Government of Zambia

Environmental and Social Audit Report and Remedial Action Plan for Ten Dams in Zambia

Additional Financing

Irrigation Support Development Project

(P102459 & AF-P172140)

Ministry of Agriculture

For presentation to the World Bank

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List of acronyms and abbreviations

AF	Additional Financing
ARAP	Abbreviated Resettlement Action Plan
CBAs	Critical Biodiversity Areas
DWRD	Department of Water Resources Development, previously Department of Water Affairs, and former department for the implementation of the WRDP
EPB	Environmental Project Brief
ESIA	Environmental and Social Impact Assessment
ESA	Environmental and Social Audit
ESMP	Environmental and Social Management Plan
EPBs	Environmental Project Briefs
ESIA	Environmental and Social Impact Assessment
FAO	Food and Agriculture Organization
fsl	full surface level
FRs	Forest Reserves
GRM	Grievance Redress Mechanism
GRZ	Government of the Republic of Zambia
IBAT	Integrated Biodiversity Assessment Tool
ICOLD	International Commission on Large Dams
ISF	Irrigation Support Fund
IDSP	Irrigation Development Support Project
IDSP AF	Irrigation Development Support Project Additional Financing
IPM	Integrated Pest Management
IUCN	International Union for Conservation of Nature
LFL	land for land
MTR	Mid Term Review
MAR	mean annual runoff
MWDSEP	Ministry of Water Development Sanitation and Environmental Protection
msl	mean sea level
NGO	non-governmental organisation
PAD	project appraisal document
PAP	project affected person
PDO	Project development objective
RAP	Resettlement Action Plan
UNOP	United Nations Office for Project Services
VEC	valued environmental component
WRDP	Water Resources Development Project
ZEMA	Zambia Environmental Management Agency
ZABS	Zambia Bureau of Standards

Environmental and Social Audit Report and Remedial Action Plan for Ten Dams in Zambia

1. Introduction

1.1 The Parent project – the Irrigation Development Support Project (IDSP)

The Parent project of this Additional Financing operation is the Irrigation Development Support Project. (IDSP, P102459, IDA Credit #48740) in the amount of SDR74.70 million (US$115 million equivalent). The IDSP was approved on April 7, 2011 and declared effective on November 11, 2011. Two restructurings of the original project changed the PDO, the number of components and the closing date. The current closing date is November 30, 2020.

The current PDO of this project is to *"provide improved access to irrigation services in selected sites in the Recipient's territory".*

The project has now the following components:

(i) Public infrastructure investment,

(ii) Development of irrigation management capacity, and project management and coordination.

Progress to date of the IDSP original activities. The project has made significant progress on various milestones, including the completion of the Mwomboshi dam with a reservoir volume of 61.5 million cubic meters and impounding has started during the ongoing rainy season. Construction of the three irrigation schemes is progressing well, Mwomboshi is at 40%, Lusitu at 75%, and Musakashi at 68%. Construction of 457 resettlement housing units are completed, with 431 (94.3%) being allocated and 421 (92.1%) occupied. Under the 13 Irrigation Support Fund (ISF) sites, a total of 1,698 ha is operational with pivot irrigation, progress on bringing the remaining 650 ha under operation is under way. The cumulative disbursements at the time of this Additional Financing is about US$104.4 million (about 99%) disbursement. In section 10, this ESA includes a summary of the current environmental issues that need attention to resolve during this AF.

1.2 The second project – the Water Resources Development Project (WRDP)

The Zambia Water Resources Development Project (P114949) financed by the World Bank (USD 50 M), was approved on April 25, 2013, and became effective on December 24, 2013. The project development objective was to support the implementation of an integrated framework for development and management of water resources in Zambia. The project closed on November 30, 2018.

The WRDP project had three components:

Component A. Water Resources Management:($8.00 M) to enhance capacity at the national and regional level to address the challenges of water resources management in Zambia. The specific activities to be supported under this component were: (a) construction, rehabilitation and upgrading of hydro-meteorological and groundwater monitoring networks; (b) reviewing and upgrading of operating procedures and processes to enhance the capacity of hydro-meteorological and groundwater information management systems and functions; (c) enhancing institutional partnerships and collaborations; (d) reviewing, upgrading and implementing the national hydrological and hydrogeological information management systems, including the integration of spatial and remotely sensed data; (e) developing a flood forecasting and early warning systems; (f) preparing consolidated catchment and basin-level water resources development plans and carrying out associated strategic water assessments, including groundwater; and (g) implementing arrangements and measures for water resource allocation, licensing, revenue and compliance monitoring and management.

Component B. Water Resources Development:($30.00 M) The investments to be supported under this component were: (a) developing and rehabilitating small scale water resources infrastructure, such as small dams, weirs, gabions, and other small civil works intended to retain water, reduce erosion, enhance recharge and ensure productive application; (b) updating and climate screening the 1995 Dam Development Master Plan to identify a series of priority investments for further preparation; (c) preparing studies in support of a proposed pipeline of future medium and large scale water resource investments; (d) supporting environmental and social assessments for said future water resource investments; (e) carrying out community mobilization and sensitization for beneficial use as well as O&M; (f) developing and implementing a national dam safety monitoring program; and (g) developing and implementing a nationally managed groundwater development program

This component included the support for the design, rehabilitation and construction of 100 small dams. Of these, only 12 dam sites were procured for construction or rehabilitation. However, challenges with the foundation at 2 sites, made construction and rehabilitation to only advance at 10 sites.

Component C. Institutional Support:($12.00 M) Component C's objective was to strengthen the institutional capacity for water resources management and development, for both surface and ground water. As such, this component supported the roll-out of institutional reforms by supporting core functions for both water resources and water development (as described in paragraph 3) in the MMEWD[1] and in WARMA in accordance with the provisions of the 2011 Water Act. The component was intended to support the establishment of WARMA, while strengthening the Department of Water Affairs (DWA)[2] and the Department of Planning and Information (DPI), provide capacity building, and cover operational costs. The activities under Component C were: (a) supporting the set-up of institutions established under the 2011 WRM Act and implementing their functions; (b) developing rules, plans, strategies and carrying out studies, as needed, for implementing the Water Resources Management Act to ensure the sustainable and equitable development of water resources; (c) building capacity for negotiations, conflict resolution, monitoring and compliance with international water instruments; (d) enhancing inter-agency coordination; (e) financing costs associated with project management, coordination and oversight; and (f) developing a carrying out a training program.

The project beneficiaries were targeted rural communities to benefit from improved small-scale water resources infrastructure under component B. Benefits will also accrue at the national level and in key river basins as the project supported enhance water resource management.

Safeguards due diligence during preparation and approval of the Water Resources Development Project (WRDP)

The project was classified as a "Category B" project under the World Bank safeguard policies.

Six safeguard policies were triggered: Environmental Assessment (OP/BP 4.01); Pest Management (OP 4.09); Physical and Cultural Resources (OP/BP 4.11); Involuntary Resettlement (OP/BP 4.12); Safety of Dams (OP/BP 4.37); and Projects on International Waterways (OP/BP 7.50).

As a result, the following instruments were prepared, consulted and agreed for the implementation of the project:

- Environmental and Social Management Framework with provision for cultural resources management and protection,
- Pest Management Plan
- Resettlement Policy Framework
- For dam safety - The ISDS indicate that the project will not finance the construction of large dams (i.e. dams over 10 meters) and required only generic dam safety measures contained in existing

[1] Water sector competences were transferred from the MMEWD to the Ministry of Water Development, Sanitation and Environmental Protection (MWDSEP) in September 2016.

[2] The DWA became the Department of Water Resources Development (DWRD) under the Ministerial reform.

operational procedures and the application of the 2010 Food and Agriculture Organization (FAO) Technical Guide for Small Earth Dams for compliance with safeguards on Dam Safety (ISDS and PAD).

The WRDP project Non-compliance issues

Substantial delays were accrued during the first three years of implementation, mainly caused by the ongoing institutional changes in the sector, which delayed decision making. On April 2017, the World Bank conducted the project Mid Term Review (MTR). At that time, the only investments under implementation were Lidar data collection and a Hydro-met activity under component A; the construction or rehabilitation of 12[3] dams —out of the 100 targeted at appraisal—along with the TA consultancy for dam design and supervision under component B. Training and operating costs that were financed under component C. The World Bank's MTR also identified non-compliance with World Bank's safeguards policies and poor quality of construction of the dams. Despite the project management unit prepared the Environmental Project Briefs (EPBs) for the 12 dams, which were finalized between March and June 2016, and despite the fact that these briefs were approved by Zambian Environmental Management Agency (ZEMA) between January and May 2017; these EPBs were not compliant with World Bank safeguards policies.

Despite the efforts to bring the project back on track with safeguards compliance since MTR on both GRZ and the World Bank side, the project continued to remain out of safeguards compliance. As a consequence, on March 26, 2018, the Bank issued a Partial Suspension of the Project. The Suspension limited project expenditure to addressing safeguards issues and remediating the dams that were built or rehabilitated under WRDP. Although at the time of closure (November 30, 2018) safeguards instruments were substantially advanced, remedial works at the 10 dam sites did not started.

Since WRDP closure, the World Bank and GRZ have worked together to address WRDP outstanding issues given the responsibilities and obligations of the parties as per WRDP's Financing Agreement. The final decision was to tackle these issues under IDSP's umbrella.

Instruments. The project implementation did not also comply with several agreements captured in the financing agreement like the preparation of Environmental and Social Impact Assessment, Environmental and Social Management Plan, Resettlement Action Plan and/or Dam Safety Plan to be prepared prior to tendering in accordance with the Environmental and Social Management Framework and the Resettlement Policy Framework approved by the Bank for the project.

During the construction phase it was also determined that the EPBs did not comply with Zambian regulations for Environmental Assessment. This was mainly because two of the dams (Katembula and Chibalashi) were larger than 25 ha, which is the threshold for a full Environmental and Social Impact Assessment (ESIA). During the last months of project implementation, a consultant was appointed to prepare the ESIAs and ESMPs. At the same time, it was decided that the EPBs for the other dam sites should be upgraded and integrated into a comprehensive ESMP for the remaining six dams' sites.

***Dam safety*.**

Some of the dams exceed the dimensions and /or storage capacity prescribed in the project appraisal document (PAD) that stated that investments should be restricted to those of less than 10 meters. The project did not comply with the Financing Agreement that provides detailed environmental and social safeguards obligations of the Recipient with respect to any water infrastructure to be built or rehabilitated under the Project, including the requirements for an Environmental and Social Impact Assessment (ESIA),

[3] 12 dams were procured and contracted under the project. However, challenges with the foundation at 2 sites, made construction and rehabilitation to only advance at 10 sites. While the initial technical and safeguards reviews were conducted at 12 sites, the remedial action plan focused solely on the 10 dams where construction and rehabilitation advanced.

Environmental and Social Management Plan (ESMP), RAP and/or Dam Safety Plan to be prepared in accordance with the ESMF and the RPF. Further, potential non- compliance regarding the the requirements of the safeguards policy for large dams and dam classified as (i) 15 meters or more in height; or (ii) between 10 and 15 meters in height and presenting special design complexities; or (iii) under 10 meters in height and expected to reach or exceed 15 meters in height during operation.

The main issues in relation to dam safety were inadequate compaction, poor detail, presence of piping through embankment, lack of well designed and constructed seepage control measure, capacity and erosion of the spillway, which will be described in detail in this ESA.

Projects on International Waterways. A notification of the project was sent prior to WRPD appraisal to all riparian states within Zambezi River and Congo River Basin (that is, Angola, Botswana, Democratic Republic of Congo, Malawi, Mozambique, Namibia, Tanzania and Zimbabwe). The riparian states raised no objections.

Resettlement. During the construction phase it was found Resettlement Action Plans (RAPs) were needed for six of the dam sites, namely Chibalashi, Chikowa, Kanyika, Katembula, Makaba and Nabowa. Since none of the dams resulted in impacts on more than a hundred project-affected persons (PAPs), Abbreviated Resettlement Action Plans (ARAPs) were considered fit for purpose. These instruments were prepared by a consultant and cash compensation was subsequently paid to the PAPs in accordance with the payment schedules. Preliminary verification of cash compensation by the Bank is complete for five of the cases while the other is in progress. The project is negotiating with the traditional authorities for replacement land for PAPs who lost fields. In some instances, where it is proposed that the tribal land downstream will be converted to leasehold in the irrigation scheme, the PAPs could be accommodated within this scheme.

Table 1. Table summarizing PAPs impacts.

Site	Total Number of PAPs as identified in the ARAPs	Requiring Cash compensations [4]	Requiring Land-for-Land Compensations	Requiring Housing Unit	Community infrastructure
Chibalashi	72	72	72	0	Access points
Chikowa	4	1	4	1	
Kanyika	12	9	3	0	Access points
Katembula	30	30	30	0	Access points
Makaba	18	18			
Nabowa	8	8	8	1	Water points
TOTAL	**144**	**138**	**117**	**2**	

1.3 Safeguards due diligence in preparation and approval of the project

The project was classified as a "Category B" project under the World Bank safeguard policies.

Six safeguard policies were triggered: Environmental Assessment (OP/BP 4.01); Pest Management (OP 4.09); Physical and Cultural Resources (OP/BP 4.11); Involuntary Resettlement (OP/BP 4.12); Safety of Dams (OP/BP 4.37); and Projects on International Waterways (OP/BP 7.50).

[4] All cash compensations effected.

As a result, the following instruments were prepared, consulted and agreed for the implementation of the project:

- Environmental and Social Management Framework prepared with provision for cultural resources management and protection,
- Pest Management Plan prepared
- Resettlement Policy Framework prepared
- Dam Safety requirements agreed, which included only generic dam safety measures contained in existing operational procedures and the application of the 2010 Food and Agriculture Organization (FAO) Technical Guide for Small Earth Dams for compliance with safeguards on Dam Safety (ISDS and PAD). The ISDS indicated that the project will not finance the construction of large dams (i.e. dams over 10 meters) and required.
- International Waterway requirements determined through consultation with during appraisal with all riparian states within Zambezi River and Congo River Basins (that is, Angola, Botswana, Democratic Republic of Congo, Malawi, Mozambique, Namibia, Tanzania and Zimbabwe). The riparian states raised no objections.

1.3.1 The Project Non-Compliance Issues

As specified above at the Mid-Term review of the project, several non-compliance issues with the environmental, social and dam safety safeguards policies were encountered in the project. In addition, construction performance was reviewed and found to be inadequate.

1.3.1.1 Non-Compliance with Zambian Environmental Law

During the construction phase it was determined that the EPBs did not comply with Zambian regulations for Environmental Assessment, two of the dams (Katembula and Chibalashi) being larger than 25 ha, which is the threshold for a full Environmental and Social Impact Assessment (ESIA). A consultant was appointed to rectify this and prepare the ESIAs and ESMPs.

1.3.1.2 Inadequacy of instruments applied to manage environmental and social impacts at the other dam sites

At the same time as the determination under 1.3.1.1 above, it was decided that the EPBs for the other dam sites should be upgraded to provide safeguards in line with World Bank policies, and the same consultant prepared an integrated ESMP for the remaining eight dams sites as a supplement to the existing EPBs.

1.3.1.3 Inadequacy of instruments applied to manage resettlement

During the construction phase it was found Resettlement Action Plans (RAPs) were needed for six of the dam sites, namely Chibalashi, Chikowa, Kanyika, Katembula, Makaba and Nabowa. Since none of the dams resulted in impacts on more than a hundred project-affected persons (PAPs), Abbreviated Resettlement Action Plans (ARAPs) were considered fit for purpose and were prepared by a consultant.

1.3.1.3.1 Dam Design Safety Issues

The project did not apply the requirements of the safeguards policy for large dams and dams classified as (i) 15 meters or more in height; or (ii) between 10 and 15 meters in height and presenting special design complexities; or (iii) under 10 meters in height and expected to reach or exceed 15 meters in height during operation. The main concerns in relation to design issues related to dam safety include the size of the spillways in relation to catchment area. These issues will be described in more detail in this ESA.

1.3.1.4 Inadequate Construction performance

Construction work on all of the dam sites was suspended in 2018. This was due to generally poor contract performance and concerns about the structural safety of the dams, which eventually led to construction being terminated. Demobilisation and restoration of the sites in accordance with the project ESMPs was not

done. In November 2019, an expert appointed by the project prepared an initial outline of dam safety issues for each of the dams on which to base the future design and implementation of remedial works.

2 Proposed Objectives of the Irrigation Development Support Project Additional Financing (IDSP AF)

The current project is an Additional Financing to the IDSP project (US 30 million) and its development objective is the same as the PDO of the IDSP: "*provide improved access to irrigation services in selected sites in the Recipient's territory".*

This IDSP AF consists of: (i) completing the remaining activities under IDSP, parent project; (ii) completing remediation works for the ten dams that were built or rehabilitated under the WRDP, (iii) and responding to the current drought situation to support farmers of the three irrigation schemes with provision of inputs. This will enable farmers to restore their production capacities and re-engage in the agriculture production cycle. The total amount of this proposed IDA Credit is US 30 Million, which is expected to be financed over an implementation period of 2.5 years (requiring a 24-month extension of the original parent project closing date of 30 November 2020 to 30 November 2022).

2.1 Activities Supported

The Additional Financing of the **IDSP (P102459 & IDSP AF-P172140) will** support the following activities as part of the activities of the current component 1 of IDSP. A brief explanation of these activities follows:

(**i) Activity 1. Completion of ongoing works under IDSP**. Given that the parent project has experienced significant exchange rate losses since its approval and the actual costs of infrastructure also exceeded the initial estimates, an additional funding of around US$ 1 million is needed to complete the irrigation infrastructure and ensure that all infrastructure is operational and provides irrigation services and support to target beneficiaries. This does not include adding any new activities.

(ii) Activity 2. **Remedial works for the ten WRDP dams**. On October 10, 2019, the World Bank and the Government of the Republic of Zambia (GRZ) agreed for taking remedial actions to ensure the safety of ten dams that were constructed / rehabilitated under the World Bank funded "Water Resources Development Project" (P114949) which closed in November 2018. It was also agreed that the remedial work of these dams will be carried out through the IDSP following a two phased approach. The first phase being financed by IDSP parent project, the second phase financed by this AF (see below the phases for more details).

(iii) Activity 3. **Drought Emergency Response:** During the 2018 / 2019 agriculture season, Zambia witnessed prolonged dry spells with below average rainfall, resulting in a sharp decline in agriculture output. This affected all crops, including maize, which is the main crop grown in the country and is the main staple of the Zambian diet, accounting for around 65 percent of the agriculture lands of Zambia. Shortage of seeds for the next production season (2020 / 2021) is one of the projected consequences of this cycle of drought, adding to the challenges that farmers and producers are already facing. The drought response will be in the amount of US$ 1 million and will include distribution of high-quality pest and drought seeds and fertilizers sufficient to cultivate around 3,000 hectares in the locations where IDSP is being implemented. Priority will be given to small scale farmers with less than one ha of land.

2.2 Detailed scope of the IDSP AF, P172140

2.2.1 Activity 1. The completion of ongoing works under IDSP and cost replenishment (US$14 million).

i) Due to exchanges rates, the project has lost more than US$10.5 million. This has limited the project's ability to complete planned activities which includes the completions in the construction of several irrigation schemes which are connected to large dams and will ensure that all infrastructure is operational and providing irrigation services and support to target beneficiaries

ii) Recovery of US$ 500,000. IDSP have been redirected to fund activities under Phase 1 of the remedial dam safety works of the now closed WRDP. A total of US$500,000 were reallocated from existing resources under IDSP to finance the activities of Phase 1 of the remedial works. These funds will be redirected to support the on-going constructions of the project.

iii) Cash compensation for economic losses of Project Affected People, due to not cultivating lands during the 2018/2019 season as a result of project activities was not processed. Therefore, the GRZ requested the World Bank to utilize IDA funding to address the deficit in cost associated with the cash compensation section of the resettlement plan of about US$2 million.

2.2.2 Activity 2. The implementation of Phase 2 of the remedial works for the ten WRDP dams (US$15 million).

Phase 1. Preparatory stage. The scope of Phase 1 consists of:

(i) A level 2 restructuring was completed on January 20, 2020 to allow the financing of Phase 1 of the remedial works for the ten dams. The implementation of Phase 1 has been slow but steady. The Phase 1 has been supported with funds from IDSP (parent project) and includes activities to: (i) minimize risks posed by the 10 dams by financing non-structural interventions (i.e. perform surveillance and emergency preparedness plans for communities) and very limited structural interventions, and (ii) update designs of the 10 dams for subsequent remedial works to be financed under Phase 2.

(ii) Preparation of the Environmental and Social Audit Report. One ESMP for each dam will be prepared and no more ESMP framework will be accepted by the World Bank. Each ESMP will include the specific remediation and rehabilitation plan, a clear location map, a layout of the dam and auxiliary components.

(iii) A two-phase specialist assessment of aquatic and terrestrial biodiversity impacts, including an initial screening study to determine those dams which require more detailed assessment; and a second phase to prepare the assessments for biodiversity protection and environmental flow requirements.

Phase 2. Remedial activities. The scope of Phase 2 consists of:

(i) Civil works on the ten dams to ensure the safety of dams and downstream communities;
(ii) Establishment of operation and maintenance arrangements; Surveillance will continue during the implementation of Phase 2.
(iii) Upon completion of the works, hand-over of the management, operation and maintenance of the dams to dam committees comprising people from the beneficiary communities; and
(iv) Implementation of the Environmental and Social Management Plan (ESMP), Biodiversity Assessments and Ecological flow requirements.
(v) Remediation of environmental legacy areas such as borrow pits, excavation pits, spoil areas, hazardous wastes areas, etc.
(vi) Training how to operate and conserve the catchment as requested in the consultations.

The remedial works for the ten dams consists of strengthening and stabilizing existing dam embankments and completing and reinforcing existing spillways to ensure dam safety. The activities will not change the nature and scope of the existing schemes and will not increase the dams' existing capacity. Therefore, the remedial measures will not adversely change the quality or quantity of water flows to the other riparian's countries.

The additional financing will support remediation actions to reduce the risk/impacts related to construction and operational issues of the ten dams, but it will not support the irrigation components originally supported by the WRDP. The AF will support the training and capacity building required to safely operate the dams and reduce the downstream environmental impacts.

3 The Environmental and Social Audit (ESA) Scope and Objectives

The main goal of this Environmental and Social audit (ESA) is to determine the extent of compliance and non-compliance with the World Bank Safeguards policies and national regulations of the investments to be supported by the AF to the IDSP.

The specific objectives of this audit are:

- To review the extent of non-compliance with the project ESMPs and (where relevant) the Abbreviated Resettlement Action Plan (ARAP) for each of the dam sites, together with any other requirements that are necessary to comply with World Bank environmental and social policies
- To identify non-compliance with environmental regulations of the country, permits and international good practices in the development of dams for the water sector
- To develop an action plan to guide the preparation of the Environmental and Social Impact Assessment and the Environmental and Social Management Plans and the Dam safety instruments as required per the WB Safeguards Policies - during the remedial works and operation of the dams.

The ESMP instruments to be prepared after appraisal will follow the environmental and social policies triggered for the AF to the ISDP. The audit will also indicate actions of the previous instruments that were inadequate, to be sure that these are not repeated in the process of the remediation work to be done.

The ESA will describe the institutional arrangements for the management of the remediation works, the environmental and social staff to be included in the UNOPS team and the IDSP, capacity building, additional specialist assessment, monitoring and supervision.

4 Location of the Dams to be Remediated

The ten dams to be remediated under the AF are located in the Luapula, Western, Northwestern, Eastern, Copperbelt, and Southern Provinces of Zambia, on tributaries of the Zambezi and Congo River systems. The Zambezi and Congo Rivers and their tributaries are considered international waterways. These dams are located in an altitude range of 1500-2000 masl.

