287

The estimated domestic and livestock water demand in the project areas, has been based on the 2035 projected human and livestock populations and per capita consumption of 20 l/d/person and 30 l/unit respectively, and is summarised in Table 3 below. The estimated domestic demand per village is depicted in Table 3 below.

Table 3: Estimated human and Livestock water demand (2030)

Project area	Water demand in m ³ /day		
	Human	Livestock	Total
Lyoni	7.5	8.3	15.8
Silangi	3.9	4.3	8.2
Munengo	11.0	12.2	23.2
Chinyama	6.6	7.3	13.9
Kamwi	10.2	11.3	21.5
Mudobo	5.7	6.4	12.1

⁴Discussions with project team, site visit December 2015

⁵ Site visits, December 2015

Status of current WASH facilities

Water supply in the Mulobezi GMA is significantly limited. There are a number of hand-pumps, placed often at schools or near the Headmen's houses. Some of these are, however, broken (such as the borehole at Munengo and Kamwi villages).

Out of the six sites visited, only Mabwe had a functional borehole, while the other five sites all relied on shallow wells dug in dry river beds. None of them had any means of protecting the sandy walls of the wells from collapsing, and water quality in most of them looked extremely poor.

Cattle and goats are watered from the limited surface water that remains in the streams, and one key informant reported that four cattle in his herd of 12 died the previous year due to poor water quality.



Figure 4: Shallow well dug near Munengo village

There is thus a pressing need for more adequate domestic water supply in all of the five identified sites, along with adequate irrigation infrastructure. Food gardens would be a major additional contribution to basic human needs in the area.

In terms of sanitation, most communities have built some pit latrines and know about the risks of open-defecation. Hand-washing is also understood to be important to good health practices. However, communities have significantly limited resources to purchase soap and to do further improvements to their sanitation facilities. A WASH training programme would thus be an essential part of the design of the project to ensure that the full benefits of the infrastructure flow to the community. Community Led Total Sanitation (CLTS) has been reportedly done in Silangi, which is the closest community to Moomba. It is hoped that this will be conducted in other areas, but access to these communities is limited by the lack of transport to enable health staff to conduct training.

Site location and community buy-in

There is institutional buy-in for the project across a range of levels: at the local government level, the Kazungula District Council has been consulted with on two separate occasions, while His Royal Highness, Chief Moomba, has expressed his support of the project. In terms of wildlife and natural resource management in the area, there is buy-in for the project from The Nature Conservancy (TNC) and ZAWA, who have already made in-kind contributions to the project in terms of time, knowledge of the area and equipment for the site visits. Finally, there is community buy-in for the project in terms of its technical design, as well as a good understanding of the operational requirements of the infrastructure within each of the identified communities. Communities are all aware of the fact that they will need to make a contribution to the cost of the infrastructure (which may possibly be earmarked to cover its operation and maintenance).

In terms of site locations, four of the beneficiary communities (Silangi, Munengo, Chinyama and Lyoni) have a clear idea of where the infrastructure should be placed, whilst two of the other previously identified sites must be carefully re-evaluated.

The first of these is Kamwi village – a site which is expected to serve the communities of Mpengu, Kamwi, Simuendengwe and Kabwaya. During the initial scoping trip, a site in Mpengu was identified as the proposed site for the infrastructure. However, during consultations with community members during the site visit in December 2015, Kamwi village was identified as a more appropriate site due to the fact that it was a more central location. This change in location caused some disturbance in the community as Mpengu served as a meeting point for local government and some of the community felt that it was better suited. One key informant also expressed concern that Kamwi had previously been earmarked by CRRB as a potential beneficiary site for a borehole. After discussions with TNC, it was agreed that these funds were not forthcoming, and from the communities point of view Kamwi was a more appropriate site.

The second challenging site was that of Mabwe. The site was titled Mabwe after the scoping trip, however, the site is located approximately four kilometres from Mabwe itself. While Mabwe has a functional hand-pump, the site, which is meant to be the future location of community school, does not have a water supply. The site is meant to cater for three or four other villages, including Mudobo, Chijumba, Muchindu and Mandyoli, but is currently in undeveloped bush. The site is thus inappropriate for the type of approach that the KAZA Water Infrastructure for Livelihoods projects aim to pilot, which includes water supply and small scale irrigation and livestock equipment. Without any households living at the project site, and with distances being relatively far between beneficiary villages, the site is not ideal. For the time being, the project site has been paused,

however, clear communication with the stakeholders involved is essential to manage community expectations. It may be that the site could move to one of the villages, such as Mudobo, however, there are only a limited number of households in these settlements and even further from the other beneficiaries.