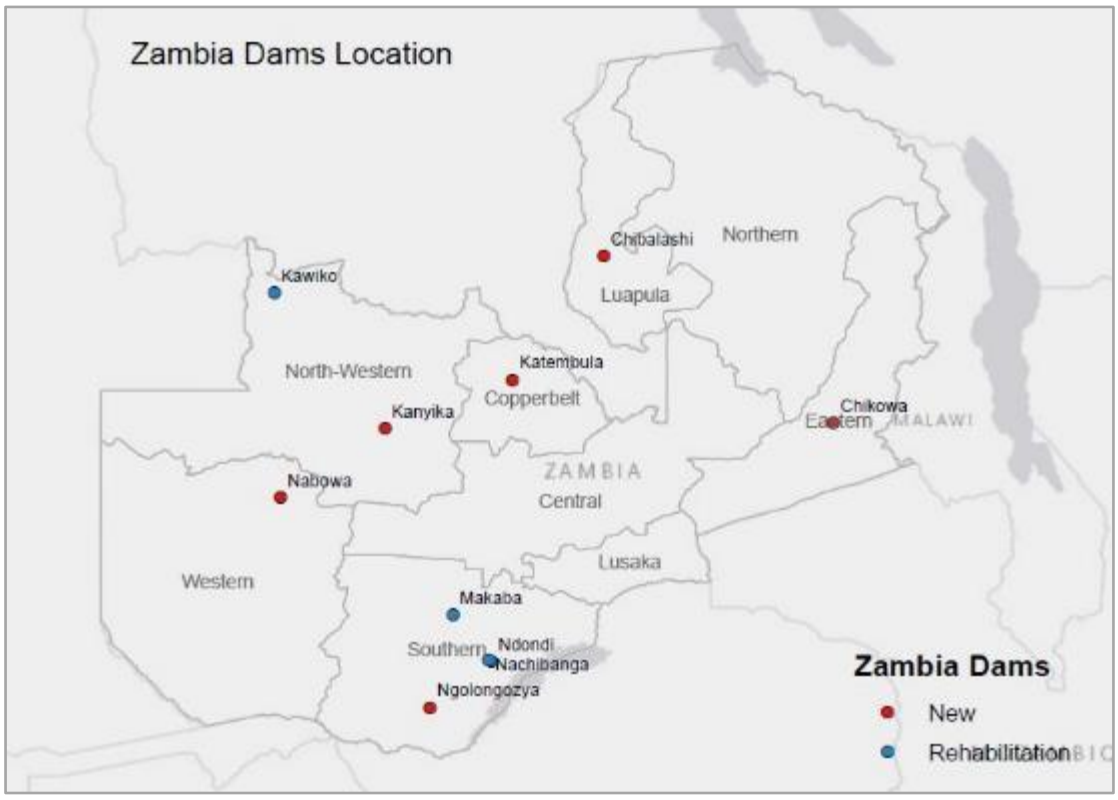


Figure 4-1. Location of the ten dams with dam safety and environmental and social non-compliances selected to be remediated under the proposed Additional Financing (P172140) to the Irrigation Development Project (P102459) in Zambia.

Table 4-1: Summary of characteristics of the ten dams in Zambia and their catchments.

Name of Dam	Location & River Basin	Nature of Stream	Dam height (m) (1)	Crest Length (m)	Estimated Total Reservoir Volume (Mm^3)	Preliminary Dam Classification as per this audit, OP 4.37 guidance (2)
Katembula	Lufwanyama (Copperbelt) about 63 km west of Kitwe. On the perennial Katembula stream (tributary of the Lufwanyama River which in turn flows into the Kafue River.	Perennial	10.4	190	2.03	Large dam
Chibalashi	Mansa District (Luapula). About 9 km north-east of the town of Mansa. On the perennial Chibalashi stream (tributary of Mansa River which in turn flows into the Luapula River).	Perennial	10.3	185	3.15	Large dam
Makaba	Namwala District (Southern Province). About 80 km north of Choma. On an un-named non-perennial stream, which drains to the Munyeke River.	Seasonal	8.5	190	1.0	Large dam
Nabowa	Mangango (Western Province). About 50 km north west of Kaoma and 21 km north of Mangango. On the perennial Nabowa Stream, which drains to the Luena River.	Perennial	10.7	270	0.5	Large dam
Ngolongozya	Zimba District (Southern Province). About 37 km south of Kalomo. On the non-perennial Ngolongozya River, which drains to the Kalomo River.	Seasonal	10.5	300	0.936	Large dam
Kanyika	Kasempa District (North-Western Province). About 11 km south east of Kasempa Central. On the perennial Kanyika Stream which drains to Nkenyauna River.	Perennial	10	155	0.27	Small dam
Kawiko	Mwinilunga (North Western Province). About 10 km north west of Mwinilunga town. Collects water from perennial springs.	Perennial (springs)	8	180	1,032	Small dam
Chikowa	Mambwe (Eastern Province). About 3 km from Chikowa Mission in the Eastern Province. It is located on the non-perennial Kasenengwa River.	Seasonal	12	420	0.653	Small dam
Ndondi	Pemba District (Southern Province). About 23.5 km south of Pemba. On the non-perennial Ndondi stream, which drains to the Kaunga River.	Seasonal	8.5	300	1.0	Small dam
Nachibanga	Pemba District (Southern Province). About 21.2 km south of Pemba. On the non-perennial Lunywamakubi stream, which drains to Napagwe and then the Kaunga Rivers	Seasonal	8.5	128	To be verified	Small dam

(1) The table reflects the dam size as described in the WRDP ISDS.

(2) *It is expected that the during the implementation of the AF dam classification of the dams could change, based on due diligence of the current state and World Bank OP 4.37.*

5 Documentation reviewed (including regulations)

In the context of this audit, compliance has been assessed with reference to the project-specific documents in Table 5-1. In addition, the Zambia Environmental Management Agency (ZEMA) Decision Letter for each dam, authorising the development in terms of Statutory Instrument No, 28 of 1997, Environmental Impact Assessment Regulations, was reviewed. There are no specific conditions in the decision letter that were relevant for the purposes of the audit.

The WRDP (2016) Environmental Project Briefs (EPBs) were used for reference purposes and to provide environmental background to the project. The key instruments against which performance has been audited are the ESMPs and ARAPs prepared by the project consultant, COWI (2018a, 2018b, 2018c, 2018d-j).

Table 5-1. Reference documents used in the audit.

Author	Instrument	Description
UNOPS (2019)	Dam Safety Assessment	November 2019 preliminary assessment (PowerPoint presentation) of dam safety issues associated with each dam in the Water Resources Development Programme.
Department of Water Resources Development (2016)	Environmental Project Briefs (EPB) for the rehabilitation of the dams (prepared individually for each dam site)	Prepared on behalf of the Ministry of Energy and Water Development. The Environmental Project Brief's (EPBs) consisted of desktop environmental assessments of the impacts and impact management of each dam site. During the course of construction of the dams, the EPBs were found to be inadequate tools for the management of impacts, which resulted in the preparation of the COWI remedial investigations listed below.
COWI (2018a)	Remedial Environmental Impact Statement for the Chibalashi Dam under the Water Resources Development Programme	Chibalashi is considered to be a large dam which required a full ESIA under Zambian environmental regulations. Study included a project-specific ESMP.
COWI (2018b)	Remedial Environmental Impact Statement for the Katembula Dam under the Water Resources Development Programme	Katembula is considered to be a large dam which required a full ESIA under Zambian environmental regulations. Study included a project-specific ESMP.
COWI (2018c)	Remedial Environmental and Social Management Plans of Eight Dams under the Water Resources Development Programme	This ESMP reviewed the impacts described in the EPBs and the construction activities on site and provided revised and more detailed construction and operational impact management measures for all of the dams other than Katembula and Chibalashi.
COWI (2018d-i)	Abbreviated Resettlement Action Plan - WRDP	Provided individual separate reports for each of 6 dam sites (Katembula, Chibalashi, Chikowa, Kanyika, Makaba and Nabowa). An ARAP was selected and agreed with World Bank as a suitable instrument for the level of resettlement and livelihood restoration associated with the dams. For the remaining four dams (Kawiko, Ndondi, Ngolongozya and Nachibanga), no compensation or livelihood restoration requirements were identified, and social impact management was defined by the COWI (2018c) ESMP.
COWI (2018j-s)	Project Review Report	Provided a planning and design review of each dam site, including dam safety issues.
COWI (2018 t-ac)	Flood Hydrology	Provides details of catchment characteristics, dam size classification and hazard potential, recommended Safety Evaluation Flood (SEF)

World Bank (2019)	Compensation Payment Verification Report for Makaba, Katembula and Chibalashi Dam Sites	End of Mission Report 24 April to 3 May 2019.
World Bank	PAD of the IDSP &WRDP	Provides overall project objectives and activities at appraisal
World Bank	ISDS of the IDSP &WRDP	
World Bank	ESMF of the IDSP &WRDP	
World Bank	E/S Safeguards Policies triggered for the 2 projects	

6 Compliance norms and standards

6.1 World Bank safeguard policies

Relevant provisions and how both projects and the AF will tackle each of the policies.

Table 6-1. World Bank instruments triggered by the IDSP, WRDP and IDSP AF.

Operational policy	Name	Water Project: Zambia Water Resources Development Project (P114949)	Parent Project: IRRIGATION DEVELOPMENT AND SUPPORT PROJECT (P102459)	Actions to be followed by the AF to the IDSP (Irrigation Development Support Project - Additional Financing (P172140)
OP 4.01	Environmental Assessment	-The project was classified environmental assessment (EA) Category B and an Environmental and Social Management Framework (ESMF) was prepared to comply with OP 4.01. -The policy **was triggered** because of the negative environmental and social impacts from the rehabilitation of existing infrastructure, construction of dams and scale water infrastructure, such as irrigation canals, boreholes, water points, irrigation equipment, hydrological or meteorological monitoring stations, weirs, small fish farms, and unpaved tertiary access roads or footpaths. Such impacts included: (i) vegetation clearing; (ii) health and safety risks for workers;(iii) air pollution from dust during excavations; (iv) noise from heavy machinery; (v) pollution from waste water and solid waste from construction site and	-The project was classified environmental assessment (EA) Category A and an Environmental and Social Management Framework (ESMF) was prepared to comply with OP 4.01 -The policy was triggered because of direct potential impacts associated with dam construction and irrigated agriculture development. -Some of the impacts caused by the project includes changes in the flow regime of several rivers which have been dammed, generation of water pollution due to sedimentation, waste, tree cutting, impoundment of land and natural and modified habitats. -Site specific environmental and social impact assessments (ESIAs) have been	-The project was classified environmental assessment (EA) Category B and an Environmental and Social Audit was been prepared to comply with OP 4.01. -The policy is triggered because of the potential impacts the investments could bring to the environment and people. -Some of the potential impacts include: soil excavations, borrow pits, construction waste, clearing of vegetation, noise, sedimentation, etc. -For the ongoing activities of the IDSP which includes the construction of the two dam- the AF will: i) use the instruments already prepared in the IDSP for the ongoing constructions (ESIA/ESMP, environmental clauses in the tender documents of contractor's

Operational policy	Name	Water Project: Zambia Water Resources Development Project (P114949)	Parent Project: IRRIGATION DEVELOPMENT AND SUPPORT PROJECT (P102459)	Actions to be followed by the AF to the IDSP (Irrigation Development Support Project - Additional Financing (P172140)
		materials; (vi) reduced downstream water flow; (vii) soil erosion; (viii) sedimentation of rivers, ix) dam safety risks, etc. -Site specific environmental and social impact assessments (ESIAs) were prepared for each investment based on the screening process required in the ESMF and detailed management plans were developed as necessary. -Due to different issues that affected the project compliance with these instruments which are described in the public ISR and ICR of the project, the project did not properly implement these ESIAS and it closed with pending actions to comply with this Policy and the instruments prepared. This is the reason for the proposed AF to the IDSP project.	prepared for each investment based on the screening process required in the ESMF and detailed ESMP were developed. Also, environmental and social measures were included in the tender documents. Current rating of the project is MS for safeguards implementation.	contracts, supervision instruments) and additional measures to be defined during supervision mission during the AF. ii) For the remediation works of the dams, the AF will prepare ESIA/ESMP for each dam following the requirements defines in this Environmental and Social Audit as the project will implement all measures describe in both instruments to remediate, reduce and compensate impacts. The IDSP will also strengthen its environmental and social management by i) hiring additional supervisors for the ongoing construction sites and ii) contracting UNOPS to handle all contracts and environmental and social management of the remediation works in the dams.
OP/BP 4.04	Natural Habitats	-The policy **was NOT triggered** because the project: - Promised that all investments were going to be screened thorough a negative list excluding infrastructure investments and associated works in designated protected areas.	-The Policy was triggered in the project because of direct potential impacts associated with dam construction and irrigated agriculture development such as soil and water pollution during construction, construction waste disposal issues, burrowing and	-This policy is triggered because the AF will support ongoing construction of dams and irrigation systems and the remediation of ten dams which will cause impacts in natural and modified habitats. Also, the impact of the operation of the dams on downstream flow and the induced impacts of increasing human populations on both

Operational policy	Name	Water Project: Zambia Water Resources Development Project (P114949)	Parent Project: IRRIGATION DEVELOPMENT AND SUPPORT PROJECT (P102459)	Actions to be followed by the AF to the IDSP (Irrigation Development Support Project - Additional Financing (P172140)
		-Neither the Environmental Project Briefs (EPFs) prepared by the project and originally used as the basis for approval of the projects, nor the subsequent work done by consultants to prepare the ESIAs for Katembula and Chibalashi, and to improve the ESMPs, provided an adequate basis for the assessment of these impacts. No baseline studies were done, and experienced specialist ecologists were not involved.	impoundment of water and significant changes to the environment. - Also because unmitigated irrigation development may have an impact on the remnants of natural habitats, both downstream of the command area, and in the catchments where deforestation and land clearing activities may be carried out. The project indicated that it is not expected that environmentally sensitive habitats will be converted under this project; rather environmental conservation will be encouraged in project sites. -The current rating in the ISR of the project is Satisfactory	aquatic and terrestrial ecosystems was poorly assessed in the previous safeguard instruments. The ESIA/ESMPs prepared for the dams listed some of the ecological impacts associated with dams and flow regulation but argued in favour of the dams as a means of guaranteeing flow in the downstream system in the dry season and during times of drought. This presupposes that flows will be managed to benefit downstream ecology, which, given capacity limitations and cost, is far from certain; and while there may be benefit in supplementing ecological baseflows in dry periods, this does not necessarily outweigh other negative considerations. Cumulative changes brought about by the dams may negatively affect the downstream aquatic and wetland environment and may also impact upstream on the river system as a whole by creating a barrier to the movement of aquatic species. Depending on the strap efficiency of the dams, they may also starve the downstream areas of sediment, increasing the erosive potential

Operational policy	Name	Water Project: Zambia Water Resources Development Project (P114949)	Parent Project: IRRIGATION DEVELOPMENT AND SUPPORT PROJECT (P102459)	Actions to be followed by the AF to the IDSP (Irrigation Development Support Project - Additional Financing (P172140)
				of flows and the risk of channelling and drying out of the wetlands. The opportunity to properly address the above issues, as required by OP 4.01, has to some extent passed. The dams are already built. There are, however, some options for impact minimization, as well as actions to make the most of the potential benefits of flow regulation. These will need to be determined by additional investigation by competent ecologists. **Action:** The Environmental and Social Audit will be proposed measures to avoid, mitigate and compensate impacts to terrestrial and aquatic ecosystems in the project area of the team dams which will included in the ESIA/ESMP. The ESIA/ESMP will fine tune the measures to mitigate current impacts and liabilities in the river banks, soil and land of the existing dams, to reduce reservoir slope erosion and increase conservation of downstream wetlands and riparian areas. Mitigation measures for cumulative impacts will also be included. The AF will also additional aquatic ecological studies to serve a baseline for managing future impacts related to river

Operational policy	Name	Water Project: Zambia Water Resources Development Project (P114949)	Parent Project: IRRIGATION DEVELOPMENT AND SUPPORT PROJECT (P102459)	Actions to be followed by the AF to the IDSP (Irrigation Development Support Project - Additional Financing (P172140)
				regulation. Undertake the studies at the selected dam sites and prepare impact mitigation and monitoring programs with the national and district authorities.
OP 4.06	Forests	This policy **was Not triggered** in the project. The ISDS indicates that "Small scale investments in water resources infrastructure may include activities to combat environmental degradation, reduce soil erosion and sedimentation to enhance the quality of natural forests – such investments will enhance the environmental benefits generated by the project and will be guided by the provisions of the ESMF. The project does not involve forests or forest management activities." -This policy should have been triggered. -The safeguard instruments provided no meaningful account of the terrestrial impact of the dams. No baseline studies were done, the lists of species provided were unverified and incomplete and no critical analysis of possible	-This policy was triggered because of envisaged potential impacts on forest habitats as a result of dam construction and water collection/ harvesting and delivery systems. - ESIA prepared for the project includes measure to avoid impact on trees and forest lands. -The current rating of the application of this policy is Satisfactory.	-This policy is triggered in the AF because potentially during the construction and future operation of the dams and expansion of the agriculture areas, tree loss and impact on riparian forest could occur. Restoration measures will be included in the ESIA/ESMP to reduce reservoir slope erosion and increase conservation of downstream wetlands and riparian areas. -Increasing populations supported by the irrigation schemes will create additional pressure on surrounding habitats, which may be important in the cases where the dams are in habitats with little transformation. The audit has shown that three of the dam sites – Nabowa, Kawiko and Chikowa are associated with substantial areas of untransformed habitat and, in the case of Nabowa, at least, large herbivores and

Operational policy	Name	Water Project: Zambia Water Resources Development Project (P114949)	Parent Project: IRRIGATION DEVELOPMENT AND SUPPORT PROJECT (P102459)	Actions to be followed by the AF to the IDSP (Irrigation Development Support Project - Additional Financing (P172140)
		direct, indirect or induced impacts was undertaken		predators are apparently still well represented. The risk of increasing human settlement and cultivation on these remaining wild animal populations, as well as increased risk to their habitats, is likely to be significant. **Action:** The ESIA/ESMP to be prepared for the remediation of the dams, will include protocols that during project implementation the AF will support baseline investigations of terrestrial habitats, flora and fauna where there is a likelihood of significant induced biodiversity impacts. Prepare mitigation, restoration plans and monitoring based on the results of the field assessments, taking into account the likely effect of increasing human populations in the area.
OP 4.09	Pest Management	The policy **was triggered** because of the specific investments plan in crop and fish farming were envisaged in support of agriculture and fisheries sectors aimed at enhancing production of water resources infrastructure. The project was not supposed to use toxic pesticides in the production systems.	The policy was triggered due to potential expansion, intensification of agricultural activities, and diversification into new crops that requires the use of or combinations of agro-chemicals.	The policy is triggered because of the potential impacts the activities of the IDSP to be supported with the AF could generate (in the use of agrochemicals) in agriculture expansion as result of the new dams and remediated dams all to serve water provision for agriculture -irrigation.

Operational policy	Name	Water Project: Zambia Water Resources Development Project (P114949)	Parent Project: IRRIGATION DEVELOPMENT AND SUPPORT PROJECT (P102459)	Actions to be followed by the AF to the IDSP (Irrigation Development Support Project - Additional Financing (P172140)
		-The project prepared an integrated pest management techniques (PMP) for the safe use, storage, and disposal of agro-chemicals as required in the project's ESMF. There is not information available to ensure this PMP was implemented.	-A Pest Management Plan (PMP) was prepared for another Bank-funded agriculture project and it was adopted in the project. -The application of the PMP is been limited and awaits full implementation once the irrigation systems are completed. -The current ISR rating of the implementation of this policy is S	The AF will review the current PMP been used in the IDSP and will adjust it to ensure its application at least during the project life of the AF and will train District officer and farmers to increase the chances of application during operation stage of the irrigation systems and after the AF closes.
OP 4.11	Physical Cultural Resources	The policy **was triggered** because of the civil works that were implemented. Provisions were included in the ESMF to ensure the requirements of the policy were met and a chance find procedures was included in the event that archaeological relics, fossils, or other physical cultural resources, avoiding graveyards which had already been identified or discovered during implementation of the project. However, a Chance Find Procedure was not developed, hence no structured mechanism existed to guide actions in the event that relics were found. Grave sites that exist within the area of influence of the construction sites at the	-The policy was triggered as construction activities may lead to chance findings of archaeological artefacts and/or may have an impact on graves and other cultural sites. -ESIA/ ESMP contains chance find provisions and these have been included in the construction contracts. -The current ISR rating of the implementation of this policy is S	-The Policy is triggered because both the IDSP and the remediation activities of the ten dams will include soil excavations and intervention of rivers and streams which can have cultural and spiritual values. The ESIA/ESMP will include chance finding procedures and tangible cultural resources rescue plans. -The AF will include in the ESIA/ESMP proper chance finding protocols and measures to protect cultural resources and graves. The project will survey and map each grave site / graveyard and include specific requirements for management,

Operational policy	Name	Water Project: Zambia Water Resources Development Project (P114949)	Parent Project: IRRIGATION DEVELOPMENT AND SUPPORT PROJECT (P102459)	Actions to be followed by the AF to the IDSP (Irrigation Development Support Project - Additional Financing (P172140)
		dams have already been identified although their extent does not appear to have been demarcated and it is not recorded how they were protected during construction. Provision is made in some of the ESMPs to provided alternative access to grave sites.		such as temporary fencing, during the Remediation works. Verify through the Stakeholder Engagement process any other graves or culturally sensitive sites that have not been recorded. Where alternative access to graveyards / culturally sensitive sites is required, determine reasonable options for implementation in consultation with the affected communities.
OP 4.12	Involuntary Resettlement	-The policy **was triggered** because Land acquisition was needed for the development of the water resources infrastructure. -A Resettlement Policy Framework was prepared to screen and mitigate for the effects of involuntary resettlement and the loss of access or loss of resources associated with the Project -The rating at the closing of the project was rated as HU	-The policy was triggered because the project supports the development of water harvesting infrastructure such as dams, valley dams and reservoirs that include water distributions, both of which may trigger land acquisition and involuntary resettlement. -Land requirements for purposes of construction of a dam and ancillary facilities may permanently or temporarily limit access to both public or private land and other assets by local communities. OP 4.12 was also triggered not only due to land acquisition but because of the project activities impacting assets or restricting	-This policy is triggered in the AF because of the land issues related to both the ongoing dams' construction of the IDSP and the proposed remediation of the ten dams. -ARAPs have provided a reasonable basis for compensating PAPs for lost crops. While being late (with all of the requirements for compensation and land-for-land replacement only being identified after construction began in WRDP, the ARAPs introduced the necessary rigour into the process for identifying PAPs, determining their eligibility for

Operational policy	Name	Water Project: Zambia Water Resources Development Project (P114949)	Parent Project: IRRIGATION DEVELOPMENT AND SUPPORT PROJECT (P102459)	Actions to be followed by the AF to the IDSP (Irrigation Development Support Project - Additional Financing (P172140)
			access to other natural resources or negatively impacting local livelihoods. -Since the scope and other details of the dams and water distribution construction work, including the exact locations of the infrastructure within each project sites were not known at appraisal, a Resettlement Policy Framework (RPF) has been prepared and disclosed both in country (August 23, 2010) and at the Bank's InfoShop (August 30, 2010). -During implementation RAPs were prepared -Current rating in the last ISR is MS.	compensation, calculating temporary losses and establishing compensation amounts to be paid to each PAP. This work was done by the Ministry of Water Development Sanitation and Environmental Protection (MWDSEP) supported by consultants. Cash-compensation payments have been made to all PAPs. Verification by a World Bank's consultant was carried out at all sites but Nabowa. The verification for Nabowa is planned to take place in parallel with UNOPS design works. -While recognising the importance of land-for-land replacement to restore the livelihoods of most of the PAPs, and setting out the responsibilities for managing this process, the ARAPs do not cover this aspect in detail. -The ARAPs note the lead institutions responsible for land replacement (the Traditional Leadership and the Dam Committees, with assistance from Ministry

Operational policy	Name	Water Project: Zambia Water Resources Development Project (P114949)	Parent Project: IRRIGATION DEVELOPMENT AND SUPPORT PROJECT (P102459)	Actions to be followed by the AF to the IDSP (Irrigation Development Support Project - Additional Financing (P172140)
				of Agriculture and MWDSEP) and that this process will be ongoing until solutions are found and agreed between the parties. -This process takes time, since the host communities and their traditional leadership are involved. In some cases replacement land is not readily available. At Chibalashi Dam, for example, there are many PAPs who lost land and the proposal to give them land parcels 15 km from their present dwellings has not been well received. The PAPs are instead demanding cash compensation for the lost land, on the grounds that the location is too far from where they live and the land quality is inadequate compared with what they had. - The Bank's resettlement policy generally will not support cash compensation in lieu of land replacement as a means of livelihood restoration and Government is continuing its efforts to find a solution to this problem. To assist the displaced communities in their effort to restore their livelihoods, the AF will support trainings to the communities

Operational policy	Name	Water Project: Zambia Water Resources Development Project (P114949)	Parent Project: IRRIGATION DEVELOPMENT AND SUPPORT PROJECT (P102459)	Actions to be followed by the AF to the IDSP (Irrigation Development Support Project - Additional Financing (P172140)
				and stakeholders to makes the best use of water resources to improve their livelihoods and living standards in a sustainable manner. Planned support includes training in relation to the use and management of the fishery in the dam, agricultural extension support with regard to crops, methods of planting, use of fertiliser and pesticides and various other services. In addition, the various local Government ministries and the dam committees will assist beneficiaries of the project to maintain the existing irrigation systems. Failure to resolve land replacement issues and restore the livelihoods of the affected PAPs is a significant reputational risk for the Bank. **Action in the AF:** Emphasize in the Additional Financing agreements that a satisfactory resolution of the problems of land replacement and livelihood restoration is to be demonstrated, in accordance with the requirements of OP 4.12, and that an appropriate period of monitoring and evaluation of the

Operational policy	Name	Water Project: Zambia Water Resources Development Project (P114949)	Parent Project: IRRIGATION DEVELOPMENT AND SUPPORT PROJECT (P102459)	Actions to be followed by the AF to the IDSP (Irrigation Development Support Project - Additional Financing (P172140)
				restoration of PAPs livelihoods must be done and reported to the Bank.
OP/BP 4.37	Safety of Dams	The policy **was triggered** because the project financed the construction of dams. However, since the project indicated that the dams were small and this small-scale water resources infrastructure financed was increase income generating activities for local beneficiaries- the project indicated that it follow the application of generic dam safety measures contained in existing operational procedures. Dam safety guidelines for small dams, prepared by FAO and used throughout the sub-region, were disclosed. -Due to significant issues in dam safety and other environmental and social issues that were raised in the project, the project closed with pending issues to comply with the World Bank policy on Safety of Dams (OP 4.37) to ensure safety for downstream communities. -The project closed with Unsatisfactory rating in this policy	-The policy was triggered because of the proposed size of dams (large dams) to be constructed by the project. -In compliance with the triggered OP 4.37, a Dam Safety Panel was constituted to provide the necessary oversight. -The irrigation dams have been designed by qualified engineers, and dam safety measures have been incorporated in dam operations guidelines. -Dam Safety plans for the proposed large dam (including an Emergency Preparedness Plan (EPP)) have been drafted, reviewed, and disclosed. -Also, for small dam construction, rehabilitation, and maintenance relevant oversight procedures are included in the Project Implementation Manual that has been drafted and is being finalized.	This policy is triggered because the AF will support ongoing activities of the IDSP which includes the construction of large dams and the proposed remediation plans of the ten existing dams. -The AF will review the current implementation of the OP 4.37 in the IDSP and include measures to improve its application. For the remediation of the ten dams, the AF will follow Good International Industry Practice (GIIP) to remediate current dam safety issues. The project will also prepare the require instruments by the policy. Dam safety plans will include: i) *Plan for construction supervision and quality assurance*, ii) *Operation and maintenance (O&M) plan*, iii) *Instrumentation plan (for the large dams), iv) Emergency preparedness plan (EPP)*. Dam safety plans will be proportionate to assessed risk.

Operational policy	Name	Water Project: Zambia Water Resources Development Project (P114949)	Parent Project: IRRIGATION DEVELOPMENT AND SUPPORT PROJECT (P102459)	Actions to be followed by the AF to the IDSP (Irrigation Development Support Project - Additional Financing (P172140)
OP/BP 7.50	Projects on International Waterways	-This policy was triggered because the project intervened in the Zambezi and Congo rivers. -Riparian Notification was made on January 07, 2013 to riparian states to the Zambezi and Congo river basins.	-The policy was triggered because the project is building infrastructure and enhancing irrigated agriculture in selected high potential sites across the country during project implementation that may have an impact on riparian water sources. -Irrigation schemes under the proposed IDSP project are located on tributaries of the Zambezi and Congo river basins, which are international waterways flowing through Angola, Botswana, Democratic Republic of the Congo, Malawi, Mozambique, Namibia, Tanzania, Zambia, and Zimbabwe. -The Riparian notification process per the requirements was completed on September 15, 2010.	-The policy is triggered because the remediation of the dam sites was not previously part of the IDSP umbrella, and these dams are located in tributaries of the Zambesi and Congo rivers basins. -The AF is currently asking for an exception to notification according to paragraph 7a of the policy. The dam remedial works consist of strengthening and stabilizing existing dam embankments and completing and reinforcing existing spillways to ensure dam safety. The activities will not change the nature and scope of the existing schemes and will not increase the dams' existing capacity. Therefore, these remedial measures will not adversely change the quality or quantity of water flows to the other riparians; and will not be adversely affected by the other riparian's possible water use. Further, the AF will also finance the implementation of social and

Operational policy	Name	Water Project: Zambia Water Resources Development Project (P114949)	Parent Project: IRRIGATION DEVELOPMENT AND SUPPORT PROJECT (P102459)	Actions to be followed by the AF to the IDSP (Irrigation Development Support Project - Additional Financing (P172140)
				environmental measures as identified in the ESMPs and addendum ESIAs, which will mitigate any remediation impacts.

6.2 Country regulations

Table 6-2. Zambian regulations relevant to the project.

Legal instrument	Relevant provisions	Responsible institutions	Relevance to/compliance with the rehabilitation of the dam and reservoir
Environment and natural resources management			
Environmental Management Act No.12, 2011	To protect the environment and control pollution, so as to provide for the health and welfare of persons, animals, plants and the environment.	Ministry of Lands, Natural Resources and Environmental Protection	The various activities to be undertaken on the project are likely to have environmental and social impacts and these will require that site specific environmental instruments be prepared to eliminate or reduce impacts. At national level, In Zambia the Environmental Impact Assessment (EIA) regulation of 1997 gives guidance, schedules and categories the various project types and the relevant EIA studies to undertaken. It further gives provision on post EIA approval management of projects and guidelines for developing Environmental Social Management Plans (ESMPs). Furthermore, during the operational phase of the project, some activities will be required to be licensed by ZEMA in accordance with the compliance requirements of the Environmental Management Act, 2011. The AF will comply with the requirements of this
Environmental Impact Assessment (EIA) Regulations, Statutory Instrument No. 28 of 1997	A developer shall not implement a project for which a project brief or an environmental impact statement is required under these Regulations, unless the project brief or an environmental impact assessment has been concluded in accordance with these Regulations and the Council has issued a decision letter. The Act covers water, air, waste, pesticides and toxic substances, noise, ionizing radiation and natural resources, etc.	Zambia Environmental Management Agency	

Legal instrument	Relevant provisions	Responsible institutions	Relevance to/compliance with the rehabilitation of the dam and reservoir
			regulation and will seek the environmental permits and Approval decision letter necessary for the rehabilitation of the dams and project affected area.
Natural Resources Conservation Act, Cap 315, 1970	Conservation and improvement of natural resources and control of bush fires. Guides the management and use of natural resources outside the forest reserves and national parks.	Ministry of Lands, Natural Resources and Environment Protection	The AF will remediate and restore all affected areas to ensure protection of natural resources as required by the regulations.
Heritage and cultural aspects			
National Heritage Conservation Act No. 23 of 1989	To conserve and protect both natural and cultural heritage, e.g. waterfalls, in perpetuity and other resources within the boundaries of the site for the benefit of the present and future generation.	National Heritage and Conservation Commission	The AF will reassess all sites during the design phase. The project dam site specific ESIAs/ESMPs will detail specific mitigation measures to ensure project activities promote the conservation and protection of both natural and cultural heritage in the project affected areas, and compliance with the regulation.
Water resources development and management			
The Water Act, Cap 312 of the Laws of Zambia, 2011	To provide for ownership, control and use of water. The Act established the Water Resources Management Authority and regulates the use of public water including protection against pollution.	Ministry of Energy and Water Development through the Water Resources Management Authority	The AF will ensure that any effect on downstream water resources is minimized and/or mitigated during construction and subsequent operation of the dams. The AF will comply with the requirements of the regulation. Permits or approvals if required will be obtained.

Legal instrument	Relevant provisions	Responsible institutions	Relevance to/compliance with the rehabilitation of the dam and reservoir
Forestry resources management			
The Forest Act No. 4 of 2015	Control, manage, conserve and administer National and Local forests; Participation of local communities, traditional institutions, and NGOs; Conservation and sustainable use of forests and trees.	Zambia Forestry Commission (yet to be formulated) / currently by the Department of Forestry	The WRDP has caused impact to some forest areas. During the construction/rehabilitation of the dam sites, and subsequent operation and expansion of the agriculture areas, tree loss may occur. Restoration measures will be included in the ESIA/ESMP to reduce reservoir slope erosion and increase conservation of downstream wetlands and riparian areas. The AF will comply with this regulation. Although unlikely, if forest resources, were affected by the project, required approvals and permits will be obtained and the regulation will be complied with.
Fisheries resources management			
Fisheries Act, Cap 200, 1974	Provides for development of commercial fishing and the registration of fishermen and their boats and the protection of endangered fish species.	Ministry of Agriculture and Livestock	The AF will comply with this regulation. Approvals are required for fishing which is a main activity at the dam sites. The ESIAs/ESMPs will determine appropriate action to ensure preservation of protected and endangered fish species. Permits will be obtained according to the regulation requirements.
Lands management			

Legal instrument	Relevant provisions	Responsible institutions	Relevance to/compliance with the rehabilitation of the dam and reservoir
The Lands Act, 1995 (CAP 292, CAP 289, CAP 288)	The Department of Lands administers the Land Act, 1995 (CAP 292, CAP 289, CAP 288) and the Lands Acquisition Act, 1995 for the allocation and alienation of land under statutory leaseholds. The Department is also responsible for the administration of lands and deeds registration and land surveys and mapping.	Ministry of Lands, Natural Resources and Environment Protection	No additional land is expected to be required by the AF, as it will finance predominately remedial works at existing dam sites. If any land acquisition be required, the AF will comply with this regulation which governs the acquisition of the land to be used for various developmental activities.
Urban and Regional Planning Act, No. 3 of 2015	Provides for the appointment of planning authorities, the preparation approval and revocation of development plans, and the control of development and subdivision of land.	Ministry of Local Government and Housing Local Authorities	The AF will comply with this regulation for the approvals of construction and development plans within a locality.
Local Government Act, 1990	Provides for the establishment of Councils in districts, the functions of local authorities and the local government system.	Ministry of Local Government and Housing Local Authorities	The function of the municipalities are guided by the provision of the Local Government Act. The AF will comply with the requirements of this Act for measures related to pollution control and environmental protection functions which are handled by the local council.
Tourism management			
Zambia Tourism & Hospitality Act 24 of 2007	Provides for the control of tourism enterprises.	Ministry of Tourism and Arts	If any of these dam sites are identified as potential tourist destination, the AF will comply with the relevant requirements of this regulation.

Legal instrument	Relevant provisions	Responsible institutions	Relevance to/compliance with the rehabilitation of the dam and reservoir
Zambia Wildlife Act No. 14 of 2015	Management and Protection of National Parks and Wildlife, respectively	Ministry of Tourism	The dams are located in remote rural areas, hence all activities under the AF will comply with the requirements of this regulation if protection of wildlife were required. The ESIAs/ESMPs will determine appropriate action to ensure preservation of national parks and protected areas, wildlife, and protected and endangered species.
Employment and labour			
Worker's Compensation Act No. 10 of 1999 Employment Act	All employment regulations and laws.	Ministry of Labour	Under the AF, the contractors will be required to comply with provisions of these regulations.
Occupational Health and Safety Act	Provides for the health and safety of persons at work and for the health and safety of persons in connection with the use of plant and machinery.		Under the AF, the contractors will comply with the occupational health and safety requirements of the Act, putting in place all measures required to ensure the well-being of the workers.

7 Methods used and dates of inspection of the dam areas

The Environmental and Social audit is based on desktop review of available information (refer to Section 4) and discussions with members of the Government of Zambia, the World Bank and United Nations Office for Project Services (UNOP) teams who have first-hand knowledge of the dam sites and the history of the construction contracts.

Due to time limitations, field visits were not conducted. The audit has considered each dam site separately, based on the available documents, current satellite imagery, and photographs presented in the reports. Where information has been available to distinguish between environmental and social performance at the different dam sites, this has been assessed.

Since the available documents provide a very limited account of valued environmental components in the areas of potential influence of the dams, the ability to determine ecological risks with any degree of confidence is limited.

8 Audit findings by Dam

8.1 Dam 1: Katembula

8.1.1 Characteristics of the dam and surrounding area

8.1.1.1 Dam and catchment characteristics

Katembula Dam is roughly 63 km west of Kitwe town in the Zambian Copperbelt Province (Figure 8-1).

The dam site on the Katembula stream was selected as the best option for a new dam for the newly established Lufwanyama urban centre that has no reliable water supply. The dam has been built to serve this requirement, as well as water for livestock, aquaculture and eventually irrigation development and the dam has been built for the sole purpose of serving the township.

The dam is classified as large under the International Commission on Large Dams (ICOLD) system, with a requirement for a non-erodible spillway. The design report estimates the annual sediment deposit to be 88,700 m^3, which gives the dam a theoretical lifespan of 25 years before it is silted up.

The main features of the dam and catchment are described in Table 7-1.

Table 7-1. The location and main characteristics of Katembula Dam.

DAM # 1: Katembula	Features
Location of the dam	
Province	Zambian Copperbelt Province
District	Lufwanyama District
Location of the dam (D.ddddd°)	S12.84450° E27.67682°
Name of the river/stream on which the dam was built	Katembula stream (perennial tributary of Lufwanyama River)
Dam characteristics and dimensions	
Dam type/material	Zoned earth fill embankment
Size classification (COWI 2019t)	Small (based on ICOLD)
Hazard Classification	
- Potential loss of lives	Significant
- Potential economic loss	Low
- Potential adverse impact on resource economy	Low
- Maximum hazard classification	Significant
Year dam was constructed	2016 -2019
Contractor name	Jearmy Enterprises
Wall height	10,4 m
Wall length	190 m
Volume storage	2,029,724 m^3
Reservoir surface area (at FSL)	58.6 ha
Reservoir catchment area	285.3 km^2
Maximum depth at FSL	7.4 m
Spillway (main)	Open channel at end of left flank with reinforced concrete drop structures

Spillway (emergency)	Open channel on right flank
Throwback	2.6 km
1:50 year design flood	692.1 m^3/s
1:100 year flood	827.6 m^3/s
Safety Evaluation Flood (SEF)	965.2 m^3/s
Other	
Foundation	Predominantly shales, siltstones, sandstones and mixtites
Foundation treatment	Core cut-off trench and mortaring/ slushing of cracks
Drainage system	Sand blanket drain with rock toe
Outlet works and scour	Two pipes equal unconfirmed diameter, concrete encased. Upstream inlet tower with inlet at ±2.5 m above river bed level. Flow is controlled at the downstream end of the pipe via three gate valves in a valve chamber.
Monitoring instruments	None

Figure 8-1. Satellite view of the Katembula dam site and surrounding area (imagery date 24 May 2018).

Figure 8-2. Katembula Dam – detail of the wall (imagery date June 2019).

Main spillway approach.

Valve chamber.

Step drop downstream of the wall.

Embankment crest with rock armouring on the upstream side.

Figure 8-3. Katembula Dam in November 2019.

8.1.1.2 Physical environment

The study area consists of hilly to gently undulating terrain, with some low lying areas. Climate is subtropical, with an annual average rainfall of 1,232 mm and average relative humidity of around 65%. The average daily temperature range in Lufwanyama District is between 6 °C and 15 °C in June and between
27 °C and 32 °C in December.

The predominant soil types are humic ferrosols (well-drained soils with red or yellow-brown colour and have clay-loam to clay textures). These soils have formed from the ancient basement complex geology of the Lufwanyama District, in a humid tropical climate and naturally occurring forest vegetation. In the Katembula valley bottom, dambo soils occur. Dambos are seasonally to permanently wet grassy valleys, associated with river systems. They exhibit a catenary of soils, being well drained on the upper slopes and becoming poorly to very poorly drained in the valley bottom. Dambos have a polygenetic origin, being often essentially alluvial soils but are almost always underlain by laterite at some depth.

The Katembula stream drains an area of 286.3 km^2 upstream of the dam. It is a perennial tributary of the Lufwanyama River, which in turn flows into the Kafue River. Natural mean annual runoff (MAR) at the dam wall is 17,178,000 m^3. In the vicinity of the dam, the stream flows in an open channel associated with fringing dambos (wetlands). These are clearly evident in Figure 8-1.

Water quality testing shows quality of both surface and groundwater sources to be good for inorganic constituents. No testing for organic constituents was done and it can be assumed that in the circumstances of typical rural areas, where people use long-drop toilets and livestock enter surface water sources, there would be bacteriological contamination.

8.1.1.3 Biological environment

The study area lies in the Central Zambezian Miombo woodlands dominated by Julbernardia, Brachystegia and Isoberlinia tree species. The north eastern fringe of the dam has undergone minimal human influence with few signs of agricultural activity. On the western side of the dam, associated with the gravel road and along the edges of the wetlands (dambos) upstream of the FSL, there is more extensive cultivation and loss of natural habitat. No threatened or endemic plant species were identified in the vegetation assessment prepared by COWI (2018) and no gazetted forest or protected areas were affected.

The dam is situated in largely natural habitat and has resulted in the outward shifting of the wetland area. The original wetlands have been submerged. The upland tree species that were within the dam basin have died or are dying, not being water loving plants. There are presently no data available about the downstream wetlands along the stream, nor about any effect that the changes in flow caused by the dam may have had on them.

The natural terrestrial fauna of the area is likely to be depauperate, having been extensively hunted over the years. Few medium sized mammals remain and none of the larger species are likely to be present, other than as vagrants. A wide range of reptiles, amphibians and birds are still likely to occur which considerably exceeds the list recorded by COWI (2018), which was based on discussions with communities rather than field survey. Twenty-seven fish species occur in the river, also identified from community consultation meetings. All of these are harvested at various times of year by the communities.

Among the animal species recorded by COWI (2018) from community consultations, the Southern African python (*Python sebae*) is the only Red Data species, listed as 'Vulnerable' in the latest International Union for Conservation of Nature (IUCN) Red Data classification.

Use of the Integrated Biodiversity Assessment Tool (IBAT)[5] as an adjunct to screening level assessment shows 26 potentially occurring Red Data species - 5 mammal, 14 bird, 2 fish and 5 plant species - within a 50 km radius of the dam site. Most of these are likely to have been recorded in the protected areas, which are all Forest Reserves (FRs). Twenty-one FRs occur within the 50 km buffer, with the largest being the Lamba Headwaters FR, the Kafue Headwaters FR, the Kisangwa, Lushishi, and No. 39 and 44 FRs, having a

[5] The Integrated Biodiversity Assessment Tool (IBAT) is a multi-institutional programme of work involving BirdLife International, Conservation International, IUCN and UNEP-WCMC. IBAT provides a basic risk screening on biodiversity. It draws together information on globally recognised biodiversity information drawn from a number of IUCN's Knowledge Products: IUCN Red List of Threatened Species, Key Biodiversity Areas (priority sites for conservation) and Protected Planet/The World Database on Protected Areas (covering nationally and internationally recognised sites, including IUCN management categories I–VI, Ramsar Wetlands of International Importance and World Heritage sites).

combined and more or less contiguous area of around 5,000 km^2. The boundary of the Lamba Headwaters FR is within 2 km of the dam. Most of the FRs in this area have been severely encroached in the past decade, being only 40-50 km south and west of Chingola and Kitwe, which are major towns.

Five endemic fish are known from drainage system (pers. comm. W Aken, March, 2020) as well as the two vulnerable Red Data cichlid species, recorded by IBAT. Both of the cichlids are threatened by *O. niloticus,* which has been introduced into Zambian river systems by anglers and aquaculturalists.

Table 7-2 Red Data species recorded within a 50 km radius of the Katembula dam site

Species (common name)	**Scientific name**	**IUCN Red Data Status**
Mammals		
Black rhinoceros	*Diceros bicornis*	CR
African wild dog	*Lycaon pictus*	EN
White-bellied pangolin	*Phataginus tricuspis*	EN
Hippopotamus	*Hippopotamus amphibius*	VU
Leopard	*Panthera pardus*	VU
Birds		
White-backed vulture	*Gyps africanus*	CR
Hooded vulture	*Necrosyrtes monachus*	CR
White-headed vulture	*Trigonoceps occipitalis*	CR
Steppe eagle	*Aquila nipalensis*	EN
Madagascar pond-heron	*Ardeola idae*	EN
Grey crowned crane	*Balearica regulorum*	EN
Egyptian vulture	*Neophron percnopterus*	EN
Lappet-faced vulture	*Torgos tracheliotos*	EN
Tawny eagle	*Aquila rapax*	VU
Southern ground-hornbill	*Bucorvus leadbeateri*	VU
Wattled crane	*Bugeranus carunculatus*	VU
Slaty egret	*Egretta vinaceigula*	VU
Martial eagle	*Polemaetus bellicosus*	VU
Secretarybird	*Sagittarius serpentarius*	VU

Species (common name)	Scientific name	IUCN Red Data Status
Fish		
Threespot tilapia	*Oreochromis andersonii*	VU
	Oreochromis macrochir	VU
Plants		
	Rotala robynsiana	CR
	Xyris exigua	CR
	Nymphoides tenuissima	EN
	Rotala fontinalis	VU
	Rotala smithii	VU

8.1.1.4 Socio-economic environment

The site is in Kansoka Ward of Lufwanyama District. The immediate project area is also in Chieftainess Shimukunami's area of the Lamba speaking people. Kasonka ward has an estimated population of 6,360, consisting of 48 per cent women and 52 per cent men, with 1,267 households. Settlements are generally extended families living in villages. The project area communities have settled mainly along the M18, which is a tar road (Figure 8-1). Gravel roads provide access from the M18 to both sides of the dam wall, and a single small road extends up the west side of the dam to communities at the upper end of the FSL.

The major villages where the dam's beneficiaries live include Manda, Kanchigwe, Songo, Manjimela, Chaisa, Pungwa, Lundwe, Kambinji, Vambi, Chipimpi, Chifulo, Kangaye, Thomashi, Chishima, and Kaputula.

The dam is located at a sub-centre, which is serviced by varied social services. These include the Katembula primary, Katembula and Lufwanyama secondary schools, Katembula Rural Health Centre and the Lufwanyama district hospital, located in Lufwanyama urban centre.

Land tenure in the dam basin area is generally traditional, administered by Chieftainess Shimukunami. Small scale farming makes up most of the animal husbandry in the project area, including rearing of chickens, sheep, goats and cattle. Crop cultivation includes cassava, maize, millet, sorghum, beans, sweet potatoes, and groundnuts, most of which are inter-cropped to save time, land and labour.

8.1.2 Non-compliance issues and risks

8.1.2.1 Dam safety (structural) risks

The UNOPS (2019) site report describes the dam wall as well-graded laterites with a defined crest and slopes, good rock pitching on the upslope and grassing on the downslope. Grass cover was patchy at the time of the site visit in November 2019, but is expected to improve. The main spillway consists of a number of stepped weirs founded on hard laterite, but has a constricted approach and is not wide enough to

accommodate the full design flood – consequently a secondary (emergency) spillway has been cut on the right bank. The stepped weirs appear to be competent with limited erosion below the downstream step. The knife valves at the spillway were all in good condition and operational at the time of the site visit.

The main structural safety concerns are described in Table 8-2.

Table 8-2. Dam safety compliance status and risks (Katembula Dam).

Code	Aspect	Concern/non-compliance	Risk
Construction Remediation Phase			
SFA-1	Structural safety	Crest tension cracks probably due to settlement of the embankment fill caused by sponging and seepage along the toe of the dam.	Dam failure through slips - downstream community safety.
SFA-2	Structural safety	Piping of water down the side of the emergency spillway as settlement shears vertically down the side, causing erosion.	Dam failure through eventual undercutting of the spillway - downstream community safety.
SFA-3	Structural safety	The tight turn of the channel below the emergency spillway into the main river channel, which is likely to result in channel erosion on the bend.	Undercutting of the emergency spillway.

Tension crack on the embankment crest.

Seepage around the headwall on the lower step.

Figure 8-4. Incipient structural failures due to poor construction (Katembula).

8.1.2.2 Dam health and safety (non-structural) risks

The main non-structural health and safety concerns associated with the construction and operational phases of the dam are described in Table 8-3.

Table 8-3. Dam health and safety compliance requirements and risks.

Cod	Aspect	ESMP/ARAP requirement	Risk	Status on site
Construction Remediation Phase				
HSA-1	Community health and safety	Rehabilitation of borrow pits to avoid ponding of water creating of mosquito breeding grounds and risk of drowning or injury.	Increased malaria risks. Increased risk of children drowning or injury.	Not done.
HSA-2	Community safety	Erection of safety hazard signs around the dam.	Serious or fatal incidents/drownings.	Not done.

Cod	Aspect	ESMP/ARAP requirement	Risk	Status on site
HSA-3	Community health and safety	Provision of safe pedestrian access across the river downstream of the dam.	Serious or fatal incidents/drownings.	Not done.
Operational Phase				
HSA-4	Community safety	Provide dam emergency safety talks/ sensitisation and training to local community and dam committee.	Lack of knowledge about actions to take in emergencies.	Not done.
HSA-5	Community safety	Sensitization of community to avoid risk of spillway crossings.	Serious or fatal incidents/drownings	Not done.
HSA-6	Community safety	Enforcement of dam safety and security measures around the dam.	Serious or fatal incidents/drownings	Not done.
HSA-7	Community safety	Warning prior to opening of overflow pipes in the event of flooding.	Serious or fatal incidents/drownings	Not done.
HSA-8	Community Safety	Safety sensitisation and awareness programmes of swimming risks particularly for children.	Serious or fatal incidents/drownings	Not done.
HSA-9	Community health	Sensitization of community to impacts of drinking untreated water.	Increased prevalence of water borne diseases.	Not done.