These complex institutional arrangements suggest that the selection of the location of the borehole in Kamwi should take the community's expectations into account and that sufficient consultation happens with all four beneficiary villages. In Mabwe, stakeholders must understand why the site has not been chosen as a pilot site at this stage. It is essential that further work in the area continues to be done through community consultation and that further buy-in is sought when the precise location for each site is chosen. Additionally, while there is a surplus of land available at all the villages, it is important that land arrangements are done explicitly.

Ability to pay

The proposed design of the project envisages water supply for domestic, livestock and agricultural purposes through infrastructure which is 'owned' by the beneficiary communities in the sense that they will be able to utilise it, but must also be responsible for its on-going maintenance and operation. As noted in Section II: Socio-Economic Context, beneficiary communities have extremely limited financial capacity, thus restricting their ability to pay for additional services, however essential these are. While the infrastructure is expected to result in increased crop production and diversification, along with livestock benefits, only through converting these benefits into money will yield a greater ability to pay to operate and maintain the infrastructure.

As a direct result of these challenges, two recommendations arise: 1) the design of the infrastructure should keep on-going costs to a minimum, through the use of solar pumps for example, especially with the agricultural infrastructure where on-going costs are expected to be relatively high; and 2) it will be necessary to include a significant training and extension work component on agricultural practices in the project, covering items such as crop rotation, the use of inputs and the operation and maintenance of the infrastructure.

In the case of the former, it will be useful to investigate innovative technology, which can be maintained by the community itself without the need for outside contractors. Additionally, the availability of parts locally (in Mulobezi or Moomba) should also be a primary consideration in the design. It may be necessary to choose a lower project life time in the appraisal for these reasons, depending on the technical design.

Section V: Technical Design Solution and Investment Cost

The overarching KAZA Water Infrastructure for Livelihoods in Zambia project seeks to provide adequate water supplies to five or six vulnerable villages from groundwater. Additionally, the project aims to pilot climate-resilient infrastructure in the form of small-scale irrigation and livestock watering infrastructure, with associated agricultural and sanitation training.

The proposed initiative in the Mulobezi GMA therefore consists of the following:

- drilling of new boreholes and fitting them with solar pumps;
- provision of limited water reticulation infrastructure from the water source to delivery points for domestic use, livestock watering and irrigated gardens;
- provision of small (1 ha) fenced community vegetable gardens that will derive water from the developed water sources;
- promotion of appropriate latrines to improve the sanitation of the communities;
- promotion of and improving the understanding of the need for improved hygiene;
- one year extension inputs on gardening and conservation agriculture (with startup inputs)

Figure 5: Example of solar pump used in the KAZA Zimbabwe area



Source: CRIDF (2015). Technical Report. KAZA Water Infrastructure for Livelihoods Intervention Phase II

Implementation options and costs

Preliminary cost estimates have been based on the drilling of large diameter gravel packed boreholes at the six sites occurring in Kalahari sand. Equipment costs for all sites have been based on the installation of solar powered pumps and drip irrigation systems. These high level cost estimates have been developed in the absence of surveys and detailed design of components of the scheme.

It is estimated that the KAZA project in Zambia, exclusive of the provision for start-up, will cost **GBP 196,973**, broken down as summarised below.

Table 4 Cost estimates per site

Project Area	Cost GBP
Lyoni	32,922
Silangi	31,871
Munengo	33,763
Chinyama	32,572
Kamwi	33,273
Mudobo	32,572
Total	196,973

It is important to note that these costs are not inclusive of any agricultural extension support or the sanitation programme. It has, however, been agreed that both these training programmes are essential to the success of the scheme and should be costed as part of the upfront investment.

Section VI: Institutional Arrangements

The beneficiary communities fall within the Kazungula District of Southern Province, however, the rural centre of Mulobezi, on which many of the communities depend for services such as health care, falls within the Sichili District of Western Province. The Moomba Chiefdom is represented by one councillor on the Kazungula District Council. The Kazungula District Council is, however, approximately a five hour drive from the area on poor roads, and remains under-catered for in terms of public services.

It is anticipated that the water supply and livelihood infrastructure for this project will be operated and maintained by the communities themselves, without the need for government involvement. However, the Kazungula District Council implements national policy on rural water, emphasising that the development of such infrastructure should be demand-driven. There is a formal procedure for the submission of applications to the Council for the installation of water supplies, and communities are expected to make a cash contribution of ZMW 1,500 before drilling starts.⁶ It would be useful if this money could be earmarked to cover the on-going costs of the infrastructure, an option which should be explored during detailed design. Additionally, it is recommended that support is provided to communities in making such an application and in establishing a water committee early on in this process.