8.1.2.3 Environmental risks

Katembula dam floods 59 ha of riverine and aquatic habitat over a distance of 2.6 km. The environmental instruments prepared for the project are too generic to determine the ecological impacts that have resulted from inundation of this river system and the future impact of the dam on flow regulation. There is inadequate knowledge of site, upstream and downstream ecological conditions. As a result, the ESMP (COWI, 2018a) provides no meaningful guidance about the interventions necessary to manage the impacts on the system, referring only to "monitoring and mitigation for adaptive management in order to quantify and evaluate accumulative environmental impacts after demobilisation". Two vulnerable Red Data tilapia species are recorded by IBAT, although it is known that other species, including 5 endemic fish and two cichlids are known from the catchment area (pers. comm. W Aken, March, 2020).

Since this issue applies to all of the dams it is discussed in more detail in Section 7.11 'Compliance with World Bank Policies'.

The terrestrial baseline presented in the instruments on vegetation types, flora and fauna is also inadequate, even as the basis for a preliminary assessment of impact. No specialist field work was done by an experienced ecologist. There is no reference in the reports to Red Data species, areas of conservation concern, valued environmental components (VECs) or any of the other indicators that would provide a basis for a structured assessment of impact and future management and monitoring recommendations. Again, this limitation applies to other dam sites as well and the actions necessary are discussed in Subsection 7.11 and Section 8.

Environmental management requirements (post-construction) in the COWI (2018a) ESIA/ESMP are aimed primarily at responsible demobilisation and site restoration. These requirements are included in Table 8-4, summarised from Section 7 of the ESIA/ESMP. The ESMP provides an adequate framework for demobilisation and site restoration. Table 8-4 shows the project status to be non-compliant with most of the requirements, and remedial action is required in these cases. No structured process of demobilisation and restoration has been followed and the plan required by the ESMP has not been prepared or implemented. A plate gauge has not been installed, as required by the ESMP, and there is no plan in place to monitor ecological impacts of the dam.

Table 8-4. Environmental compliance status and risks (Katembula Dam).

Code	Aspect	Safeguard requirement (ESMP/ARAP)	Risk	Compliance status
Construction Remediation Phase				
ENA-1	Demobilisation and restoration	Prepare Demobilisation and Restoration Plan.	Plan ensures structured management to minimise environmental risk of dam construction impacts	No plan prepared or implemented.
ENA-2	Rehabilitation of work areas	Rehabilitate disturbed work areas and restore as close as possible to original contours. Restore topsoil from stockpiles. Replant with native plant seed mixes, where natural revegetation likely to be unsuccessful.	Erosion and sedimentation. Alien plant infestation. Loss of use of land.	Not done. Rehabilitation very limited. No formal restoration undertaken. Extensive clearing of woodland above the left bank and downstream of the right bank.
ENA-3	Rehabilitation of work areas	Install drainage structures to reduce uncontrolled runoff. Plant fast growing trees in erosion-prone areas	Erosion and sedimentation. Loss of habitat	Not done as works were suspended and project closed.
ENA-4	Rehabilitation of borrow pits	Make borrow area safe. Stabilise steep slopes. Backfill to acceptable landform. Prevent accumulation of water. Topsoil. Reseed naturally or with indigenous seed mixtures.	Erosion and sedimentation.	Not done. No borrow pit rehabilitation plans prepared or evaluation of borrow pit safety. No slope stabilise undertaken. No topsoil reinstatement or reseeding done. Any recovery of grass has been due to natural processes.
ENA-5	Site clean-up and rehabilitation	Repair community roads and paths. Close selected bush paths by ripping and revegetating. Close contractor paths around dam. Train dam committees.	Erosion and sedimentation. Alien plant invasion. Loss of use of land.	No repair done. Dam committees formed but not trained.
ENA-6	Site clean-up and rehabilitation	Remove housing, office units, other infrastructure. Hand over any useful units to the community/dam committee. Rehabilitate campsite.	Alien plant invasion. Loss of use of land.	Campsite was demolished and the camp house on the right bank is used as deposit/guard house.
ENA-7	Hazardous waste	Recycle used hydrocarbons where possible. Dispose off-site in accordance with regulatory requirements. Bioremediate oil-contaminated soil in a land farm or use in-situ remediation where the	Surface and groundwater pollution. Soil contamination.	Not done. No oil recycling took place during construction. Waste hydrocarbons may be present on site. Hydrocarbon-contaminated soils may also be present,

Code	Aspect	Safeguard requirement (ESMP/ARAP)	Risk	Compliance status
		contamination plume is shallow.		particularly at the camp site refuelling bays and in other areas where drip trays and oil containment measures were not taken. No biological remediation of contaminated soils was done.
ENA-8	Non-hazardous construction waste	Dispose all rubble and other non-hazardous waste at a ZEMA/local authority certified landfill. Level and rehabilitate heaps of soil.	Water and soil pollution.	No systematic process of site clean-up done.
ENA-9	Non-hazardous construction waste	Use overburden spoil to backfill the borrow pits.	Erosion and sedimentation.	No systematic process of site clean-up and rehabilitation done.
ENA-10	Sanitary waste	Dismantle and bury pit latrines after applying lime.	Groundwater pollution	Not done.
ENA-11	Downstream ecological flow	Install gauge plates to measure water levels and water releases	If not done, absence of data to evaluate downstream flow impacts.	Not done.
Operational Phase				
ENA-12	Environmental flow releases	No flow requirement specified.	Impact assessed by COWI (2018) as ecologically positive due to increased reliability of downstream flow. Assessment not supported by detailed evidence	No measurement of flow or evaluation of downstream impact.
ENA-13	Environmental flow releases	Designated flow gauge reader to record flow results.	If not done, inability to monitor and manage downstream ecological impacts (positive or negative)	Not done.
ENA-13	Performance monitoring	Undertake performance and impact monitoring as a basis for adaptive management	If not done, failure to understand and manage long term impacts.	Not done.

Some naturally occurring grass cover on the downslope embankment. No topsoil evident (November 2019).

Lack of proper compaction and grass cover on side wall abutments resulting in erosion loss which will eventually undercut the steps (November 2019).

River diversion during construction. Note highly eroded embankments (March 2018).

Borrow pit on the right bank (March 2018).

Figure 8-5. Issues relating to rehabilitation of the site (Katembula).

8.1.2.4 Social risks

Compliance requirements for social impact management are included in Table 8-5, summarised from Section 9 of the ESMP (COWI, 2018a) and the Abbreviated Resettlement Action Plan (COWI, 2018d). Compliance relates to the compensation and reinstatement of the livelihoods of PAPs, capacity building of PAPs and institutions, and community health and safety, affected by rehabilitation and making safe of the construction site. Livelihood restoration planning has completed and compensation has been paid and verified by the World Bank, except for 5 PAPs who claim they were flooded in 2018/2019 but were not included in the ARAP (according to the Government, they were planting crops within the full supply level of the dam). There are also a number of outstanding actions in relation to ongoing PAP support and capacity building of PAPs and local institutions.

Apart from cash compensation for lost crops, Table 8-5 shows that most of the community development requirements have not been met yet, and action is required in these cases.

Table 8-5. Social compliance status and risks (Katembula Dam).

Code	Aspect	ESMP/ARAP requirement	Risk	Status on site
Construction Remediation Phase				
SCA-1	Community Water Supply	Construction of water treatment and water supply components of the project to communities.	Failure of project to meet its primary objective.	Dam built but local authority has been unable to fund the water treatment plant and water supply pipeline.
SCA-2	Compensation and livelihood restoration	A resettlement action plan to be prepared to ensure compensation for the lost assets and income.	Failure to restore PAPs livelihoods.	Abbreviated Resettlement Action Plan (ARAP) prepared by COWI (2018d). Thirty PAPs identified. A further five have claims for land-for-land compensation which were raised during the verification by the World Bank's consultant. ARAP approved by Zambian authorities and no objection from World Bank. Compensation payments for lost crops made by government and verified by WB. No grievances logged in the grievance redress mechanism (GRM).
SCA-3	Compensation and livelihood restoration	Replacement land to be made available by the traditional leadership. Where land cannot be identified, cash payments at market rates can be made	Failure to restore PAPs livelihoods.	In progress. Status of land-for-land compensation to be verified upon commencement of re-design works.
SCA-4	Cultural heritage	Fencing of the graveyard	Damage to graveyard	Not done. No graveyard close to site. To be verified during design works.
Operational Phase				
SCA-5	Community development	Stocking of the dam with fish.	Failure to meet project objectives of improved livelihoods for local communities.	Not done. It should be noted that this dam has been built primarily to provide drinking water to the community.
SCA-6	Community safety	Farmers to be educated about safe methods of chemical handling and control.	Injury or illness.	Not done.
SCA-8	Community Development	Training in entrepreneurship, fish farming, community organization, agricultural diversification,	Lack of capacity to benefit fully from irrigation water supply.	Not done. Less applicable given the primary use envisaged for the dam as water supply reserve.

Code	Aspect	ESMP/ARAP requirement	Risk	Status on site
		development of skills to pursue added value agricultural activities such as food processing and intensive farming.		
SCA-9	Livelihood restoration	Training to avoid crop losses due to planting in areas within the FSL.	Crop failure and GRM compensation claims.	Not done. Sanitary zone to be established.
SCA-10	Livelihood restoration	Monitoring of livelihood restoration/community development.	Inability to evaluate success of programme to meet development goals and objectives.	Future action.
SCA-11	Community health and safety	Update of the generic Emergency Response Plan to be dam-specific	Inability to effectively manage emergencies caused by the dam	Not done

8.1.3 Proposed actions

8.1.3.1 Actions to address dam safety risks (structural)

Proposed remedial actions for identified dam safety risks and non-compliances during construction are described in Table 8-6.

Table 8-6. Actions to address structural dam non-compliances and risks (Katembula Dam).

Code	Aspect	Risk	Action required
SFA-1	Dam failure	Failure of dam embankment due to settlement of fill embankment and absence of drainage control.	• Open crest tension cracks to a depth of 300 mm and backfill to prevent lubricating the cracks in the rains. • Install filtered rock toe to control seepage and stabilise the embankment.
SFA-2	Dam failure	Seepage and piping around one of the head walls, circumventing the spillway step structure.	• Open fill around head walls and re-compact with small sand filtered toe to control any seepage.
SFA -3	Dam failure	Erosion at tight turn below emergency spillway	• Lengthen the spillway return.

8.1.3.2 Actions to address dam health and safety risks (non-structural)

Proposed remedial actions for identified dam health and safety risks and non-compliances are described in Table 8-7.

Table 8-7. Actions to address dam health and safety non compliances and risks (non-structural)

Code	Aspect	Risk	Action required
Construction Remediation Phase			
HSA-1	Rehabilitation of borrow pits	Failure to rehabilitate causing increased malaria risks and increased risk of	• Comply with ENA-4, ENA-9 action requirements. • Ensure borrow pits free draining to avoid malarial breeding sites and minimise drowning risks.

Code	Aspect	Risk	Action required
		children being injured or drowning.	
HSA-3	Access across the river	Lack of access across the dam with increased risk of community injury and drowning.	• Verify and construct required access across the river downstream of the dam (or in location best suited for convenient community access).
HSA-2	Community health and safety	Drowning due to absence of warning signs.	• Design and erect appropriate hazard notices • Sensitise communities to risks.
Operational Phase			
HSA-4, HSA-5, HSA-6, HSA-7, HSA-8, HSA-9	Community health and safety	Injury or illness caused by lack of knowledge of dam risks.	• Develop a training programme for communities who live around the dam. • Train communities in accordance with the plan (including drinking water and water borne diseases, avoidance of dangerous spillway crossings, swimming risks, emergency preparedness in floods or dam failure).

8.1.3.3 Actions to address environmental non-compliances and risks

Proposed remedial actions for identified environmental risks and non-compliances are described in Table 8-8. Several non-compliances are combined into a single action in some instances. All actions described are to be included in the remediation ESMP to be developed for the construction remediation phase and operational phase of the dams.

Table 8-8. Actions to address environmental non-compliances and risks (Katembula Dam).

Code	Aspect	Risk	Action required
Construction Remediation Phase			
ENA-1	Demobilisation and restoration plan	Plan ensures structured management to minimise environmental risk of dam construction impacts.	• Prepare plan as part of the requirements of the ESMP.
ENA-2, ENA-3,	Rehabilitation of disturbed works areas	Erosion and sedimentation	• Conduct detailed site inspections • Define and map disturbed areas where rehabilitation/erosion control is required. • Develop method statements for each area, including problem statement, method of rehabilitation, resources needed and responsibilities (See ENA-1 above). • Implement rehabilitation and monitor effectiveness.
ENA-5	Rehabilitation of community roads	Loss of community access.	• Rehabilitate community roads used by the contractor. • Close and rehabilitate any informal bush tracks made by the contractor.

Code	Aspect	Risk	Action required
ENA-4; ENA-9	Rehabilitation of borrow pits	Erosion and sedimentation. Weed infestation. Entrapment risk to wild animals.	• Conduct detailed site inspections • Prepare detailed rehabilitation plan for each borrow area. Define methodologies for top-soiling and reseeding with natural grass seed mixtures. • Reduce slopes and backfill with inert spoil, where necessary/possible, to create safe conditions that avoid entrapment of animals and accumulation of water. • Monitor effectiveness of rehabilitation.
ENA-6, ENA-8	Waste, construction infrastructure and rubble	Weed infestation, loss of productive land.	• Conduct detailed site inspections • Prepare snag list defining each area where remedial action is necessary, and the required actions. • Waste/rubble to be removed to government-approved disposal sites.
ENA-10	Sanitary waste	Groundwater and surface water pollution.	• Identify and map location of all pit latrines created by the Contractor. • Define methods to ensure safe capping with no pollution risk.
ENA-7	Hazardous waste, hydrocarbon-polluted soils	Groundwater and surface water pollution.	• Conduct detailed site inspections • Prepare snag list defining each area where remedial action is necessary, including location of waste oil drums and/or other hazardous chemicals, location of oil-contaminated soils and the required actions. • Define methods for soil remediation. • Implement and monitor recovery. • Hazardous waste to be removed to a government-approved hazardous waste disposal site.
ENA-11	Environmental flow releases	Inability to monitor and assess downstream ecological effects of dam operation.	• Design and install gauge plates. • Undertake assessment of downstream aquatic and riparian conditions as a basis for flow requirements and monitoring to be imposed on the operational phase of the dam. • Undertake assessment of the ecological effect of stocking the dam with fish (particularly *O. nilotica*)
Operational Phase			
ENA-12, ENA-13, ENA-14	Environmental flow releases	Inability to monitor and assess downstream ecological effects of dam operation.	• Ensure adherence to the prescribed environmental flow and other management requirements; • Develop O&M plan to include ecological flow requirements. • Appoint and train flow reader. • Maintain flow records. • Monitor dam impact on aquatic environment (monitoring plan to be determined in the assessment phase above).

8.1.3.4 Actions to address social non-compliances and risks

Proposed remedial actions for identified social risks and non-compliances are described in Table 8-9. Several non-compliances are combined into a single action in some instances. All actions described are to be included in the ESMP to be developed for remediation of the site in the construction remediation phase and the operational phase of the dams.

Table 8-9. Actions to address social non-compliances/risks (Katembula Dam).

Code	Aspect	Risk	Action required
Construction Remediation Phase			
SCA-1	Community water supply – water treatment plant	Failure of project to meet its primary objective.	• Engage local authority to establish progress on plans to construct the water treatment plant and the water supply pipeline for Lufwanyana.
SCA-2	Cash compensation for crops	Failure to pay additional PAPs for lost crops.	• All cash compensations as identified in the ARAPs have been paid. •
SCA-3	Replacement land	Incomplete livelihood restoration.	• During the verification of the cash compensations carried out by a team of consultants of the World Bank in April 2019, it emerged that 5 more PAPs requested land, in land-for-land compensation requirements (35 instead of the 30 identified by COWI). The Ministry of Water Development Sanitation and Environment Protection has been following up with the chiefs. UNOPS will update on the status during the design and community mobilization phase. • Sensitisation of communities not to below the maximum water level during the dry season as fields will then be flooded during the wet season.
SCA-4	Cultural heritage	Interference with the graveyard.	• Fence graveyard. This appears to be incorrect. Presence of Graveyard to be verified during design phase.
Operational Phase			
SCA-5	Community development	Food security – failure to stock the dam with fish.	• Outside of the scope of the additional financing programme.
SCA-6	Community health and safety	Injury or illness caused by use of pesticides.	
SCA-7	Community health and safety	Unsafe drinking water.	
SCA-8	Community development	Lack of capacity/training to benefit fully from irrigation water supply.	
SCA-9	Community development	Lack of capacity to benefit fully from irrigation water supply.	

Code	Aspect	Risk	Action required
SCA-10	Livelihood restoration	Inability to evaluate success of programme to meet development goals and objectives.	• Develop and implement a monitoring and evaluation programme based on the requirements of the ARAP.
SCA-11	Community health and safety	Lack of capacity to respond effectively to emergencies related to the dam	• Update Emergency Response Plan

8.2 Dam 2: Chibalashi

8.2.1 Characteristics of the dam and surrounding area

8.2.1.1 Dam and catchment characteristics

Chibalashi dam is a new earth fill dam located approximately 9 km north-east of the town of Mansa in Mansa District, Luapula Province. The dam is constructed on the Chibalashi stream, one of the tributaries of the Mansa River. Its main purpose is to provide water for irrigation, fishing and other additional water uses that can be identified by the recipients.

The main features of the dam and catchment are described in Table 7-10.

Table 7-10. The location and main characteristics of Chibalashi Dam.

DAM # 2: CHIBALASHI	Features
Location of the dam	
Province	Zambian Luapula Province
District	Mansa District
Location of the dam (D.ddddd°)	S11.13663 E28.93960
Name of the river/stream on which the dam was built	Chibalashi River (drains to Mansa River)
Dam characteristics and dimensions	
Dam type/material	Zoned earth fill embankment
Size classification (COWI, 2019u)	Small (based on ICOLD)
Hazard Classification	
- Potential loss of lives	High (11 persons)
- Potential economic loss	Low
- Potential adverse impact on resource economy	Low
- Maximum hazard classification	High
Year dam was constructed	2016
Contractor name	Integrity Enterprises Limited
Wall height	10.3 m
Wall length	185 m
Volume storage	3,150,000 m^3
Reservoir surface area (at FSL)	90.7 ha
Reservoir catchment area	374.16 km^2
Maximum depth at FSL	~ 6.5 m
Spillway (main)	Service spillway: Open approach channel on the right flank with L-shaped thin crested reinforced concrete weir.
Spillway (emergency)	Auxiliary: By wash open channel spillway.
Catchment area	374.2 km^2
Throwback	3.6 km
1:50 year design flood	471.6 m^3/s
1:100 year flood	556.3 m^3/s

Safety Evaluation Flood (SEF)	717.2 m^3/s
Other	
Foundation	Lithological units of different ages, predominantly granite with volcanics and meta-volcanics.
Foundation treatment	Core cut-off trench.
Drainage system	Chimney drain, sand blanket drain with rock toe, details to be confirmed.
Outlet works and scour	Three outlet pipes were constructed but the 300 mm diameter stated on the design drawings does not correlate with what was seen on site (COWI, 2018k).
Monitoring instruments	None.

Figure 8-6. Satellite view of the Chibalashi dam site and surrounding area (imagery date June 2019).

Figure 8-7. Chibalashi Dam – detail of the wall (imagery date June 2019).

Main embankment – downslope showing grassing.

Main embankment – upslope and rock fill at the FSL.

L-shaped spillway.

Spillway abutment.

Left bank irrigation canal.

Right bank irrigation canal.

Figure 8-8. Chibalashi Dam (November 2019).

8.2.1.2 Physical environment

The Chibalashi River is perennial, flowing into the Katumbe, the Nsange, the Lupuma and finally into the Luapula River. This is the only one of the ten rivers on which the project's dams are situated that falls outside of the Zambesi drainage system, being a part of the Congo River drainage system. Flows at the dam site in a 1:00 year flood are estimated be 556 m^3/s. The gross mean annual runoff is 22,3 million cubic metres. Very high sediment yields occur in the dam's catchment which are expected to reduce storage capacity significantly in the next 50 years.

Mansa District generally lies between altitudes from 1,015 to 1,300 masl. The terrain is undulating hills and valleys. Regional geology of the area is granitic, interspersed with volcanics and meta volcanics. Soils are typically orthic ferrosols, being sandy clay overlying a layer of laterite/gravel soil with a thin layer of yellowish brown clay in between. Soils tend to be acidic. In the Chibalashi valley bottom, dambo soils occur. Dambos are seasonally to permanently wet grassy valleys, associated with river systems. They exhibit a catenary of soils, being well drained on the upper slopes and becoming poorly to very poorly drained in the valley bottom. Dambos have a polygenetic origin, being often essentially alluvial soils but are almost always underlain by laterite at some depth.

Groundwater levels are generally high in the valley bottoms and have been raised by the dam to the extent that some landowners now report springs in their cassava fields around the fringes of the dam. Water quality testing shows good inorganic quality for both surface and groundwater. No testing for organic constituents was done and it can be assumed that in the circumstances of typical rural areas, where people use long-drop toilets and livestock enter surface water sources, there will be bacteriological contamination of the water sources.

The district experiences a relatively moderate subtropical type of climate. Rainfall is over 1,200mm per year. Average relative humidity of around 65%. The average daily temperature range in Mansa District is between 9 °C and 25 °C in June and between 17 °C and 27 °C in December.

8.2.1.3 Biological environment

Mansa District lies in the ecoregion of central Zambezian miombo woodlands with predominant trees being of the Brachystegia and Julbernardia species. The grass layer is vigorous and naturally replenishes the existing woodland flora species. The woodlands are characterised by large trees, but has been extensively cleared in the dam area, as is evident from Figure 8-6. Relatively high rural population densities have resulted in pressure on natural resources, and trees are harvested to make way for cultivation and to provide firewood, charcoal and timber. In the wetland (dambo) areas of the valley bottom, wetland vegetation is extensively transformed, being the area in which market gardens are grown.

Within a 50 km radius of the dam site, there are five protected areas recorded, all of which are Forest Reserves. One (Chimimba Hills) is roughly 20 km west of the dam site. Other forest reserves include Lukangaba, Mubende, Pembela and Shamendi. The Red Data species list of terrestrial species recorded in the IBAT data base (Table 8-11) is likely to be largely from these forest reserves. No Key Biodiversity Areas (KBAs) occur with a 50 km radius of the dam site.

Table 8-11: Red Data Species recorded with 50 km of the Chibalashi Dam Site

Species (common name)	Scientific name	IUCN Red Data Status
Mammals		
Black rhinoceros	*Diceros bicornis*	CR
White-bellied pangolin	*Phataginus tricuspis*	EN
Lion	*Panthera leo*	VU
Leopard	*Panthera pardus*	VU
Birds		
White-headed vulture	*Trigonoceps occipitalis*	CR
Steppe eagle	*Aquila nipalensis*	EN
Madagascar pond-heron	*Ardeola idae*	EN
Grey crowned crane	*Balearica regulorum*	EN
Lappet-faced vulture	*Torgos tracheliotos*	EN
White-backed vulture	*Gyps africanus*	CR
Hooded vulture	*Necrosyrtes monachus*	CR
Tawny eagle	*Aquila rapax*	VU
Shoebill	*Balaeniceps rex*	VU
Southern ground-hornbill	*Bucorvus leadbeateri*	VU
Wattled crane	*Bugeranus carunculatus*	VU
Martial eagle	*Polemaetus bellicosus*	VU
Secretarybird	*Sagittarius serpentarius*	VU
Fish		
	Serranochromis robustus	CR
	Chetia mola	EN
	Nothobranchius sainthousei	EN
	Orthochromis luongoensis	EN
	Chiloglanis elisabethianus	VU

Species (common name)	Scientific name	IUCN Red Data Status
	Chiloglanis macropterus	VU
	Nothobranchius cooperi	VU
Plants		
	Drosera insolita	CR
	Rotala robynsiana	CR
	Xyris exigua	CR
	Aponogeton bogneri	EN
	Nymphoides tenuissima	EN
	Psilotrichum axilliflorum	EN
	Rotala fontinalis	VU
	Rotala smithii	VU

Twenty seven fish species are identified from community consultation meetings. All of these are harvested at various times of year by the communities. This area has not been well studied from a ichthyofaunal perspective, with many endemic, red listed and undescribed species present. *Nothobranchius cooperi* (VU) is endemic to freshwater habitats in northern Zambia. It is known from temporary pools and swamps on the floodplains of the Mansa and Lufimba river systems in Zambia and is likely to occur within the dam's area of influence (pers. comm. Warren Aken, March 2020).

Among the fish species recorded from community consultations by COWI (2018) and listed by IBAT, *Serranochromis robustus* (Yellow-belly bream or 'inusuku') *is Critically Endangered*. Suitable habitats include perennial rivers, streams and lakes/dams. The species status is expected to continue to decline due to extensive overfishing in its native ranges.

8.2.1.4 Socio-economic environment

Chibalashi Dam is located in Mansa ward of Bahati Constituency, under Chief Chimense IX. The project area consists of three large communities namely Chibalashi, Chakulya and Mutiti. Within these communities are dispersed large villages. It is estimated that there are twenty villages and 510 households that will benefit from the dam activities. The villages are inhabited by extended families and the major languages spoken are Ushi and Bemba.

The zone is densely populated and the economy is based on fishing and agricultural production. The major crops grown in the project and other adjoining areas are maize, rice, cassava, sorghum, finger millet, soya beans, groundnuts, beans, cowpeas, Bambara nuts and sweet potatoes. Livestock reared include, goats, chickens, sheep, pigs and few cattle.

Given its proximity to Mansa district, which is the provincial capital for Luapula Province, the area has

relatively good support from public institutions such as health, education, agriculture, community development and social services, fisheries and non-governmental organisations (NGOs). Some of the active NGOs include SALIYE that provides sexual reproductive health service, AFRICARE and PLAN international that are actively advocating for a stop to early marriages, and Peace Corps that has been implementing education and health programmes.

8.2.2 Non-compliance issues and risks

8.2.2.1 Dam safety (structural) risks

The main structural safety concerns are described in Table 8-11. These are summarised from UNOPS (2019).

Table 8-11. Dam safety compliance status and risks (Chibalashi Dam).

Code	Aspect	Concern/Non Compliance	Risk
Construction Remediation Phase			
SFB-1	Structural safety	The catchment area and design flood estimation need to be confirmed to demonstrate that the spillway has the necessary capacity.	Embankment failure - downstream community safety.
SFB-2	Structural safety	The abutment walls on the main spillway are eroding at the base.	Erosion hazard and spillway stability - downstream community safety.
SFB-3	Structural safety	The main spillway approach is not wide enough with a narrow approach that will restrict flood flow over the spillway (refer Figure 8-9).	Reduced spillway capacity – downstream community safety.
SFB-4	Structural safety	The secondary spillway return is inadequate.	Spillway failure risk – downstream community safety.

Restricted throat to the main spillway.

Erosion at the base of the spillway abutments.

Figure 8-9. Dam safety issues at Chibalashi Dam due to poor construction.

8.2.2.2 Dam health and safety (non-structural) risks

The main non-structural health and safety concerns associated with the construction and operational phases of the dam are described in Table 8-12.

Table 8-12. Dam health and safety compliance requirements and risks.

Cod	Aspect	ESMP/ARAP requirement	Risk	Status on site
Construction Remediation Phase				
HSB-1	Community health and safety	Rehabilitation of borrow pits to avoid ponding of water creating of mosquito breeding grounds and risk of drowning or injury.	Increased malaria risks. Increased risk of children being injured or drowning.	Not done.
HSB-2	Community safety	Erection of safety hazard signs around the dam.	Serious or fatal incidents/drownings.	Not done.
HSB-3	Community health and safety	Provision of safe pedestrian access across the river.	Serious or fatal incidents/drownings.	Uncertain. Reference not found in instruments.
Operational Phase				
HSB-4	Community safety	Provide dam emergency safety talks/sensitisation and training to local community and dam committee.	Lack of knowledge about actions to take in emergencies.	Not done.
HSB-5	Community safety	Sensitization of community to avoid risk of spillway crossings.	Serious or fatal incidents/drownings.	Not done.
HSB-6	Community safety	Enforcement of dam safety and security measures around the dam.	Serious or fatal incidents/drownings.	Not done.
HSB-7	Community safety	Warning prior to opening of overflow pipes in the event of flooding.	Serious or fatal incidents/drownings.	Not done.
HSB-8	Community Safety	Safety sensitisation and awareness programmes of swimming risks particularly for children.	Serious or fatal incidents/drownings.	Not done.
HSB-9	Community health	Sensitization of community to impacts of drinking untreated water.	Increased prevalence of water borne diseases.	Not done.

8.2.2.3 Environmental risks

Chibalashi dam floods over 90 ha of riverine and aquatic habitat over a distance of 3.6 km. The environmental instruments prepared for the project are too generic to determine the ecological impacts that have resulted from inundation of this river system and the future impact of the dam on flow regulation. There is inadequate knowledge of site, upstream and downstream ecological conditions. As a result, the ESMP (COWI, 2018b) provides no meaningful guidance about the interventions necessary to manage the impacts on the system, referring only to "monitoring and mitigation for adaptive

management in order to quantify and evaluate accumulative environmental impacts after demobilisation".

A desktop review of available information for the area suggests that Red Data fish may be present in the river system affected by the dam, including the critically endangered *Serranochromis robustus* (Yellow-belly bream or 'inusuku') and *Nothobranchius cooperi* (VU), which is endemic to freshwater habitats in northern Zambia. Stocking of the dam with fish may impact on these threatened species, depending on the species introduced. No assessment of these risks has been made. Since this issue applies to most of the dams it is discussed in more detail in Section 5.4 'Compliance with World Bank Policies'.

While the terrestrial baseline presented in the instruments on vegetation types, flora and fauna is also limited, with no specialist ecological screening having been done, the habitat disturbance over an extensive area around this dam due to cultivation suggests that further ecological work is not warranted.

Environmental management requirements for the dam (post-construction) in the COWI (2018b) ESIA/ESMP are aimed primarily at responsible demobilisation and site restoration. These requirements are included in Table 8-4, summarised from Section 7 of the ESIA/ESMP. The ESMP provides an adequate framework for demobilisation and site restoration. Table 8-13 shows the project status to be non-compliant with most of the requirements, and remedial action is required in these cases. No structured process of demobilisation and restoration has been followed and the plan required by the ESMP has not been prepared or implemented. A plate gauge has not been installed, as required by the ESMP, and there is no plan in place to monitor ecological impacts of the dam.

Table 8-13. Environmental compliance status and risks (Chibalashi Dam).

Code	Aspect	Safeguard requirement (ESMP/ARAP)	Risk	Compliance status
Construction Remediation Phase				
ENB-1	Demobilisation and Restoration	Prepare demobilisation and restoration plan.	Plan ensures structured management to minimise environmental risk of dam construction impacts.	No plan prepared or implemented.
ENB-2	Rehabilitation of work areas	Rehabilitate disturbed work areas and restore as close as possible to original contours. Restore topsoil from stockpiles. Replant with native plant seed mixes, where natural revegetation likely to be unsuccessful.	Erosion and sedimentation. Alien plant infestation. Loss of use of land.	Appears that grassing of the embankment was done and is in reasonable condition. Contour furrows for reseeding or erosion control on the embankments still evident. Adequacy of topsoil restoration uncertain. High levels of construction disturbance (borrow?) on the left bank (Figure 8-7).
ENB-3	Rehabilitation of work areas	Install drainage structures to reduce uncontrolled runoff. Plant fast growing trees in erosion-prone areas.	Erosion and sedimentation. Loss of habitat.	Not done.
ENB-4	Rehabilitation of borrow pits	Make borrow area safe. Stabilise steep slopes. Backfill to acceptable	Erosion and sedimentation.	Not done. There is a borrow area on the right flank of the dam which extends above

Code	Aspect	Safeguard requirement (ESMP/ARAP)	Risk	Compliance status
		landform. Prevent accumulation of water. Topsoil. Reseed naturally or with indigenous seed mixtures.		the FSL. There may be other borrow areas.
ENB-5	Site clean-up and rehabilitation	Repair community roads and paths. Close selected bush paths by ripping and revegetating. Close contractor paths around dam.	Erosion and sedimentation. Alien plant invasion. Loss of use of land.	No repair done.
ENB-6	Site clean-up and rehabilitation	Remove housing, office units, other infrastructure. Hand over any useful units to the community/dam committee. Rehabilitate campsite.	Alien plant invasion. Loss of use of land.	Not done. Campsite has been demolished. Grading of excavation required.
ENB-7	Hazardous waste	Recycle used hydrocarbons where possible. Dispose off-site in accordance with regulatory requirements. Bioremediate oil-contaminated soil in a land farm or use in-situ remediation where the contamination plume is shallow.	Surface and groundwater pollution. Soil contamination.	Not done. No oil recycling took place during construction. Waste hydrocarbons may be present on site. Hydrocarbon-contaminated soils may also be present, particularly at the camp site refuelling bays and in other areas where drip trays and oil containment measures were not taken. No biological remediation of contaminated soils was done.
ENB-8	Non-hazardous construction waste	Dispose all rubble and other non-hazardous waste at a ZEMA/local authority certified landfill. Level and rehabilitate heaps of soil.	Water and soil pollution.	No systematic process of site clean-up done.
ENB-9	Non-hazardous construction waste	Use overburden spoil to backfill the borrow pits.	Erosion and sedimentation.	No systematic process of site clean-up and rehabilitation done.
ENB-10	Sanitary waste	Dismantle and bury pit latrines after applying lime.	Groundwater pollution.	Not done.
ENB-11	Downstream ecological flow	Install gauge plates to measure water levels and water releases.	If not done, absence of data to evaluate downstream flow impacts.	Not done.
Operational Phase				

Code	Aspect	Safeguard requirement (ESMP/ARAP)	Risk	Compliance status
ENB-12	Environmental flow releases	No flow requirement specified.	Impact assessed as ecologically positive due to increased reliability of downstream flow.	No measurement of flow or evaluation of downstream impact.
ENB-13	Environmental flow releases	Designated flow gauge reader to record flow results.	If not done, inability to monitor and manage downstream ecological impacts (positive or negative).	Not done.
ENB-14	Performance monitoring	Undertake performance and impact monitoring as a basis for adaptive management.	If not done, failure to understand and manage long term impacts.	Not done.

8.2.2.4 Social risks

Compliance requirements for social impact management are included in Table 8-14, summarised from Section 7 of the ESIA/ESMP (COWI, 2018b); the Abbreviated Resettlement Action Plan (COWI, 2018e); and the Compensation Payment Verification Report prepared by the World Bank following the Mission between 24 April and 3 May 2019. Compliance relates to the compensation and reinstatement of the livelihoods of PAPs and capacity building of PAPs and institutions.

PAPs made extensive use of the area within the dam FSL, where they farmed vegetables and other crops in the dambos in the valley bottom. A total of 72 PAPs were identified as being directly affected by inundation of the dam. All of these PAPs have received compensation for lost crops in accordance with the schedules in the ARAP (COWI, 2018e), and verified by the World Bank. During the World Bank consultant's verification, the community communicated that additional 30 PAPs had been identified who had their fields submerged. This claim is being verified by the authorities

In addition, the process of land replacement for PAPs has been problematic. The area is heavily settled and finding suitable replacement land is difficult, particularly as most of the land lost was of high value, situated in the dambos associated with the river. The project approached Chief Kalaba with a request for 250 ha of land, but PAPs rejected this, arguing that the land is 15 km from their residences, that the proposed 3 ha land area will not compensate for the high value land they have lost along the river and that that there are widespread issues of witchcraft in that host community. PAPs opted for cash compensation instead. According to the Department of Water Resources Development (DWRD, part of the Ministry of Water Development Sanitation and Environmental Protection MWDSEP), this matter has been resolved. Further PAP complaints include the failure of the project to fulfil promises, particularly with regard to a bridge across the river to reinstate community crossings, which are significant, involving (according to the canoe peddler) around 300 person/trips per day. At present, the only means of crossing the lake is to use the canoe peddler, who has only one canoe.

However, Table 8-14 shows that most of the community health and safety requirements to minimise dam risks and the community and institutional support requirements to maximise project benefits are still to be met. Action is required in these cases.

Table 8-14. Social compliance status and risks (Chibalashi Dam).

Cod	Aspect	ESMP/ARAP requirement	Risk	Status on site
Construction Remediation Phase				
SCB-1	Community irrigation water supply	Construction of irrigation water supply for downstream community.	Failure of project to meet its primary objective.	The irrigation system was built under the WRDP and is being used.
SCB-2	Compensation and livelihood restoration	A Resettlement Action Plan to be prepared to ensure compensation for the lost assets and income. Cash compensation.	Incomplete restoration of PAP's livelihoods.	Abbreviated Resettlement Action Plan (ARAP) prepared by COWI (2018). All cash compensations to the 72 PAPs identified in the ARAPs have been paid.
SCB-3	Compensation and livelihood restoration	Replacement land to be made available to affected PAPs.	Failure to restore PAP's livelihood.	Land-for-land to the same 72 PAPs still ongoing. To be followed up during design and mobilization phase. During the verification of the cash compensations carried out by a team of consultants of the World Bank in April 2019, it emerged that 30 more PAPs requested land, in land-for-land compensation requirements (102 instead of the 72 identified by COWI). The Ministry of Water Development Sanitation and Environment Protection has been following up with the chiefs. UNOPS will update on the status during the design and community mobilization phase.
Operational Phase				
SCB-4	Community development	Stocking of the dam with fish.	Failure to meet project objectives of improved livelihoods for local communities.	Not done.
SCB-5	Community safety	Farmers to be educated about safe methods of chemical handling and control.	Injury or illness.	Not done.
SCB-6	Institutional capacity building	Institute a strong committee or cooperative management structure to ensure a functional irrigation scheme. Devise clear rules and regulations to	Lack of capacity to benefit fully from irrigation water supply.	Not done.

Cod	Aspect	ESMP/ARAP requirement	Risk	Status on site
		be complied with by members of the scheme. Foster organised livelihood activities including irrigation and fishing. Public institutions to support irrigation, Sensitise local leadership on the operation of the irrigation scheme.		
SCB-7	Training of beneficiaries	Assist PAPs with training to improve their knowledge of irrigation agriculture, high value crops to cultivate and other enterprises besides agriculture that could assist in income generation.	Lack of capacity to benefit fully from irrigation water supply.	Not done.
SCB-8	Livelihood restoration	Monitoring of livelihood restoration/community development (4 times after irrigation system established).	Inability to evaluate success of programme to meet development goals and objectives.	Future requirement – not started yet.
SCB-9	Community health and safety	Update of the generic Emergency Response Plan to be dam-specific	Inability to effectively manage emergencies caused by the dam	Not done.

8.2.3 Proposed actions

8.2.3.1 Actions to address dam safety risks (structural)

Proposed remedial actions for identified dam safety risks and non-compliances during construction are described in Table 8-15.

Table 8-15. Actions to address structural dam non-compliances and risks (Chibalashi Dam).

Code	Aspect	Risk	Action required
SFB-1	Structural safety	Catchment area/design flood too large for spillway capacity.	• Confirm catchment area and adequacy of spillway capacity.
SFB-2	Structural safety	Erosion of abutment wall on the main spillway.	• Repair and adequately protect abutment fill from erosion.

Code	Aspect	Risk	Action required
SFB-3	Structural safety	Main spillway approach not wide enough and serves as a choke on flows.	• Widen spillway approach.
SFB-4	Structural safety	Secondary spillway return is inadequate.	• Extend spillway to create a defined return to the river. Rehabilitate around the spillway. • Complete the auxiliary spillway which was abandoned unfinished when WRDP was suspended.

8.2.3.2 Actions to address dam health and safety risks (non-structural)

Proposed remedial actions for identified dam health and safety risks and non-compliances are described in Table 8-16.

Table 8-16. Actions to address dam health and safety non compliances and risks (non-structural)..

Code	Aspect	Risk	Action required
Construction Remediation Phase			
HSB-1	Rehabilitation of borrow pits	Failure to rehabilitate causing increased malaria risks and increased risk of children being injured or drowning.	• Comply with ENB-4, ENB-9 action requirements • Ensure borrow pits free draining to avoid malarial breeding sites and minimise drowning risks.
HSB-3	Access across the river	Lack of a bridge with increased risk of community injury and drowning.	• Construct pedestrian bridge across the river downstream of the dam (or in location best suited for convenient community access).
HSB-2	Community health and safety	Drowning due to absence of warning signs.	• Design and erect appropriate hazard notices • Sensitise communities to risks.
Operational Phase			
HSB-4, HSB-5, HSB-6, HSB-7, HSB-8, HSB-9	Community health and safety	Injury or illness caused by lack of knowledge of dam risks	• Develop a training programme for communities who live around the dam. • Train communities in accordance with the plan (including drinking water and water borne diseases, avoidance of dangerous spillway crossings, swimming risks, emergency preparedness in floods or dam failure).

8.2.3.3 Actions to address environmental non-compliances and risks

Proposed remedial actions for identified environmental risks and non-compliances are described in Table 8-17. Several non-compliances are combined into a single action in some instances. All actions described are to be included in the ESMP to be developed for the construction remediation phase and operational phase of the dams.

Table 8-17. Actions to address environmental non-compliances and risks (Chibalashi Dam).

Code	Aspect	Risk	Action required
Construction Remediation Phase			
ENB-1	Demobilisation and restoration plan	Plan ensures structured management to minimise environmental risk of dam construction impacts.	• Prepare plan as part of the requirements of the ESMP.
ENB-2, ENB-3,	Rehabilitation of disturbed works areas	Erosion and sedimentation.	• Conduct detailed site inspections. • Define and map disturbed areas where rehabilitation/erosion control is required. • Develop method statements for each area, including problem statement, method of rehabilitation, resources needed and responsibilities (See ENB-1 above). • Implement rehabilitation and monitor effectiveness.
ENB-5	Rehabilitation of community roads	Loss of community access.	• Rehabilitate community roads used by the contractor. • Close and rehabilitate any informal bush tracks made by the contractor.
ENB-4; ENB-9	Rehabilitation of borrow pits	Erosion and sedimentation. Weed infestation. Entrapment risk to wild animals.	• Conduct detailed site inspections. • Prepare detailed rehabilitation plan for each borrow area. Define methodologies for top-soiling and reseeding with natural grass seed mixtures. • Reduce slopes and backfill with inert spoil, where necessary/possible, to create safe conditions that avoid entrapment of animals and accumulation of water • Monitor effectiveness of rehabilitation.
ENB-6, ENB-8	Waste, construction infrastructure and rubble	Weed infestation, loss of productive land.	• Conduct detailed site inspections. • Prepare snag list defining each area where remedial action is necessary, and the required actions. • Non-hazardous waste/rubble to be removed to government-approved disposal sites.
ENB-10	Sanitary waste	Groundwater and surface water pollution.	• Identify and map location of all pit latrines created by the Contractor. • Define methods for the specific identified sites to ensure safe capping with no pollution risk.
ENB-7	Hazardous waste, hydrocarbon-polluted soils	Groundwater and surface water pollution.	• Conduct detailed site inspections. • Prepare snag list defining each area where remedial action is necessary, including location of waste oil drums and/or other hazardous chemicals, location of oil-contaminated soils and the required actions

Code	Aspect	Risk	Action required
			• Define methods for soil remediation. • Implement and monitor recovery. • Hazardous waste to be removed to a government-approved hazardous waste disposal site.
ENB-11	Environmental flow releases	Inability to monitor and assess downstream ecological effects of dam operation.	• Design and install gauge plates. • Undertake assessment of downstream aquatic and riparian conditions as a basis for flow requirements and monitoring to be imposed on the operational phase of the dam. • Undertake assessment of the ecological effect of stocking the dam with fish (particularly *O. nilotica*)
Operational Phase			
ENB-12, ENB-13, ENB-14	Environmental flow releases	Inability to monitor and assess downstream ecological effects of dam operation.	• Ensure adherence to the prescribed environmental flow and other management requirements;. • Develop O&M plan to include ecological flow requirements. • Appoint and train flow reader. • Maintain flow records. • Monitor dam impact on aquatic environment (monitoring plan to be determined in the assessment phase above).

8.2.3.4 Actions to address social non-compliances and risks

Proposed remedial actions for identified social risks and non-compliances are described in Table 8-18. Several non-compliances are combined into a single action in some instances. All actions described are to be included in the Phase 1 design of the remediation works to be developed for the dam.

Table 8-18. Actions to address social non-compliances/risks (Chibalashi Dam).

Code	Aspect	Risk	Action required
SCB-1	Community irrigation water supply	Failure of project to meet its primary objective.	• No action required – primary objective of the project is met.
SCB-2	Cash compensation for crops	Failure to pay additional PAPs for lost crops.	• Cash compensation for lost crops during WRDP implementation have been paid and verified. •
SCB-3	Replacement land	Incomplete livelihood restoration.	• Land-for-Land replacements must be completed. Connect community to the irrigation system downstream to enable PAPs to join existing users. •
SCB-4	Community development	Food security – failure to stock the dam with fish.	• Stock the dam with fish.
SCB-5	Community health and safety	Injury or illness caused by use of pesticides.	• Develop a training programme for PAPs in the irrigation area concerning safe use of pesticides using the integrated pest management programme (IPM) prepared for the project.

Code	Aspect	Risk	Action required
SCB-6	Community development	Lack of capacity/training to benefit fully from irrigation water supply.	• Strengthen the dam or irrigation committee to ensure cooperation and spread of benefits to a wider section of the community.
SCB-7	Community Development	Lack of capacity to benefit fully from irrigation water supply.	• Train PAPs in irrigation agricultural techniques, knowledge of the types of high value crops to cultivate and other enterprises besides agriculture that could assist in income generation.
SCB-8	Livelihood restoration	Inability to evaluate success of programme to meet development goals and objectives.	• Develop and implement a monitoring and evaluation programme based on the requirements of the ARAP.
SCB-9	Community health and safety	Lack of capacity to respond effectively to emergencies related to the dam	• Update Emergency Response Plan

8.3 Dam 3: Chikowa

8.3.1 Characteristics of the dam and surrounding area

8.3.1.1 Dam and catchment characteristics

The Chikowa dam site is located about 15 km south east of the Mambwe District Administrative Centre, and 3 km from the Chikowa Mission in the Chikowa Ward in the Eastern Province. It is located on the non-perennial Kasenengwa River. The site is about 98 km north-west of Chipata City and about 66 km from Mfuwe. The location is shown in Figure 8-10. The main features of the dam and catchment are described in Table 7-1.

The main purpose of the dam is to provide water for irrigation as well as livestock, domestic water, recreation, aquaculture and fishing for the people of Chikowa, Mambwe. The dam is classified as small although large in terms of spillway), and it has a large catchment carrying a potentially high sediment load. It has a requirement for a non-erodible spillway. The life span of the dam is expected to be 50–100 years.

Following the failure of the first spillway, an additional curved embankment section was built, and a new spillway (Figure 8-12). At the time of the site visit for the COWI (2018k) review report in March, the dam was impounding water and spilling across the new spillway.

Table 8-19. The location and main characteristics of Chikowa Dam.

DAM # 3: CHIKOWA	Features
Location of the dam	
Province	Zambian Eastern Province
District	Mambwe District
Location of the dam (D.ddddd°)	S13.43585° E32.10763°
Name of the river/stream on which the dam was built	Kasenengwa River (non-perennial tributary of the Lupande River)
Dam characteristics and dimensions	
Dam type/material	Zoned earth fill embankment
Size classification (COWI, 2019v)	Small (based on ICOLD)

Hazard Classification	
- Potential loss of lives	Significant
- Potential economic loss	Low
- Potential adverse impact on resource economy	Low
- Maximum hazard classification	Significant
Year dam was constructed	2016
Contractor name	Plem Construction Limited
Wall height	12 m
Wall length	~ 420 m (including extra embankment)
Volume storage	653, 000 m^3
Reservoir surface area (at FSL)	±15 ha (design report had 150 ha)
Reservoir catchment area	514.89 km^2
Maximum depth at FSL	~ 10 m
Spillway (main)	Open approach channel on the right flank with L-shaped reinforced concrete inclined faced weir
Spillway (emergency)	Nil
Throwback	1.5 Km
1:50 year design flood	389.2 m^3
1:100 year flood	462.5 m^3
Safety Evaluation Flood (SEF)	536.5 m^3
Other	
Foundation	The geology around the project site is characterised by sedimentary (undifferentiated Upper karoo) rocks. The lithology comprises granitic gneiss, migmatites and schist (Basement Gneiss).
Foundation treatment	Core cut-off trench
Drainage system	Chimney drain, Sand blanket drain with rock toe, details to be confirmed
Outlet works and scour	One outlet pipe was constructed. The pipe diameter stated on the design drawings of 600mm does not correlate to what was seen on site. Details of the outlet works have been requested (COWI, 2018l).
Monitoring instruments	None

Figure 8-10. Satellite view of the Chikowa dam site and surrounding area (imagery date June 2018).

Figure 8-11. Chikowa dam - detail of the main wall and hemispheric wall (imagery date August 2019).

New L-shaped spillway (photo in March 2018).