The water committee is expected to manage the resource sustainably, including the allocation of water to various users and uses, supervision of O&M and the collection of user fees that can be used for O&M costs. Water committees should be formalised and supported by the local District Council where possible.

CRIDF's role in the project is one of preparation support and stakeholder engagement, as well as in accessing finance for the project's implementation if deemed appropriate. Table 4 below provides an outline of the key stakeholders involved in the project development, implementation and operation.

Table 5: Key project stakeholders

Stakeholder	Role
Ministry of Local Government and Housing (MLGH) <ul style="list-style-type: none"> Department of Housing and Infrastructure Development (DHID) 	Overall policy guidance and political support; would also assist in resource mobilisation
Kazungula District Council	Implementation support; guidance on district planning and activities to optimise location of boreholes
TNC	On-site support and facilitation
ZAWA	On-site support and wildlife policy guidance
His Royal Highness, Chief Moomba	Local political support, including in the allocation of new land to farmers if necessary
The Headmen of the beneficiary communities	Provide oversight into the formation of the water committee, allocation of land within the gardens and

⁶ Interview with Kazungula District Council, December 2015

	providing a platform for community engagement
Silangi, Munengo, Chinyama, Lyoni and Kamwi community members	Beneficiaries

There is institutional buy-in for the project across a range of levels: at the local government level, the Kazungula District Council has been consulted on two separate occasions, while His Royal Highness, Chief Moomba, has expressed his support of the project. In terms of wildlife and natural resource management in the area, there is buy-in for the project from The Nature Conservancy (TNC) and the former Zambian Wildlife Authority (ZAWA), who have already made in-kind contributions to the project in terms of time, expertise and equipment for site visits. Finally, there is community buy-in for the project in terms of its technical design, as well as a good understanding of the operational requirements of the infrastructure within each of the identified communities. However, the location of two of the previously identified sites must be carefully re-evaluated.

Section VI: Expected Project Impacts, Key Risks and Financier Engagement

Project Impacts

The implementation of this project will be the first and most fundamental step in addressing the large water infrastructure deficit in the area in terms of domestic supply for the communities. The project is ultimately a pro-poor social intervention. The direct socio-economic benefits of the project include improved livelihoods, time savings, health improvements, increased productivity, reduced human-wildlife conflict and improved community resilience to climate change. Ultimately, however, the project will also pilot an approach to building resilience in vulnerable communities through the combination of water supply, small-scale irrigated agriculture and possible other livelihood interventions such as livestock watering facilitates and conservation agriculture training. The benefit of a successful pilot project of this nature is long-run in nature and may prove too uncertain to quantify, however, in terms of unlocking funding from other institutions wanting to do work in the area, its value should not be overlooked. When combined with the coordinated approach to piloting such projects in Namibia (Phase I) and Zimbabwe (Phase II), KAZA/CRIDF has potential to provide significant returns to the TFCA.

Improved Livelihoods

Improved livelihoods will be a function of increased crop production through irrigation infrastructure, as well as in improved livestock production through livestock troughs. Secondary livelihood benefits are likely to stem from better nutrition and diets, which in the long run are likely to decrease illness. In children, diversified diets may result in improved concentration levels, as well as in increased intellectual and physical development.

Time

Currently, women and children in the Moomba chiefdom spend a significant part of their day collecting water. Key informant interviews in all six of the locations visited expressed frustration at the length of time and physical effort of such a task. Streambeds are located approximately 0.5 – 1.5 kilometre from the villages and takes on average 30 minutes per trip. Depending on the number of people in the household, up to 5 or 6 trips need to be taken per day.

The opportunity cost of this time for women is the forgone work in agriculture or beer brewing activities, although at present this value is limited by the inputs available to the community. While there is land available for additional agriculture, households are limited by the ability to clear and cultivate land. Women reported that additional time would enable them to attend to their other household chores, or even travel to their nearest market to sell produce. The opportunity cost of this time for children is attendance at school. In addition, the physical fatigue resulting from this exercise of water collection results in negative impacts on the health of women and children.

Health

Access to improved quality water, coupled with a strong WASH training programme, would decrease the incidence of water-related illness, such as diarrhoea, cholera and bilharzia. There is rarely adequate water to practice good hygiene such as hand washing and as such, diarrhoea is a common illness in the area, particularly in the dry season.

Health will also be positively impacted by higher production of crops and diversified diets. Malnutrition is a challenge to households in the Moomba chiefdom due to a lack of adequate food supply, while inadequately diversified diets (and a lack of protein) is also be a challenge in some communities (particularly those which do not grow groundnuts).