Additional curved 'hemispheric' dam embankment (photo in March 2018).

Main embankment (November 2019).

Downstream slope of main embankment with (blocked) outlet chamber (November 2019).

Figure 8-12. Chikowa Dam between under construction.

8.3.1.2 Physical environment

The Kasenengwa River is a seasonal stream which dries up around April/May, every year. The dam lies on the Kasenengwa stream which flows into the Lupande River, which in turn is a tributary of the LwangwaLuangwa River. The dam is at an altitude 631 masl and will inundate an area of approximately 19 ha. The reservoir catchment area is 54,8 km^2.

The geology of the site is characterized by sedimentary (undifferentiated) Upper Karoo rocks. Lithology includes granitic gneiss, migmatites and schists. Generally, the area has limited groundwater potential with yields being as low as 0.2 litres per second, up to 2.3 litres per second in a few areas. Water quality for both surface and groundwater (shallow wells), used by the local community, does not meet drinking water standards, due to high total suspended solids in the surface water, and in some cases organic and

inorganic pollution, probably caused by fertilisers, pesticides and pit latrines. The water is generally suitable for irrigation.

Climate is humid sub tropical, with dry winters and hot summers. A warm, wet season occurs from November to spring, a hot dry season from September to November and a cold, dry season from April to August. Annual rainfall is between 833 and 1,050 mm. January is the wettest month receiving about 250 mm. Annual mean temperature is 19.3°C. The hottest month is October (32.2°C) and the coldest is July (11.8°C).

8.3.1.3 Biological environment

The dam lies in the Zambezian and Mopane woodlands dominated by a mixture of Mopane, Julbernardia, Brachystegia and Isoberlinia tree species. The lower storey of the woodlands consists of vigorous grass cover and other herbaceous species. The upper storey is characterised by large trees with a typical canopy cover ranging from 75% to 90%. Over 200 species of trees and shrubs are listed as occurring or potentially occurring in the district. The study area is not near any gazetted forests or protected areas, the nearest being Luangwa National Park, which is in Mfuwe district approximately 50 km away.

The area south east of the dam is predominantly natural, which may be due to the poor and rocky soils, which limit their suitability for cultivation. Downstream, and between the Kasenengwa and a seasonal tributary, cultivation has resulted in clearing of natural vegetation. These are the areas that are farmed by Chikowa villagers.

Data obtained from the Zambia Wildlife Authority lists 109 species of mammal, 432 bird species, several reptile and amphibian species as well as chameleons and tortoises that occur or potentially could occur in the district. Amongst the mammals are several large predators as well as a range of bat species. The African wild dog (*Lycaon pictus*) and hippopotamus (*Hippopotamus amphibius*) are both Red Data species, listed as 'Endangered' and 'Vulnerable' in the latest IUCN Red Data classification. The frog species *Hyperolius pyrrhodictyon* is endemic to the project area. These species lists are likely to be for the South Luangwa National Park. Similarly, the terrestrial Red Data species listed by IBAT (Table xx) are likely to be representative of the National Park.

COWI (2018) lists 18 fish species in the dam, described by local fisherman, whereas the Zambia Wildlife Authority provides a list of 37 potentially occurring fish species. *Oreochromis andersonii* is listed as 'vulnerable' on the IUCN Red Data list. The dam is a source of fish for local people. The Luangwa River plays an important role in the natural stocking of fish in its tributaries and sub-tributaries. Typical of fresh water fish, they swim upstream into the smaller tributaries during breeding before returning to the main rivers.

The IBAT database shows three Red Data fish species potentially occurring in the river systems in the vicinity of the dam. *Oreochromis andersonii* is not listed, but *Oreochromis mortimeri* is, which is a Critically Endangered species, together with *Serranochromis robustus* (Critically Endangered) *and Nothobranchius boklundi* (Vulnerable).

Table xx: Red Data species recorded in IBAT within a 50 km radius of the Chikowa dam site

Species (common name)	**Scientific name**	**IUCN Red Data Status**
Mammals		

Species (common name)	Scientific name	IUCN Red Data Status
Black rhinoceros	*Diceros bicornis*	CR
African wild dog	*Lycaon pictus*	EN
Giraffe	*Giraffa camelopardalis*	VU
Hippopotamus	*Hippopotamus amphibius*	VU
African elephant	*Loxodonta africana*	VU
Lion	*Panthera leo*	VU
Leopard	*Panthera pardus*	VU
Temminck's pangolin	*Smutsia temminckii*	VU
Birds		
White-backed vulture	*Gyps africanus*	CR
Hooded vulture	*Necrosyrtes monachus*	CR
White-headed vulture	*Trigonoceps occipitalis*	CR
Steppe eagle	*Aquila nipalensis*	EN
Madagascar pond-heron	*Ardeola idae*	EN
Grey crowned crane	*Balearica regulorum*	EN
Egyptian vulture	*Neophron percnopterus*	EN
Lappet-faced vulture	*Torgos tracheliotos*	EN
Tawny eagle	*Aquila rapax*	VU
Southern ground-hornbill	*Bucorvus leadbeateri*	VU
Wattled crane	*Bugeranus carunculatus*	VU
Blue swallow	*Hirundo atrocaerulea*	VU
Martial eagle	*Polemaetus bellicosus*	VU
Secretarybird	*Sagittarius serpentarius*	VU
Fish		
Kariba tilapia	*Oreochromis mortimeri*	CR
	Serranochromis robustus	CR

Species (common name)	Scientific name	IUCN Red Data Status
	Nothobranchius boklundi	VU
Plants		
	Nymphoides tenuissima	EN

8.3.1.4 Socio-economic environment

The dam is located about 15 kilometres from the Mambwe district administrative centre. The area falls in the Chikowa ward, under the jurisdiction of His Royal Highness Chief Jumbe. It has a total population of 4,907 people in 898 households.

The population is concentrated in small to medium sized villages situated along the Kasenengwa River downstream of the dam site. Most of the main housing structures are built with burnt bricks and are roofed with corrugated iron sheets. The change-over to relatively modern housing structures has been as a result of climate resilient infrastructure promotion by the many organisations that have provided assistance in the area, such as the NGO CARITAS Chipata.

Community members' sources of livelihoods are rain-fed subsistence agriculture (including a wide range of vegetables and some fruit trees), trading and informal wage employment. Some farmers grow cash crops such as cotton under contract farming. Farmers receive extensive agricultural technical support from the NGO. Most cropping activities are limited to the riverbanks, which expose them to the risk of flooding.

Chikowa area has two major sources of water, namely surface water from the Kasenengwa River and underground water abstracted from boreholes, protected hand dug wells and shallow wells. The area has benefited from domestic water supply programmes through communal boreholes equipped with hand pumps and hand dug wells. The Chikowa Rural Health Centre services Chikowa ward and serious cases are referred to Kamoto Mission hospital, which is about 18 kilometres away in Mambwe district centre area. The area has a preschool, a community school, a basic school and a vocational training school.

8.3.2 Non-compliance issues and risks

8.3.2.1 Dam safety (structural) risks

The main structural safety concerns are described in Table 8-20.

Table 8-20. Dam safety compliance status and risks (Chikowa Dam).

Code	Aspect	Concern/non-compliance	Risk
Construction Remediation Phase			
SFC-1	Structural safety	New spillway possibly inadequate to cater for large flows. Large flows may overtop the wall.	Dam failure through overtopping of the wall - downstream community safety risk.
SFC-2	Structural safety	Hemispheric dam wall may be dispersive and subject to rapid piping. Appears to have been built to a lower standard than	Failure of the wall - downstream community safety risk.

Code	Aspect	Concern/non-compliance	Risk
		the main wall although no gullying evident. Mild tension cracks that have occurred may be due to poor material selection or poor foundation preparation.	
SFC-3	Downstream erosion	Flood erosion of the spillway return Throwing flow to the left and causing vertical slopes of 4–6 m. All eroded slopes to the channel are unstable.	Could possibly affect a small settlement 50 m downstream, causing land loss.

Figure 8-13. Rock bar below Chikowa Dam deflecting to the left hand side of the channel towards downstream settlement.

8.3.2.2 Dam safety (non-structural) risks

The main non-structural community health and safety concerns associated with the dam are described in Table 8-21.

Table 8-21. Dam health and safety compliance requirements and risks.

Code	Aspect	ESMP/ARAP requirement	Risk	Status on site
Construction Remediation Phase				
HSC-1	Community health and safety	Rehabilitation of borrow pits to avoid ponding of water creating of mosquito breeding grounds and risk of injury or drowning.	Increased malaria risks. Increased risk of children being injured or drowning.	Not done.
HSC-2	Community safety	Erection of safety hazard signs around the dam.	Serious or fatal incidents/drownings.	Not done.

Code	Aspect	ESMP/ARAP requirement	Risk	Status on site
HSC-3	Community health and safety	Provision of safe pedestrian access across the river.	Serious or fatal incidents/drownings.	Uncertain. Reference not found in instruments.
Operational Phase				
HSC-4	Community safety	Provide dam emergency safety talks/ sensitisation and training to local community and dam committee.	Lack of knowledge about actions to take in emergencies.	Not done.
HSC-5	Community safety	Sensitization of community to avoid risk of spillway crossings.	Serious or fatal incidents/drownings.	Not done.
HSC-6	Community safety	Enforcement of dam safety and security measures around the dam.	Serious or fatal incidents/drownings.	Not done.
HSC-7	Community safety	Warning prior to opening of overflow pipes in the event of flooding.	Serious or fatal incidents/drownings.	Not done.
HSC-8	Community Safety	Safety sensitisation and awareness programmes of swimming risks particularly for children.	Serious or fatal incidents/drownings.	Not done.
HSC-9	Community health	Sensitization of community to impacts of drinking untreated water.	Increased prevalence of water borne diseases.	Not done.
HSC-10	Community health	Sensitization of community to wildlife interaction risks, such as crocodiles	Serious or fatal incidents.	Not done.

8.3.2.3 Environmental risks

The WRDP EPBs (2016) and COWI (2018c) ESMPs provide an inadequate basis for understanding and managing the long term impacts of the project. A large increase in population farming downstream of the dam may cause direct impacts on the aquatic and wetland environment, but as importantly may increase harvesting pressures and hunting in the surrounding mopane woodlands, some of which, to the south east, remains largely in natural condition. The reports provide no guidance about possible interventions to manage the impacts of increasing habitation in this environment, referring only to “monitoring and mitigation for adaptive management in order to quantify and evaluate accumulative environmental impacts after demobilisation”. Since this issue broadly applies to many of the dams it is dealt with in more detail in Section 7.11 and Section 8.

Compliance requirements for demobilisation of the contractor and restoration of the Chikowa dam site are included in Table 8-22, summarised from Sections 6.1.1 and Section 7 of the ESMP (COWI, 2018c). Table 8-21 shows the project status to be non-compliant with most of the requirements, and remedial action is required in these cases. No structured process of demobilisation and restoration has been followed and the plan required by the ESMP has not been prepared or implemented. The direction of water throw from the spillway is causing erosion downstream of the wall, with changes in river morphology and increased sedimentation. Dispersive soils appear to be a problem in places where top-

soiling has been done. A plate gauge has not been installed, as required by the ESMP, and there is no plan in place to monitor ecological impacts of the dam.

Table 8-22. Environmental compliance status and risks (Chikowa Dam).

Code	Aspect	Safeguard requirement (ESMP/ARAP)	Risk	Compliance status
Construction Remediation Phase				
ENC-1	Demobilisation and Restoration	Prepare demobilisation and restoration plan.	Plan ensures structured management to minimise environmental risk of dam construction impacts.	No plan prepared or implemented.
ENC-2	Rehabilitation of work areas	Rehabilitate disturbed work areas and restore as close as possible to original contours. Restore topsoil from stockpiles. Replant with native plant seed mixes, where natural revegetation likely to be unsuccessful.	Erosion and sedimentation. Alien plant infestation. Loss of use of land.	Top-soiling done on downstream slope of main dam wall but grass recovery patchy (UNOPS, 2019). Topsoil appears to be dispersive. Grass recovery across the hemispheric secondary wall and all other work areas poor. No formal restoration undertaken.
ENC-3	Rehabilitation of work areas	Install drainage structures to reduce uncontrolled runoff. Plant fast growing trees in erosion-prone areas.	Erosion and sedimentation. Loss of habitat.	Not done.
ENC-4	Rehabilitation of borrow pits	Make borrow area safe. Stabilise steep slopes. Backfill to acceptable landform. Prevent accumulation of water. Topsoil slopes. Reseed naturally or with indigenous seed mixtures.	Erosion and sedimentation.	Not done. No borrow pit rehabilitation plans prepared or evaluation of borrow pit safety. No slope stabilisation undertaken. No topsoil reinstatement or reseeding done. Any recovery of grass has been due to natural processes.
ENC-5	Site clean-up and rehabilitation	Repair community roads and paths. Close selected bush paths by ripping and revegetating. Close contractor paths around dam. Train dam committees.	Erosion and sedimentation. Alien plant invasion. Loss of use of land.	No repair done. No training of dam committees.
ENC-6	Site clean-up and rehabilitation	Remove housing, office units, other infrastructure. Hand over any useful units to the community/dam	Alien plant invasion. Loss of use of land.	Not done. Campsite made of containers has been removed.

Code	Aspect	Safeguard requirement (ESMP/ARAP)	Risk	Compliance status
		committee. Rehabilitate campsite.		
ENC-7	Hazardous waste	Recycle used hydrocarbons where possible. Dispose off-site in accordance with regulatory requirements. Bioremediate oil-contaminated soil in a land farm or use in-situ remediation where the contamination plume is shallow.	Surface and groundwater pollution. Soil contamination.	Not done. No oil recycling took place during construction. Waste hydrocarbons may be present on site. Hydrocarbon-contaminated soils may also be present, particularly at the camp site refuelling bays and in other areas where drip trays and oil containment measures were not taken. No biological remediation of contaminated soils was done.
ENC-8	Non-hazardous construction waste	Dispose all rubble and other non-hazardous waste at a ZEMA/ local authority certified landfill. Level and rehabilitate heaps of soil.	Water and soil pollution.	No systematic process of site clean-up done.
ENC-9	Non-hazardous construction waste	Use overburden spoil to backfill the borrow pits.	Erosion and sedimentation.	No systematic process of site clean-up and rehabilitation done.
ENC-10	Sanitary waste	Dismantle and bury pit latrines after applying lime.	Groundwater pollution.	Not done.
ENC-11	Downstream ecological flow	Install gauge plates to measure water levels and water releases.	If not done, absence of data to evaluate downstream flow impacts.	Not done.
Operational Phase				
ENC-12	Nuisance plants	Consider harvesting of algal blooms for fertiliser.	Downstream spread of nuisance plants.	Not done.
ENC-13	Environmental flow releases	No flow requirement specified.	Impact assessed as ecologically positive (COWI (2018c) due to increased reliability of downstream flow.	No measurement of flow or evaluation of downstream impact.
ENC-14	Environmental flow releases	Designated flow gauge reader to record flow results.	If not done, inability to monitor and manage downstream ecological impacts (positive or negative).	Not done.

Little grass cover on the hemispheric dam wall.

Topsoil on main wall appears to have been placed but cover remains poor. Soils may be dispersive.

Figure 8-14. Natural reinstatement of grass cover at Chikowa Dam.

8.3.2.4 Social risks

Compliance requirements for social impact management are included in Table 8-23, summarised from Section 7 of the ESMP (COWI, 2018c) and the Abbreviated Resettlement Action Plan (COWI, 2018f). Compliance relates to the compensation and reinstatement of the livelihoods of PAPs and capacity building of PAPs and institutions. While there are only a few PAPs negatively affected by the dam, and cash compensation for lost crops has been paid and verified by the World Bank; Table 8-23 shows that there are a number of outstanding actions in relation to ongoing PAP support and PAP and institutional capacity building.

Table 8-23. Social compliance status and risks (Chikowa Dam).

Code	Aspect	ESMP/ARAP requirement	Risk	Status on site
Construction Remediation Phase				
SCC-1	Community irrigation water supply	Construction of irrigation water supply for downstream community.	Failure of project to meet its primary objective.	Irrigation system neither designed nor established yet. Cost-benefit analysis for use of reservoir for irrigation or fish farming to be done
SCC-2	Compensation and livelihood restoration	A resettlement action plan to be prepared to ensure compensation for the lost assets and income.	Incomplete restoration of PAP's livelihoods.	Abbreviated Resettlement Action Plan (ARAP) prepared by COWI (2018). One PAP living in dam basin resettled. Four PAPs temporarily affected by land loss during construction. ARAP approved by Zambian authorities and No Objection from World Bank. Compensation payments for lost crops paid by government and verified by WB. No grievances logged in the GRM.

Code	Aspect	ESMP/ARAP requirement	Risk	Status on site
SCC-3	Compensation and livelihood restoration	Replacement land to be made available to affected PAP. Land to be cleared.	Incomplete restoration of PAP's livelihood.	Cash compensation to 1 PAP identified has been paid. House replacement for 1 PAP identified has been provided. Land-for-land compensation for 4 PAPs to be completed. Resettled PAP provided with replacement land nearby. Livelihood opportunities improved by relocation. Assistance to clear lands not provided yet.
SCC-4	Damage to lands	Disturbed work areas to be restored as close as possible to previous state.	Livelihood impact.	Concrete rubble dumped by contractor as a result of removal of failed spillway not removed from three PAP's land.
SCC-5	Cultural heritage	Fencing of the graveyard on left bank.	Damage to graveyard.	Not done. Location of graveyard to be verified.
Operational Phase				
SCC-6	Community development	Stocking of the dam with fish.	Failure to meet project objectives of improved livelihoods for local communities.	Not done. To be assessed.
SCC-7	Community safety	Farmers to be educated about safe methods of chemical handling and control.	Injury or illness.	Not done.
SCC-8	Community development	Assist PAPs with training to improve their knowledge of irrigation agriculture, high value crops to cultivate and other enterprises besides agriculture that could assist in income generation.	Lack of capacity to benefit fully from irrigation water supply.	Not done.
SCC-9	Institutional capacity building	Strengthening the dam or irrigation committee to ensure cooperation and spread of benefits to a wider section of the community.	Lack of capacity to benefit fully from irrigation water supply.	Not done.
SCC-10	Livelihood restoration	Training to avoid crop losses due to planting in areas within the FSL.	Crop failure and GRM compensation claims.	Not done.

Code	Aspect	ESMP/ARAP requirement	Risk	Status on site
SCC-11	Livelihood restoration	Monitoring of livelihood restoration/community development	Inability to evaluate success of programme to meet development goals and objectives.	Not done
SCC-12	Community health and safety	Update of the generic Emergency Response Plan to be dam-specific	Inability to effectively manage emergencies caused by the dam	Not done

8.3.3 Proposed actions

8.3.3.1 Actions to address dam safety risks (structural)

Proposed remedial actions for identified dam safety risks and non-compliances during construction are described in Table 8-24.

Table 8-24. Actions to address structural dam non-compliances and risks (Chikowa Dam).

Code	Aspect	Risk	Action required
Construction Remediation Phase			
SFB-1, SFB-2	Dam failure	Overtopping of dam embankment and dam failure during floods due to inadequate spillway capacity.	• Prepare detailed design review to verify spillway capacity requirements. • Confirm whether wall material is dispersive. • Possibly widen return channel to allow sufficient flow. • Consider secondary spillway on right bank.
SFB-3	Downstream channel erosion	Increasing downstream embankment scour and loss of cultivated land due to direction of throw of water over the spillway	• Consider excavating rock bars down to an agreed level to better distribute flow.

8.3.3.2 Actions to address dam health and safety risks (non-structural)

Proposed remedial actions for identified dam health and safety risks and non-compliances are described in Table 8-25.

Table 8-25. Actions to address non-structural dam non-compliances and risks at Chikowa Dam.

Code	Aspect	Risk	Action required
Construction Remediation Phase			
HSC-1	Rehabilitation of borrow pits	Failure to rehabilitate causing increased malaria risks and increased risk of children being injured or drowning.	• Comply with ENC-4, ENC-9 action requirements. • Ensure borrow pits free draining to avoid malarial breeding sites and minimise drowning and injury risks.

Code	Aspect	Risk	Action required
HSC-2	Community health and safety	Drowning due to absence of warning signs.	• Design and erect appropriate hazard notices. • Sensitise communities to risks.
HSC-3	Access across the river	Lack of a bridge/crossing with increased risk of community injury and drowning.	• Construct pedestrian access across the river downstream of the dam (or in location best suited for convenient community access).
Operational Phase			
HSC-4, HSC-5, HSC-6, HSC-7, HSC-8, HSC-9, HSC-10	Community health and safety.	Injury or illness caused by lack of knowledge of dam risks.	• Develop a training programme for communities who live around the dam. • Train communities in accordance with the plan (including drinking water and water borne diseases, avoidance of dangerous spillway crossings, swimming risks, emergency preparedness in floods or dam failure, preparedness to deal with interactions with wildlife including crocodiles).

8.3.3.3 Actions to address environmental non-compliances and risks

Proposed remedial actions for identified environmental risks and non-compliances are described in Table 8-26. Several non-compliances are combined into a single action in some instances. All actions described are to be included in the ESMP to be developed for the construction remediation phase and operational phase of the dams.

Table 8-26. Actions to address environmental non-compliances and risks (Chikowa Dam).

Code	Aspect	Risk	Action required
Construction Remediation Phase			
ENC-1	Demobilisation and Restoration Plan	Plan ensures structured management to minimise environmental risk of dam construction impacts.	• Prepare plan as part of the requirements of the ESMP.
ENC-2, ENC-3,	Rehabilitation of disturbed works areas	Erosion and sedimentation.	• Conduct detailed site inspections. • Define and map disturbed areas where rehabilitation/erosion control is required. • Develop method statements for each area, including problem statement, method of rehabilitation, resources needed and responsibilities (See ENC-1 above). • Check topsoil for dispersive properties and ameliorate. • Implement rehabilitation and monitor effectiveness.
ENC-4; ENC-9	Rehabilitation of borrow pits	Erosion and sedimentation. Weed infestation. Entrapment risk to wild animals.	• Conduct detailed site inspections • Prepare detailed rehabilitation plan for each borrow area. Define methodologies for top-soiling and reseeding with natural grass seed mixtures. • Reduce slopes and backfill with inert spoil, where necessary/possible, to create safe conditions that

Code	Aspect	Risk	Action required
			avoid entrapment of animals and accumulation of water. • Monitor effectiveness of rehabilitation.
ENC-6, ENC-8	Waste, construction infrastructure and rubble	Weed infestation, loss of productive land.	• Conduct detailed site inspections. • Prepare snag list defining each area where remedial action is necessary, and the required actions. • Waste/rubble to be removed to government-approved disposal sites.
ENC-10	Sanitary waste	Groundwater and surface water pollution.	• Identify and map location of all pit latrines. • Define methods to ensure safe capping with no pollution risk.
ENC-7	Hazardous waste, hydrocarbon-polluted soils	Groundwater and surface water pollution.	• Conduct detailed site inspections. • Prepare snag list defining each area where remedial action is necessary, including location of waste oil drums and/or other hazardous chemicals, location of oil-contaminated soils and the required actions. • Define methods for soil remediation. • Implement and monitor recovery. • Hazardous waste to be removed to a government-approved hazardous waste disposal site.
ENC-11	Environmental flow releases	Inability to monitor and assess downstream ecological effects of dam operation.	• Design and install gauge plates. • Undertake assessment of downstream aquatic and riparian conditions as a basis for flow requirements and monitoring to be imposed on the operational phase of the dam. • Undertake assessment of the ecological effect of stocking the dam with fish (particularly *O. nilotica*)
Operational Phase			
ENC-12	Nuisance plants	Spread of nuisance aquatic plants.	• Consider interventions to harvest and dry nuisance weed for use as fertiliser. • Manage fertiliser use around the dam.
ENC-13, ENC-14	Environmental flow releases	Inability to monitor and assess downstream ecological effects of dam operation.	• Ensure adherence to the prescribed environmental flow and other management requirements. • Develop O&M plan to include ecological flow requirements. • Appoint and train flow reader. • Maintain flow records. • Monitor dam impact on aquatic environment (monitoring plan to be determined in the assessment phase above).

8.3.3.4 Actions to address social non-compliances and risks

Proposed remedial actions for identified social risks and non-compliances are described in Table 8-27. Several non-compliances are combined into a single action in some instances. All actions described are to be included in the ESMP to be developed for remediation of the site in the construction remediation phase and the operational phase of the dams.

Table 8-27. Actions to address social non-compliances/risks (Chikowa Dam).

Code	Aspect	Risk	Action required
Construction Remediation Phase			
SCC-1	Community irrigation water supply	Failure of project to meet its primary objective.	• Cost-benefit analysis required for scoping the design and construct irrigation infrastructure. • Compensate PAPs for any temporary disruption/losses due to construction of irrigation infrastructure.
SCC-4	Assistance to PAPS	Incomplete livelihood restoration.	his was done) • Remove construction rubble from 3 PAPs land.
SCC-5	Cultural heritage	Damage to graveyard.	• Fence graveyard if located near the site.(there is no graveyard in the vicinity of the dam) • Communicate with stakeholders.
Operational Phase			
SCC-6	Community development	Food security – failure to stock the dam with fish.	• Stock the dam with fish. To be assessed for sustainability.
SCC-7	Community safety	Unsafe handling of pesticides.	• Develop a training programme for PAPs in the irrigation area concerning safe use of pesticides using the integrated pest management programme (IPM) prepared for the project.
SCC-8	Community Development	Lack of capacity to benefit fully from irrigation water supply.	• Train PAPs in irrigation agricultural techniques, knowledge of the types of high value crops to cultivate and other enterprises besides agriculture that could assist in income generation.
SCC-9	Community development	Lack of capacity/training to benefit fully from irrigation water supply.	• Strengthen the dam or irrigation committee to ensure cooperation and spread of benefits to a wider section of the community.
SCC-10	Community Development	Inability to evaluate success of programme to meet development goals and objectives.	• Implement monitoring and evaluation of PAP livelihood and restoration programme.
SCC-11	Community health and safety	Lack of capacity to respond effectively to emergencies related to the dam	• Update Emergency Response Plan

8.4 Dam 4: Kanyika

8.4.1 Characteristics of the dam and surrounding area

8.4.1.1 Dam and catchment characteristics

Kanyika dam is a new dam with a planned irrigation system, constructed on the perennial Kanyika stream, which is a tributary of the Nkenyauna stream. The site is about 12 kilometres south of the Kasempa urban centre along the Kasempa-Mumbwa road at an altitude of 1,241 masl. It falls in the Kasempa constituency in Mutenda ward.

This dam site was selected to provide water to the Mutemba Ward, one of the highly populated wards in the constituency that provides various social services to the population. The purpose of the dam is to provide water for irrigation and aquaculture.

The main features of the dam and catchment are described in Table 8-28.

Table 8-28. The location and main characteristics of Kanyika Dam.

DAM # 4: KANYIKA	Features
Location of the dam	
Province	Zambian North-western Province
District	Kasempa District
Location of the dam (D.ddddd°)	S13.51148° E25.92082°
Name of the river/stream on which the dam was built	Kanyika River (drains to Nkenyauna River)
Dam characteristics and dimensions	
Dam type/material	Zoned earth fill embankment
Size classification (COWI, 2019w)	Small (based on ICOLD)
Hazard Classification	
- Potential loss of lives	Significant
- Potential economic loss	Low
- Potential adverse impact on resource economy	Low
- Maximum hazard classification	Significant
Year dam was constructed	2016–2019
Contractor name	Savenda
Wall height	10 m
Wall length	155m
Volume storage	271,000 m^3
Reservoir surface area (at FSL)	7.9 ha
Reservoir catchment area	5.29 km^2
Maximum depth at FSL	8.0 m
Spillway (main)	Open channel at end of right flank with reinforced concrete drop structures
Spillway (emergency)	Nil
Throwback	0.5 km

DAM # 4: KANYIKA	Features
1:50 year design flood	44.1 m^3/s
1:100 year flood	54.1 m^3/s
Safety Evaluation Flood (SEF)	64.7 m^3/s
Other	
Foundation	Kundelungu undifferentiated: may include some mine 'series' in the north-west. Predominantly shales, siltstones, sandstones and mixtites
Foundation treatment	Core cut-off trench
Drainage system	Sand blanket drain with rock toe
Outlet works and scour	Concrete encased 200 mm ND mild steel pipe with inlet chamber with trash grid at the upstream end. Flow is controlled at the downstream end of the pipe via a 200 mm ND gate valve in a valve chamber. 150 mm ND HDPE siphon pipeline at embankment crest level with entrance screen, priming chamber and downstream control valve.
Monitoring instruments	None

Figure 8-15. Satellite view of the dam site and surrounding area (imagery date September 2019).

Figure 8-16. Kanyika Dam – detail of the wall (imagery date September 2019).

Dam crest (November 2019).

Embankment construction from right flank. Note water impoundment and pipe (March 2018).

Sampling of materials on embankment. Note upstream clayey shell zone, central clay core and downstream semi-pervious zone (March 2018).

First drop structure under construction at the end of the spillway discharge channel. Hard lateritic material in foreground (March 2018).

Downstream view of low flow pipe. Valve chamber still to be completed (March 2018).

Tension crack on the downstream slope (November 2019).

Figure 8-17. Kanyika Dam under construction.

8.4.1.2 Physical environment

The topography of Kasempa District can be described as a hilly plateau incised by numerous river valleys. The district has sedimentary geology dominated by consolidated shale-silt-sandstone. This geological unit covers about 75 % of the district especially in the northern and eastern areas. Other significant geological formations include undifferentiated Upper Karoo, alluvium, colluvium and laterite, fossil seif dunes, and some granitic outcrops.

The predominant soil type is orthic ferrosols. Other soil types include gleysols that are formed under waterlogged conditions as a result of a near-surface water table and poor drainage.

The district is characterised by high rainfall and a relatively high-water table, ranging from 10–30 m depending on the time of the year. Rainfall averages 1,000 to 1,100 millimetres annually although the past seven years have been below average, between 850 and 1,000 millimetres annually. Temperatures range between the extremes of 5 and 33 degrees Celsius. May, June and July are normally the coldest months; September, October and November are the hottest months.

Surface water quality in the dam area is generally good, tested by the Department of Water Affairs DWA EPB (2016).

8.4.1.3 Biological environment

A third of Kasempa District's land area is in the Kafue National Park and two game management areas i.e. Kasonso–Busanga and Lunga–Luswishi. The nearest protected forest area to the dam is the Kamona Forest Reserve, 8 km north of the dam and north-east of Kasempa town. It has an area of roughly 221 km^2 , and is well conserved in parts although there is evidence on the satellite imagery of habitat impact due to rural settlement and cultivation, expanding from Kasempa.

Kasempa lies in the Eco region of Central Zambezian miombo woodlands with predominant trees being of the Brachystegia and Julbernardia species. Around the dam, vegetation occurs in an agricultural mosaic - approximately 70 per cent of the vegetation cover has been cleared in the recent past for subsistence farming, extending from the town of Kasempa. Along the Kanyika river, farmers cultivate the entire area including the dambo (wetland) areas down to the stream edge, with the most noticeable effect downstream of the dam, although the upper reaches of the river have also been affected.

Red Data flora identified in the DWA EPB (2016) and the COWI (2018c) ESMP include Mubanga *(Pericopsis angolensis)* and Mukwa/Mulombwa *(Pterocarpus angolensis).* These trees are heavily exploited for timber and most of the large trees specimens have been lost. The most common larger trees left in the dam area are *Acacia* species.

COWI (2018) identifies sixteen fish species occurring in the Kanyika river (identified from a fish manual and information obtained from local communities); some only found during the rainy season and in dispersed pools during the dry season. Generally, there has been a reduction in the quantity of fish due to fishing and fluctuating water levels.

Terrestrial fauna in the area are depauperate although WRDP EPB (2016) states that government initiatives to curb hunting has had some success. The report lists species that occur although none of the lists is based on recent field survey. The occurrence of large and medium sized mammals is likely to be rare and these would probably be vagrants from Kafue National Park, over 50 km to the south. Listed

mammals (WRDP EPB, 2016) include antelope such as waterbuck and duiker. Communities further listed several other medium sized mammal species including impala, aardvark, oribi and reedbuck. Of the fauna listed by communities, 'Vulnerable' Red Data species are the hippopotamus (*Hippopotamus amphibius*) and the Southern African python (*Python sebae*).

Use of the Integrated Biodiversity Assessment Tool (IBAT) shows 28 potentially occurring Red Data species - 8 mammal, 13 bird, 2 fish and 5 plants - within a 50 km radius of the dam site. Most of the terrestrial species are likely to have been found in the protected areas, which in the context of this dam site are the game management areas and forest reserves. There are no Key Biodiversity Areas (KBAs) recorded within the 50 km buffer - Kafue National Park is outside of the buffer to the south.

With regard to the aquatic environment, IBAT lists two vulnerable cichlid species, *Oreochromis andersonii and Oreochromis macrochir,* which are both know from the Kafue drainage system. *Oreochromis mortimeri,* while not listed by IBAT is recorded by local communities (COWI, 2018) and is critically endangered, mainly due to the introduction of *O. niloticus,* which is replacing it throughout its range, having been introduced by anglers and aquaculturalists. In addition, an endemic killifish, *Nothobranchius kafuensis*, is known from the seasonal and permanent streams of the area (pers. comm. Warren Aken, March, 2020).

Table xx: Red Data species recorded in IBAT within a 50 km radius of the Kanyika dam site

Species (common name)	**Scientific name**	**IUCN Red Data Status**
Mammals		
Black rhinoceros	*Diceros bicornis*	CR
African wild dog	*Lycaon pictus*	EN
Cheetah	*Acinonyx jubatus*	VU
Hippopotamus	*Hippopotamus amphibius*	VU
African elephant	*Loxodonta africana*	VU
Lion	*Panthera leo*	VU
Leopard	*Panthera pardus*	VU
Temminck's pangolin	*Smutsia temminckii*	VU
Birds		
White-backed vulture	*Gyps africanus*	CR
Hooded vulture	*Necrosyrtes monachus*	CR
White-headed vulture	*Trigonoceps occipitalis*	CR
Steppe eagle	*Aquila nipalensis*	EN

Species (common name)	Scientific name	IUCN Red Data Status
Madagascar pond-heron	*Ardeola idea*	EN
Grey crowned crane	*Balearica regulorum*	EN
Lappet-faced vulture	*Torgos tracheliotos*	EN
Tawny eagle	*Aquila rapax*	VU
Southern ground-hornbill	*Bucorvus leadbeateri*	VU
Wattled crane	*Bugeranus carunculatus*	VU
Slaty egret	*Egretta vinaceigula*	VU
Martial eagle	*Polemaetus bellicosus*	VU
Secretarybird	*Sagittarius serpentarius*	VU
Fish		
Threespot tilapia	*Oreochromis andersonii*	VU
	Oreochromis macrochir	VU
Plants		
	Rotala robynsiana	CR
	Xyris exigua	CR
	Nymphoides tenuissima	EN
	Rotala fontinalis	VU
	Rotala smithii	VU

8.4.1.4 Socio-economic environment

The dam site falls within Kasempa constituency in Mutenda ward. The ward has a total population of 1,394 people (50.1% males and 49.9% females) with 851 households. The project area falls under the domain of Senior Chief Kasempa.

Cultivation of vegetables and at times field crops takes place along the banks of the streams including Kanyika stream. Major crops grown include maize, sweet potatoes, groundnuts and various vegetables. Other sources of income include trading in agricultural products like field crops, vegetables and livestock, and forest products such as honey.

Mukinge mission is the main source of nearby social services including a primary school, secondary school for girls and a nursing training school. In addition, the project area hosts an agricultural farm institute from where the farmers receive agricultural extension services.

8.4.2 Non-compliance issues and risks

8.4.2.1 Dam safety (structural) risks

The main structural safety concerns are described in Table 8-29.

Table 8-29. Dam safety compliance status and risks (Kanyika Dam).

Code	Aspect	Concern/non-compliance	Risk
Construction Remediation Phase			
SFD-1	Structural safety	Crest tension cracks probably due to settlement of the embankment fill caused by foundation conditions and seepage along the toe of the dam. No toe drains installed.	Dam failure through slips - downstream community safety.

8.4.2.2 Dam safety (non-structural) risks

The main non-structural health and safety concerns associated with the construction and operational phases of the dam are described in Table 7-30.

Table 7-30: Dam health and safety (non-structural) compliance requirements and risks.

Code	Aspect	ESMP/ARAP requirement	Risk	Status on site
Construction Remediation Phase				
HSD-1	Community health and safety	Rehabilitation of borrow pits to avoid ponding of water creating of mosquito breeding grounds and risk of drowning or injury.	Increased malaria risks. Increased risk of children drowning.	Not done.
HSD-2	Community safety	Erection of safety hazard signs around the dam	Serious or fatal incidents/drownings.	Not done.
Operational Phase				
HSD-4	Community safety	Provide dam emergency safety talks/ sensitisation and training to local community and dam committee.	Lack of knowledge about actions to take in emergencies.	Not done.
HSD-5	Community safety	Sensitization of community to avoid risk of spillway crossings	Serious or fatal incidents/drownings.	Not done.
HSD-6	Community safety	Enforcement of dam safety and security measures around the dam	Serious or fatal incidents/drownings.	Not done.
HSD-7	Community safety	Warning prior to opening of overflow pipes in the event of flooding.	Serious or fatal incidents/drownings.	Not done.
HSD-8	Community Safety	Safety sensitisation and awareness programmes of swimming risks particularly for children.	Serious or fatal incidents/drownings.	Not done.

Code	Aspect	ESMP/ARAP requirement	Risk	Status on site
HSD-9	Community health	Sensitization of community to impacts of drinking untreated water.	Increased prevalence of water borne diseases.	Not done.

8.4.2.3 Environmental risks

Terrestrial habitats in around Kanyika dam are an agricultural mosaic. While the IBAT and other records include a number of threatened mammals and birds within a 50 km radius of the dam, few if any are likely to occur in the vicinity of the dam site. The large mammals recorded in IBAT are probably associated with the game management areas and forest reserves which are well outside of the direct area of influence of the dam – the nearest forest reserve is Kamona which is 8 km to the north east and is separated from the dam site by extensive cultivated lands and settlement and the D181 road (Figure 7-15).

The river system, on the other hand, is more likely to be associated with species of conservation concern. The Kanyika river is a part of the Kafue drainage system, which is known for two vulnerable cichlids, *Oreochromis andersonii and Oreochromis macrochir, and the endemic* killifish, *Nothobranchius kafuensis*. *O. mortemis*, a critically endangered cichlid, apparently still occurs in the Kanyika river according to local communities, although it is not listed by IBAT. The likely impact of the dam on any remnant populations of these species is unknown without further investigation.

Environmental management requirements for the dam (post-construction) are aimed at responsible demobilisation and site restoration. These requirements are included in Table 7-30, summarised from Section 9 of the ESMP (COWI, 2018c). Table 8-30 shows the project to be non-compliant with most of the requirements, and remedial action is required. No structured process of demobilisation and restoration has been followed and the plan required by the ESMP has not been prepared or implemented. COWI (2018m) describes the contractor's performance as 'poor'. A plate gauge has not been installed, as required by the ESMP, and there is no plan in place to monitor ecological impacts of the dam.

Table 8-30. Environmental compliance status and risks (Kanyika Dam).

Code	Aspect	Safeguard requirement (ESMP/ARAP)	Risk	Compliance status
Construction Remediation Phase				
END-1	Demobilisation and restoration	Prepare demobilisation and restoration plan.	Plan ensures structured management to minimise environmental risk of dam construction impacts.	No plan prepared or implemented.
END-2	Rehabilitation of work areas	Rehabilitate disturbed work areas and restore as close as possible to original contours. Restore topsoil from stockpiles. Replant with native plant seed mixes, where natural revegetation likely to be unsuccessful.	Erosion and sedimentation. Alien plant infestation. Loss of use of land.	No top-soiling or grassing done on the downstream embankment slope and upstream rock pitching patchy (UNOPS, 2019).

Code	Aspect	Safeguard requirement (ESMP/ARAP)	Risk	Compliance status
END-3	Rehabilitation of work areas	Install drainage structures to reduce uncontrolled runoff. Plant fast growing trees in erosion-prone areas.	Erosion and sedimentation. Loss of habitat.	Not done.
END-4	Rehabilitation of borrow pits	Make borrow area safe. Stabilise steep slopes. Backfill to acceptable landform. Prevent accumulation of water. Topsoil. Reseed naturally or with indigenous seed mixtures.	Erosion and sedimentation.	Not done. Main borrow areas above the dam on the right abutment. No borrow pit rehabilitation plans prepared or evaluation of borrow pit safety. No slope stabilisation undertaken. No topsoil reinstatement or reseeding done. Any recovery of grass has been due to natural processes.
END-5	Site clean-up and rehabilitation	Repair community roads and paths. Close selected bush paths by ripping and revegetating. Close contractor paths around dam. Train dam committees.	Erosion and sedimentation. Alien plant invasion. Loss of use of land.	No repair done. No training of dam committees.
END-6	Site clean-up and rehabilitation	Remove housing, office units, other infrastructure. Hand over any useful units to the community/dam committee. Rehabilitate campsite.	Alien plant invasion. Loss of use of land.	Not done. Campsite abandoned but not rehabilitated.
END-7	Hazardous waste	Recycle used hydrocarbons where possible. Dispose off-site in accordance with regulatory requirements. Bioremediate oil-contaminated soil in a land farm or use in-situ remediation where the contamination plume is shallow.	Surface and groundwater pollution. Soil contamination.	Not done. No oil recycling took place during construction. Waste hydrocarbons may be present on site. Hydrocarbon-contaminated soils may also be present, particularly at the camp site refuelling bays and in other areas where drip trays and oil containment measures were not taken. No biological remediation of contaminated soils was done.
END-8	Non-hazardous construction waste	Dispose all rubble and other non-hazardous waste at a ZEMA/local authority certified landfill. Level and rehabilitate heaps of soil.	Water and soil pollution.	No systematic process of site clean-up done.
END-9	Non-hazardous	Use overburden spoil to backfill the borrow pits.	Erosion and sedimentation.	No systematic process of site clean-up and rehabilitation done.

Code	Aspect	Safeguard requirement (ESMP/ARAP)	Risk	Compliance status
	construction waste			
END-10	Sanitary waste	Dismantle and bury pit latrines after applying lime.	Groundwater pollution.	Not done.
END-11	Downstream ecological flow	Install gauge plates to measure water levels and water releases.	If not done, absence of data to evaluate downstream flow impacts.	Not done.
Operational Phase				
END-12	Environmental flow releases	No flow requirement specified.	Impact assessed as ecologically positive due to increased reliability of downstream flow.	No measurement of flow or evaluation of downstream impact.
END-13	Environmental flow releases	Designated flow gauge reader to record flow results.	If not done, inability to monitor and manage downstream ecological impacts (positive or negative)	Not done.
END-14	Performance monitoring	Undertake performance and impact monitoring as a basis for adaptive management.	If not done, failure to understand and manage long term impacts.	Not done.

Figure 8-18. Borrow area above Kanyika dam on the right abutment. Note project office in the background.

8.4.2.4 Social risks

Compliance requirements for social impact management are included in Table 8-31 (COWI, 2018c). Compliance relates to the compensation and reinstatement of the livelihoods of PAPs and capacity building of PAPs and institutions. Thirteen PAPs lost land and crops which required compensation as a

result of construction of the dam wall and associated infrastructure. The spillway, constructed later, led to land loss of one other farmer as did the excavation of the borrow pit. The traditional leadership has however shown commitment to replacing land lost (COWI, 2018g). There were no business premises and cultural resources lost. The only community resource lost was the access route to a graveyard (to be verified). Whilst the embankment provides a good access route, the spillway located on the right flank would not permit easy passage and alternative access arrangements are required. The graveyard on the left bank has not been impacted by the project activities.

Livelihood restoration planning has been completed, and compensation has been paid and verified by the World Bank. However, Table 8-31 shows that there are a number of outstanding actions in relation to ongoing PAP support and PAP and institutional capacity building. Action is required in these cases. The reallocation of land by the traditional authority to PAPs who lost land is still in progress. PAPs have expressed lack of confidence in the opportunities for acquiring replacement land in the irrigation area because this land is mostly owned by three individual families who are reluctant to share it.

Table 8-31. Social compliance status and risks (Kanyika Dam)

Cod	Aspect	ESMP/ARAP requirement	Risk	Status on site
Construction Remediation Phase				
SCD-1	Community irrigation water supply	Construction of irrigation water supply for downstream community.	Failure of project to meet its primary objective.	Irrigation system neither designed nor established yet.
SCD-2	Compensation and livelihood restoration	A resettlement action plan to be prepared to ensure compensation for the lost assets and income.	Incomplete restoration of PAP's livelihoods.	Abbreviated Resettlement Action Plan (ARAP) prepared by COWI (2018). Nine (9) PAPs have received cash compensation according to the ARAPs.
SCD-3	Compensation and livelihood restoration	Replacement land to be made available to affected PAPs.	Incomplete restoration of PAP's livelihoods.	Three (3) PAPs affected by land loss due to dam construction and associated works await land-for-land compensation. The local leadership has agreed to provide land along the canal to affected PAPs. To be verified.
SCD-4	Cultural heritage	Creation of alternative access to the graveyard on left abutment.	Loss of access to graveyard.	Not done. No graveyard located near Kanyika dam.
Operational Phase				
SCD-5	Community development	Stocking of the dam with fish.	Failure to meet project objectives of improved livelihoods for local communities.	Not done. To be assessed.
SCD-6	Community safety	Farmers to be educated about safe methods of chemical handling and control.	Injury or illness.	Not done.

Cod	Aspect	ESMP/ARAP requirement	Risk	Status on site
SCD -7	Institutional capacity building	Institute a strong committee or cooperative management structure to ensure a functional irrigation scheme. Devise clear rules and regulations to be complied with by members of the scheme. Foster organized livelihood activities including irrigation and fishing. Public institutions to support irrigation, Sensitize local leadership on the operation of the irrigation scheme.	Lack of capacity to benefit fully from irrigation water supply.	Not done.
SCD-8	Community development	Train PAPs in irrigation agricultural techniques, knowledge of the types of high value crops to cultivate and other enterprises besides agriculture that could assist in income generation.	Lack of capacity/training to benefit fully from irrigation water supply.	Not done.
SCD -10	Livelihood restoration	Monitoring of livelihood restoration/community development.	Inability to evaluate success of programme to meet development goals and objectives.	Future action.
SCD-11	Community health and safety	Update of the generic Emergency Response Plan to be dam-specific	Inability to effectively manage emergencies caused by the dam	Not done.

8.4.3 Proposed actions

8.4.3.1 Actions to address dam safety risks (structural)

Proposed remedial actions for identified dam safety risks and non-compliances during construction are described in Table 8-32.

Table 8-32. Actions to address structural dam non-compliances and risks (Kanyika Dam).

Code	Aspect	Risk	Action required
Construction Remediation Phase			
SFD-1	Dam failure	Failure of dam embankment due to settlement of fill embankment and absence of drainage control.	• Open crest tension cracks to a depth of 300 mm and backfill to prevent lubricating the cracks in the rains. • Install filtered rock toe to control seepage and stabilise the embankment.

8.4.3.2 Actions to address dam health and safety risks (non-structural)

Proposed remedial actions for identified dam health and safety risks and non-compliances are described in Table 8-33.

Table 8-33. Actions to address dam health and safety non compliances and risks (non-structural).

Code	Aspect	Risk	Action required
Construction Remediation Phase			
HSD-1	Rehabilitation of borrow pits	Failure to rehabilitate causing increased malaria risks and increased risk of children being injured or drowning.	• Comply with END-4, END-9 action requirements. • Ensure borrow pits free draining to avoid malarial breeding sites and minimise drowning risks.
HSD-2	Access across the river	Lack of a bridge with increased risk of community injury and drowning.	• Provide community with alternative safe access.
HSD-3	Community health and safety	Drowning due to absence of warning signs.	• Design and erect appropriate hazard notices • Sensitise communities to risks.
Operational Phase			
HSD-4, HSD-5, HSD-6, HSD-7, HSD-8, HSD-9	Community health and safety	Injury or illness caused by lack of knowledge of dam risks.	• Develop a training programme for communities who live around the dam. • Train communities in accordance with the plan (including drinking water and water borne diseases, avoidance of dangerous spillway crossings, swimming risks, emergency preparedness in floods or dam failure).

8.4.3.3 Actions to address environmental non-compliances and risks

Proposed remedial actions for identified environmental risks and non-compliances are described in Table 8-34. Several non-compliances are combined into a single action in some instances. All actions described are to be included in the Remediation works ESMP to be developed for the construction remediation phase and operational phase of the dams.

Table 8-34. Actions to address environmental non-compliances and risks (Kanyika Dam).

Code	Aspect	Risk	Action required
Construction Remediation Phase			
END-1	Demobilisation and restoration plan	Plan ensures structured management to minimise environmental risk of dam construction impacts.	• Prepare plan as part of the requirements of the ESMP.