Productivity and economic multiplier effects

Labour productivity will be positively impacted through additional time for economic activities, improved health of the community, and increased school attendance. As such, an adequate domestic water supply is an essential basis for economic development.

Moreover, with higher quantities of crops being produced and a greater variety available, the local economy in the area will be stimulated with more trade and a greater quantity of cash in circulation.

Decreased Human-wildlife conflict

The Mulobezi GMA is prone to human-wildlife impacts, with a baseline KAZA study finding that communities reported that 30% of their crops are destroyed by wildlife and 14% of cattle are killed by wildlife. The proposed infrastructure will see fences built for the food gardens in an effort to avoid HWC, while permanent water supplies for livestock are expected to reduce livestock losses due to the fact that livestock will no longer need to travel far distances to find water.

Climate resilience

Climate resilience would be ensured through the following channels:

- Permanent water supply through deep-drilled boreholes
- Decreased risk of crop failure due to drought
- Improved agricultural practices which are climate smart

At the most basic level, the project will increase the community's resilience in this context, by providing a reliable and safe supply of water for domestic consumption throughout the year, along with a host of livelihood benefits.

Key Risks

Table 6: Key risks and proposed mitigation measures

Risk	Mitigation
Acceptance of user fees in the community	Given that no user fees are currently levied for accessing water from the hand-pumps, it may be difficult to enforce the discipline of payment for water usage. CRIDF should work with the communities in establishing a water committee early on in the project who can take responsibility for sensitising the community to the idea. The council must ensure that user fees are affordable for community members, and sensitise the community on the need for regular payment for water usage, particularly for the O&M of the water infrastructure.
Financial sustainability during the O&M phase	Currently the communities have significantly limited ability to pay for the on-going costs of the infrastructure. CRIDF must ensure that the technical design accounts for this and that market opportunities are explored. Additionally, water committees, who will be responsible for determining user fees and collecting them, should receive sufficient training in the institutional arrangements necessary for the successful operation of such a scheme (including how to deal with a household who will not pay and one which cannot pay). Fees are expected to meet expected O&M requirements at a minimum, as well as be affordable for the community. There may be potential to institute a differentiated tariff for the different consumer segments, such as those which use the irrigation, livestock or domestic components of the infrastructure.
Replacements of parts and skills required	There is a high risk that the skills or parts required to fix any part of the infrastructure are not available in the community, This is evidenced by the fact that there are a number of dysfunctional boreholes in the area which have not been fixed since they broke. In order to mitigate these risks, it is necessary that the project design accounts for parts which are easy to access in Mulobezi, while ensuring that community members are taught how to fix the infrastructure themselves.
Migration and unsustainable use of natural resources in area	The Mulobezi GMA is a sensitive ecosystem – bordering the Kafue National Park, the area has pristine natural beauty, forests and virgin land. However, these attributes are already attracting migration into the area, which is accompanied by land clearing, deforestation and poaching. While the local communities are in desperate need of improved water supply and a means of improving their livelihoods, there is the real risk that these improvements will encourage even faster migration into the area. Until now, migration has been limited by water shortages, hot climates and disease, however, investments into improving these services may signal additional support. Without adequate management of this ecosystem, the effect would be devastating. If the project goes to implementation phase, discussions must

	be had with TNC and ZAWA in the region to discuss this risk and to find sustainable ways to mitigate it.
Water availability to meet demand	Detailed geotechnical studies would be conducted during the feasibility phase to confirm that there is sufficient water availability to meet demand.
Conflict in site locations	During the site visit, Kamwi village was identified as a location, which needs further discussion with community members to finalise the site location. Additionally, the Mabwe site will be sited at Mudobo as the proposed site was considered inappropriate for the pilot phase of the project.
Project procurement strategy	Timely discussions with the District Council, KAZA and CRIDF to determine a modality of infrastructure delivery that meets procurement procedures and due diligence required to unlock grant funding is needed to maintain community support for the project.

Financier Engagement

The most promising funder engagements thus far, with respect to the KAZA Water Infrastructure for Livelihoods project, have been conducted with the World Wildlife Fund (WWF) South Africa; the Global Environment and Technology Foundation (GETF) – who is responsible for managing the CocaCola Foundations Funds for water sector targets in Africa; and KfW.

Each of these institutions has indicated significant interest in the KAZA Water Infrastructure for Livelihoods project, and may have funds available to contribute to the development infrastructure. The interest shown however is at the level of the broader project rather than this pilot stage. CRIDF has therefore mobilised work⁷ to develop a larger financing strategy for the broader KAZA Water Infrastructure for Livelihoods project through increased engagement with key stakeholders and potential funders, and an event in which promising stakeholders can workshop an appropriate collective financing strategy for the KAZA vision. This financing strategy can then be shared as a model for funding such work in other TFCAs in the region.

Potential for CRIDF funding

The two previous KAZA Water Infrastructure for Livelihoods projects (Phase I: Namibia and Phase II: Zimbabwe) have met the CRIDF requirements for eligibility and were aligned to the principles and objectives of the Facility, although CRIDF finance has been mobilised for KAZA Namibia only due to institutional constraints in Zimbabwe. KAZA Zambia aims to achieve a demonstration effect for the rollout and scale up across KAZA, and to spark further economic development and growth within the beneficiary community. It is

⁷ Activity FP20-005 was mobilised in early 2015, with the aim of developing a draft financing strategy for the ‘KAZA Water Infrastructure for Livelihoods’ suite of Projects – focussing on sourcing CapEx funds for the initial KAZA pilot sites, as well as investigating the potential to leverage finance for the replication and roll-out of these interventions more broadly in the TFCA. In light of the recently published KAZA Master Integrated Development Plan, this strategy is now being further refined to ensure it aligns with, and supports, the roll-out of the MIDP in 2016. .

therefore squarely in the scope of CRIDF 'quick-win' objectives and is expected to qualify for CRIDF capital funding. Engagement with potential funding partners is however on-going, but is more focused on leveraging financial support for the larger subsequent phases of the project

Section VIII: Recommendations for next steps

Based on the findings of the Outline Business Case, it is recommended that the project progress into a full feasibility study.

The project is expected to require a small capital investment (in the range of GBP 347,741 if similar to that of KAZA Zimbabwe) and will result in significantly improved livelihoods directly to about 232 households (an approximate population of 1254). The investment will also contribute to CRIDF's core objectives of climate resilience and pro-poor development, and is relevant at a regional level through its potential to pilot a new approach to building resilience through water supply.

There are, however, a number of project risks that must be explicitly considered in further project development and the feasibility study, namely:

1. Ability to pay of communities for on-going operation and maintenance of the infrastructure;
2. Institutional arrangements in the community (in particular, the establishment of a functional water committee in each project site);
3. Community-buy into site location; and
4. Migration into the GMA by District Council and other government institutions.

Appendix 1: Breakdown of infrastructure costs in KAZA Zimbabwe pilot⁸

Item	Qty	Unit	Rate	Cost (USD)
1. Solar Powered Borehole				
1.1 Drilling of 500 mm gravel packed borehole complete with casing	1	No	15,000.00	15,000.00
1.2 Allow for gravel packing borehole	Sum		1000.00	1,000.00
1.3 Supply and installation of 150 mm diameter stainless steel Johnson type borehole screen	12	m	75.00	900.00
1.4 Develop and test borehole	Sum		500.00	500.00
1.5 Supply and installation of 50m ³ / day solar powered pump complete with accessories	1	No	14,500	14,500.00
Subtotal Borehole and solar pump				31,900.00
2.0 Storage Reservoir				
2.1 Supply and erection of 10 m ³ plastic storage reservoir	1	No	1,500.00	1,500.00
2.2 Supply in installation of 7 m high tank stand	1	No	4,500.00	4,500.00
2.3 Allow for misc pipework	Sum		250.00	250.00
Subtotal elevated storage reservoir				6,250.00
3. Infield garden Irrigation system				
3.1 Prepare and level irrigation field	1	ha	250	250.00
3.2 Supply and installation of drip irrigation system	1	ha	3,500.00	3,500.00 ⁹
3.3 Supply and erection of 1,2 m veldspan high security complete with gate	518	m	10.00	5,180.00
Subtotal infield garden irrigation system				8,930.00
4. Domestic and livestock water supply distribution				
4.1 Supply and installation of 35 mm stand pipes complete with concrete support column, platform and drainage apron	2	No	200	400.00
4.2 Supply and installation of 1 m ³ livestock drinking trough complete with pipework	2	No	500	1,000.00
Subtotal domestic water and livestock water supply distribution				1,400.00
5. Transport				

⁸ CRIDF (2015). Technical Report. KAZA Water Infrastructure for Livelihoods Intervention - Phase II (Zimbabwe), FP20

⁹ Unlikely to be a cost as drip irrigation would require high on-going costs (which the Moomba communities cannot afford). Instead, a hose solution will most likely be proposed

5.1 Allow for transportation of all materials and personnel to site	0.5	km	1,000	500.00 ¹⁰
Total scheme (1 village)				48,980.00

¹⁰ Likely to be higher for the Moomba communities due to its distance from commercial hubs

CRIDF