Code	Aspect	Risk	Action required
Construction Remediation Phase			
END-2, END-3,	Rehabilitation of disturbed works areas	Erosion and sedimentation.	• Conduct detailed site inspections • Define and map disturbed areas where rehabilitation/erosion control is required • Develop method statements for each area, including problem statement, method of rehabilitation, resources needed and responsibilities (See END-1 above). • Implement rehabilitation and monitor effectiveness over three years.
END-5	Rehabilitation of community roads	Loss of community access.	• Rehabilitate community roads used by the contractor. • Close and rehabilitate any informal bush tracks made by the contractor.
END-4; END-9	Rehabilitation of borrow pits	Erosion and sedimentation. Weed infestation. Entrapment risk to wild animals.	• Conduct detailed site inspections. • Prepare detailed rehabilitation plan for each borrow area. Define methodologies for top-soiling and reseeding with natural grass seed mixtures. • Reduce slopes and backfill with inert spoil, where necessary/possible, to create safe conditions that avoid entrapment of animals and accumulation of water. • Monitor effectiveness of rehabilitation over three years.
END-6, END-8	Waste, construction infrastructure and rubble	Weed infestation, loss of productive land.	• Conduct detailed site inspections. • Prepare snag list defining each area where remedial action is necessary, and the required actions. • Waste/rubble to be removed to government-approved disposal sites.
END-10	Sanitary waste	Groundwater and surface water pollution.	• Identify and map location of all pit latrines. • Define methods to ensure safe capping with no pollution risk.
END-7	Hazardous waste, hydrocarbon-polluted soils	Groundwater and surface water pollution.	• Conduct detailed site inspections. • Prepare snag list defining each area where remedial action is necessary, including location of waste oil drums and/or other hazardous chemicals, location of oil-contaminated soils and the required actions. • Define methods for soil remediation. • Implement and monitor recovery. • Hazardous waste to be removed to a government-approved hazardous waste disposal site.
END-11	Environmental flow releases	Inability to monitor and assess downstream ecological effects of dam operation.	• Design and install gauge plates. • Undertake assessment of downstream aquatic and riparian conditions as a basis for flow requirements and monitoring to be imposed on the operational phase of the dam. • Undertake assessment of the ecological effect of stocking the dam with fish (particularly *O. nilotica*)
Operational Phase			
END-12, END-13, END-14	Environmental flow releases	Inability to monitor and assess downstream	• Ensure adherence to the prescribed environmental flow and other management requirements. • Develop O&M plan to include ecological flow requirements. • Appoint and train flow reader.

Code	Aspect	Risk	Action required
Construction Remediation Phase			
		ecological effects of dam operation.	• Maintain flow records. • Monitor dam impact on aquatic environment (monitoring plan to be determined in the assessment phase above).

8.4.3.4 Actions to address social non-compliances and risks

Proposed remedial actions for identified social risks and non-compliances are described in Table 8-35. Several non-compliances are combined into a single action in some instances. All actions described are to be included in the ESMP to be developed for remediation of the site in the construction remediation phase and the operational phase of the dams.

Table 8-35. Actions to address social non-compliances/risks (Kanyika Dam).

Code	Aspect	Risk	Action required
Construction Remediation Phase			
SCD-1	Community irrigation water supply	Failure of project to meet its primary objective.	• Support community with the design and construction of community-based irrigation infrastructure. Financing is not done under the AF.
SCD-3	Replacement land	Incomplete livelihood restoration.	• Provide PAPs who lost land with replacement irrigation land. Follow-up with community and local leadership.
Operational Phase			
SDC-5	Community development	Food security - failure to stock the dam with fish.	• Stock the dam with fish. To be assessed.
SDC-6	Community safety	Unsafe handling of pesticides	• Develop a training programme for PAPs in the irrigation area concerning safe use of pesticides using the integrated pest management programme (IPM) prepared for the project.
SCD-7	Community development	Lack of capacity/training to benefit fully from irrigation water supply.	• Strengthen the dam or irrigation committee to ensure cooperation and spread of benefits to a wider section of the community.
SDC-8	Community development	Lack of capacity/training to benefit fully from irrigation water supply	• Train PAPs in irrigation agricultural techniques, knowledge of the types of high value crops to cultivate and other enterprises besides agriculture that could assist in income generation.
			•
SCD-10	Livelihood restoration	Inability to evaluate success of programme to meet development goals and objectives.	• Develop and implement a monitoring and evaluation programme based on the requirements of the ARAP.
SCD-11	Community health and safety	Lack of capacity to respond effectively to emergencies related to the dam	• Update Emergency Response Plan

8.5 Dam 5: Makaba

8.5.1 Characteristics of the dam and surrounding area

8.5.1.1 Dam and catchment characteristics

Makaba dam is an old earth fill dam constructed in 2000 by the Ministry of Agriculture, and rehabilitated in 2008, with the most recent works in 2017. It is located in Namwala District of the Southern Province of Zambia on a seasonal river which drains the Kafue Flats in the Lower Kafue River Catchment. It is a tributary of the Munyeke River which flows into the Kafue River. The site is about approximately 80 km north of Choma in the Namwala District, Southern Province. According to the initial design, the inundation area is less than 25 ha.

The main purpose of the dam is to provide water for year-round irrigation of crops and water for cattle, as well as for aquaculture.

The main features of the dam and catchment are described in Table 8-36.

Table 8-36. Main features of Makaba Dam

DAM # 5: MAKABA	Features
Location of the dam	
Province	Zambian Southern Province
District	Namwala District
Location of the dam (D.ddddd°)	S16.10065° E26.85566°
Name of the river/stream on which the dam was built	Un-named stream, which drains to the Munyeke River
Dam characteristics and dimensions	
Dam type/material	Zoned earth fill embankment
Size classification (COWI, 2019x)	Small (based on ICOLD)
Hazard Classification	
- Potential loss of lives	Significant
- Potential economic loss	Low
- Potential adverse impact on resource economy	Low
- Maximum hazard classification	Significant
Year dam was constructed	2016
Contractor name	Tawanda
Wall height	8.5 m
Wall length	Unknown
Volume storage	1 million m^3
Reservoir surface area (at FSL)	Unknown
Reservoir catchment area	66.72 km^2
Maximum depth at FSL	5 m
Spillway (main)	Open channel at end of left flank with three reinforced concrete drop structure
Spillway (emergency)	Nil
Throwback	Unknown
1:50 year design flood	68.1 m^3

DAM # 5: MAKABA	Features
1:100 year flood	81.2 m^3
Safety Evaluation Flood (SEF)	94.7 m^3
Other	
Foundation	Unknown
Foundation treatment	Unknown
Drainage system	Unknown
Outlet works and scour	No outlet pipe observed. Two 75mm diameter UPVC siphon pipes at embankment crest level, currently not working.
Monitoring instruments	None

Figure 8-19. Satellite view of the Makaba Dam and surrounding area (image date September 2019).

Figure 8-20. Makaba Dam – detail of the dam wall (image date October 2018)

Upslope view of Makaba dam (November 2019).

Spillway approach (November 2019).

Spillway sill (March 2018).

Existing first drop structure (March 2018).

Left bank canal (November 2019.

Culvert crossing.

Right bank market gardens (November 2019).

Canal termination (November 2019).

Second drop structure (March 2018).

One of the new irrigation canals downstream of dam (March 2018).

Figure 8-21. Makaba Dam under construction.

8.5.1.2 Physical environment

Makaba dam lies in Mamwala District in the Kafue Flats, which form a vast floodplain with an altitude of between 970 and 1,000 masl. The dam is located at an altitude of 1,052 masl at the inlet to the reservoir and 1,036 masl at the outlet.

The Namwala district is largely drained by the Kafue River in the north and its tributaries in the western, southern and eastern parts. The dam collects water from a large catchment area, estimated to be about 100 km^2. Aquifers in the area have moderate water yields between 0.1-15 litres per second. Water quality in the stream and dam shows high levels of total coliforms and faecal matter, and high levels of iron.

The climate is humid subtropical, with dry winters, a hot and dry season from September to November and warm wet summers from November to April. Annual average rainfall is between 700 mm and 1,000 mm. The hottest month is October (average temperature of 32.6°C) and the coldest is July (average temperature of 6.4°C).

In terms of soils, the arenosols and less commonly vertisols and gleysols cover the cenozoic rocks that underlie the project area. Arenosols are sandy-textured soils that are low in humus and in subsurface clay content, and are highly permeable.

8.5.1.3 Biological environment

Namwala lies in the ecoregion of Southern Miombo Woodlands. Wooded grasslands occur in the vicinity of the dam site, with deciduous forest further way to the north and east. Predominant trees are

Brachystegia, Julbernardia, Combretum, Syzygium and Acacia. About 50% of the woodlands have been affected by human activities. The first storey has good land cover with abundant grass and numerous regenerates. Farmers cut down regenerates to fence their vegetable gardens in the wetlands so as to protect the gardens from cattle, which are prevalent in the area. Due to the upward shift of the transition point between the wetlands (dambos) and the lower part of transect, upland miombo woodland trees now occur close to the water's edge.

The site is 38 km south west of Lochinvar National Park and over 80 km from Blue Lagoon National Park, both of which are associated with the Kafue flats. No other areas of conservation significance are referenced in the WRDP (2016) EPB or the COWI (2018c) ESMP. The Kafue Flats (locally called 'Butwa') are a vast area of swamp, open lagoon and seasonally inundated flood-plain on the Kafue River in the Southern, Central and Lusaka provinces of Zambia. They comprise a shallow flood plain, 240 km long and about 50 km wide, flooded to a depth of less than a meter in the rainy season (deeper in some lagoons and permanently swampy areas), and drying out to a clayey black soil in the dry season. The flats are known for abundant termite activity.

Fauna around the Makaba dam site was identified through incidental observations and discussions with local people. Mammals include waterbuck (*Kobus defassa*), porcupine (*Atherurus africanus*), bush pig (*Potamochoerus porcus*), hare (*Lepus victoriae*), wild dog (*Lycaon pictus*) and hippopotamus (*Hippopotamus amphibius*), the latter apparently being present in the area (COWI, 2018c). Smaller animals such as vervet monkey (*Cercopithecus aethiops*) and rodents are common. Few bird species were identified, but the typical Miombo species will likely occur. The project area has a variety of reptiles, lizards, chameleons, tortoises and frog species. No field survey was done to support the baseline but given the modified habitats over a large area, fauna are likely to be depauperate, being heavily impacted by hunting and habit loss.

The African wild dog (*Lycaon pictus*) and hippopotamus (*Hippopotamus amphibius*) are both Red Data species, listed as 'Endangered' and 'Vulnerable' respectively in the latest IUCN Red Data classification. WRDP (2016) lists these species, but where they actually occur in the area is unknown – given the human settlement and the intense usage of the surrounding area for cultivation it seems highly unlikely.

Use of the Integrated Biodiversity Assessment Tool (IBAT)[6] brings up 27 potentially occurring Red Data species - 8 mammal, 16 bird, 2 fish and 1 plant - within a 50 km radius of the dam site. Most of the terrestrial species are likely to be associated with the Kafue Flats, which is a Key Biodiversity Area (KBA), at its closest point around 20 km from the dam.

IBAT lists two vulnerable cichlid species may be found in the aquatic environment, *Oreochromis andersonii and Oreochromis macrochir,* both of which are known from the Kafue drainage system. According to *WRDP (2016), Oreochromis niloticus* is also present, having been introduced by anglers and

[6] The Integrated Biodiversity Assessment Tool (IBAT) is a multi-institutional programme of work involving BirdLife International, Conservation International, IUCN and UNEP-WCMC. IBAT provides a basic risk screening on biodiversity. It draws together information on globally recognised biodiversity information drawn from a number of IUCN's Knowledge Products: IUCN Red List of Threatened Species, Key Biodiversity Areas (priority sites for conservation) and Protected Planet/The World Database on Protected Areas (covering nationally and internationally recognised sites, including IUCN management categories I–VI, Ramsar Wetlands of International Importance and World Heritage sites).

aquaculturalists. This species is likely to be having a severe impact on the other cichlids, replacing them throughout their ranges (IUCN, 2019).

Makaba dam and stream may also provide suitable habitat for an endemic killifish, *Nothobranchius kafuensis, which* is known from the seasonal and permanent streams of the area (pers. comm. Warren Aken, March, 2020).

Table xx: Red Data species recorded in IBAT within a 50 km radius of the Makaba dam site

Species (common name)	**Scientific name**	**IUCN Red Data Status**
Mammals		
Black rhinoceros	*Diceros bicornis*	CR
African wild dog	*Lycaon pictus*	EN
Kafue mole-rat	*Fukomys kafuensis*	VU
Hippopotamus	*Hippopotamus amphibius*	VU
African elephant	*Loxodonta africana*	VU
Lion	*Panthera leo*	VU
Leopard	*Panthera pardus*	VU
Temminck's pangolin	*Smutsia temminckii*	VU
Birds		
White-backed vulture	*Gyps africanus*	CR
Hooded vulture	*Necrosyrtes monachus*	CR
White-headed vulture	*Trigonoceps occipitalis*	CR
Steppe eagle	*Aquila nipalensis*	EN
Madagascar pond-heron	*Ardeola idae*	EN
Grey crowned crane	*Balearica regulorum*	EN
Cape vulture	*Gyps coprotheres*	EN
Lappet-faced vulture	*Torgos tracheliotos*	EN
Black-cheeked lovebird	*Agaprnis nigrigenis*	VU
Tawny eagle	*Aquila rapax*	VU
Southern ground-hornbill	*Bucorvus leadbeateri*	VU

Species (common name)	Scientific name	IUCN Red Data Status
Wattled crane	*Bugeranus carunculatus*	VU
Slaty egret	*Egretta vinaceigula*	VU
Zambian barbet	*Lybius chaplini*	VU
Martial eagle	*Polemaetus bellicosus*	VU
Secretarybird	*Sagittarius serpentarius*	VU
Fish		
Threespot tilapia	*Oreochromis andersonii*	VU
	Oreochromis macrochir	VU
Plants		
	Nymphoides tenuissima	EN

8.5.1.4 Socio-economic environment

The dam is located in Chitongo ward, which has an estimated population of 4,939 (consisting of 52 per cent women and 48 per cent) with 773 households.

A number of settlements are located on either side of the dam. These consist of extended families forming a number of villages namely Makaba, Chile, Habeenzu and Sompani. Most community members in the area own two pieces of land in either one or two locations. It is common to own one piece of land along the stream used for cultivation in the dry season, and an upland portion used for rain fed crops.

Main crops grown on the upland portion include maize, groundnuts, sweet potatoes, cotton and cowpeas. There are thriving market gardens on both banks downstream of the dam where a wide range of vegetables are grown, as can be clearly seen from Figure 8-19. Most communities also own cattle and small animals such as goats, pigs and fowl, from which they maintain their livelihoods and earn an income.

People living close to the dam use the dam embankment to access social services and networks. These include Makaba primary school, Chitongo Health Centre, Chitongo sub centre and the main tarred road, all located on the left bank of the Munyeke stream.

The local community draws its drinking mainly from the boreholes and shallow wells near Makaba dam. The surface water is used mainly for washing and other domestic and economic uses like irrigation and livestock watering. A sample of water from the dam tested in March 2016 showed that the natural surface waters in the project area are generally good (WRDP, 2016).

8.5.2 Non-compliance issues and risks

8.5.2.1 Dam safety (structural) risks

The main structural safety concerns are described in Table 8-37. These are summarised from UNOP (2019).

Table 8-37. Dam safety compliance status and risks (Makaba Dam).

Code	Aspect	Concern/non-compliance	Risk
Construction Remediation Phase			
SFE-1	Structural safety	Check needed on flood estimation.	Dam failure if larger floods than predicted occur - downstream community safety.
SFE-2	Structural safety	Seepage and gullying/embankment hole indicative of dispersive soils on the downstream side of the wall. Exacerbated by livestock. Upstream face has no visible stone pitching.	Probably not an immediate risk but requires monitoring. Termite action is a concern - downstream community safety.
SFE-3	Structural safety	Spillway returns inadequate. Third check weir has failed and others are showing earlier signs of erosion around the abutments.	Dam at risk of failure if spillway return not repaired – downstream community safety.

8.5.2.2 Dam safety (non-structural) risks

The main non-structural health and safety concerns associated with the construction and operational phases of the dam are described in Table 8-38.

Table 8-38. Dam health and safety (non-structural) compliance requirements and risks.

Cod	Aspect	ESMP/ARAP requirement	Risk	Status on site
Construction Remediation Phase				
HSE-1	Community health and safety	Rehabilitation of borrow pits to avoid ponding of water creating of mosquito breeding grounds and risk of drowning or injury.	Increased malaria risks. Increased risk of children drowning.	Not done.
HSE-2	Community safety	Erection of safety hazard signs around the dam.	Serious or fatal incidents/drownings.	Not done.
HSE-3	Community safety	Creation of alternative access to cross the dam below the dam wall to replace access across the embankment and spillway.	Serious or fatal incidents/drownings.	Not done.
Operational Phase				
HSE-4	Community safety	Provide dam emergency safety talks/ sensitisation and training to local community and dam committee.	Lack of knowledge about actions to take in emergencies.	Not done.
HSE-5	Community safety	Sensitization of community to avoid risk of spillway crossings.	Serious or fatal incidents/drownings	Not done.

Cod	Aspect	ESMP/ARAP requirement	Risk	Status on site
HSE-6	Community safety	Enforcement of dam safety and security measures around the dam.	Serious or fatal incidents/drownings	Not done.
HSE-7	Community safety	Warning prior to opening of overflow pipes in the event of flooding.	Serious or fatal incidents/drownings	Not done.
HSE-8	Community Safety	Safety sensitisation and awareness programmes of swimming risks particularly for children.	Serious or fatal incidents/drownings	Not done.
HSE-9	Community health	Sensitization of community to impacts of drinking untreated water.	Increased prevalence of water borne diseases.	Not done.

8.5.2.3 Environmental risks

Makaba is an old existing dam constructed on a seasonal river. The surrounding area is extensively transformed by cultivation and the construction works to modify the dam are unlikely to have resulted in significant risk to terrestrial habitats or species of conservation significance. The records of hippopotamus and wild dog described by WRDP (2016), and the additional Red Data mammal species, including elephant, that are listed by IBAT, are probably representative of the National Parks on the Kafue Flats, 20 km to the north east of the dam.

The Makaba river system may still be associated with aquatic species of conservation concern. The river is a part of the Kafue drainage system, which is known for two vulnerable cichlids, *Oreochromis andersonii and Oreochromis macrochir, and the endemic* killifish, *Nothobranchius kafuensis*. The likely impact of the construction activities and increased downstream irrigation on remnant populations of these species that may be present in the river system is unknown without further investigation. Stocking of the dam with *Oreochromis niloticus* would increase the pressure on the other cichlids with vulnerable IUCN Red Data status.

The ESMP (COWI, 2018c) provides no guidance about interventions necessary to manage the impacts on the aquatic system, referring only to "monitoring and mitigation for adaptive management in order to quantify and evaluate accumulative environmental impacts after demobilisation". Since this issue applies to all of the dams it is discussed in more detail in Section 7.11 'Compliance with World Bank Policies'.

Environmental management requirements for the dam (post-construction) in the COWI (2018c) ESMP are aimed at responsible demobilisation and site restoration. These requirements are included in Table 8-39, summarised from Section 4.4 and Section 6.1.4 of the ESMP. In addition, COWI raises concerns about the erosion damage in the downstream channel below the spillway, and the seepage of iron-enriched water through the base of the embankment, which conflicts with the results quoted by WRDP PB (2016), being well above the standard set for drinking water in Zambia.

Table 8-39 shows the project to be non-compliant with most of the requirements, and remedial action is required in these cases. No structured process of demobilisation and restoration has been followed and the plan required by the ESMP has not been prepared or implemented. A plate gauge has not been installed, as required by the ESMP, and there is no plan in place to monitor ecological impacts of the dam.

Table 8-39. Environmental compliance status and risks (Makaba Dam).

Code	Aspect	Safeguard requirement (ESMP/ARAP)	Risk	Compliance status
Construction Remediation Phase				
ENE-1	Demobilisation and Restoration	Prepare demobilisation and restoration plan.	Plan ensures structured management to minimise environmental risk of dam construction impacts.	No plan prepared or implemented.
ENE-2	Rehabilitation of work areas	Rehabilitate disturbed work areas and restore as close as possible to original contours. Restore topsoil from stockpiles. Replant with native plant seed mixes, where natural revegetation likely to be unsuccessful.	Erosion and sedimentation. Alien plant infestation. Loss of use of land.	No top-soiling or grassing done on the downstream embankment slope.
ENE-3	Rehabilitation of work areas	Install drainage structures to reduce uncontrolled runoff. Plant fast growing trees in erosion-prone areas.	Erosion and sedimentation. Loss of habitat.	Not done as works were suspended and project closed.
ENE-4	Rehabilitation of borrow pits	Make borrow area safe. Stabilise steep slopes. Backfill to acceptable landform. Prevent accumulation of water. Topsoil. Reseed naturally or with indigenous seed mixtures.	Erosion and sedimentation.	Not done as works were suspended and project closed.
ENE-5	Site clean-up and rehabilitation	Repair community roads and paths. Close selected bush paths by ripping and revegetating. Close contractor paths around dam.	Erosion and sedimentation. Alien plant invasion. Loss of use of land.	No repair done.
ENE-6	Site clean-up and rehabilitation	Remove housing, office units, other infrastructure. Hand over any useful units to the community/dam committee. Rehabilitate campsite.	Alien plant invasion. Loss of use of land.	Not done. Campsite abandoned but not rehabilitated.
ENE-7	Hazardous waste	Recycle used hydrocarbons where possible. Dispose off-site in accordance with regulatory requirements. Bioremediate oil-contaminated soil in a land farm or use in-situ remediation where the	Surface and groundwater pollution. Soil contamination.	Not done. No oil recycling took place during construction. Waste hydrocarbons may be present on site. Hydrocarbon-contaminated soils may also be present, particularly at the camp site refuelling bays and in other

Code	Aspect	Safeguard requirement (ESMP/ARAP)	Risk	Compliance status
		contamination plume is shallow.		areas where drip trays and oil containment measures were not taken. No biological remediation of contaminated soils was done.
ENE-8	Non-hazardous construction waste	Dispose all rubble and other non-hazardous waste at a ZEMA/ local authority certified landfill. Level and rehabilitate heaps of soil.	Water and soil pollution.	No systematic process of site clean-up done.
ENE-9	Non-hazardous construction waste	Use overburden spoil to backfill the borrow pits.	Erosion and sedimentation.	No systematic process of site clean-up and rehabilitation done.
ENE-10	Sanitary waste	Dismantle and bury pit latrines after applying lime.	Groundwater pollution.	Not done.
ENE-11	Downstream ecological flow	Install gauge plates to measure water levels and water releases.	If not done, absence of data to evaluate downstream flow impacts.	Not done.
Operational Phase				
ENE-12	Environmental flow releases	No flow requirement specified.	Impact assessed as ecologically positive due to increased reliability of downstream flow.	No measurement of flow or evaluation of downstream impact.
ENE-13	Environmental flow releases	Designated flow gauge reader to record flow results.	If not done, inability to monitor and manage downstream ecological impacts (positive or negative)	Not done.
ENE-14	Performance monitoring	Undertake performance and impact monitoring as a basis for adaptive management.	If not done, failure to understand and manage long term impacts.	Not done.

Second check weir (November 2019).

Second check weir left abutment erosion (November 2019).

Figure 8-22. Downstream erosion of the channel at the second check weir below the Makaba Dam spillway.

8.5.2.4 Social risks

Compliance requirements for social impact management are included in Table 8-40, summarised from Section 4.4 and Section 6.1.4 of the ESMP (COWI, 2018c) and the Abbreviated Resettlement Action Plan (COWI, 2018h). Compliance relates to the compensation and reinstatement of the livelihoods of PAPs, capacity building of PAPs and institutions. Eighteen PAPs were affected by temporary land and crop losses due to construction of the irrigation channels and rehabilitation of the spillway. Most of the land was returned to them after the irrigation canal was finished, while the small area of permanent land loss for the canal itself can be compensation for by extending the existing plots. There is therefore no need to find additional replacement land.

Livelihood restoration planning has been completed, and compensation for lost crops has been paid and verified by the World Bank. However, Table 8-40 shows that most of the community training and institutional support requirements to maximise project benefits still need to be done. Action is required in these cases.

Table 8-40. Social compliance status and risks (Makaba Dam).

Code	Aspect	ESMP/ARAP requirement	Risk	Status on site
Construction Remediation Phase				
SCE-1	Community irrigation water supply	Construction of irrigation water supply for downstream community.	Failure of project to meet its primary objective.	Irrigation system not fully functional. Canals need to be extended to serve more people. Syphons have failed. Effectiveness of design questioned by UNOPS (2019). Downstream gardeners bucketing water to their crops.
SCE-2	Compensation and livelihood restoration	A resettlement action plan to be prepared to ensure compensation for the lost assets and income.	Incomplete restoration of PAP's livelihoods.	Abbreviated Resettlement Action Plan (ARAP) prepared by COWI (2018). Eighteen (18) PAPs affected by temporary (and small amount of

Code	Aspect	ESMP/ARAP requirement	Risk	Status on site
				permanent) land loss due to irrigation canal construction and remedial work on the return spillway have received cash compensation and verified by WB.
SCE-3	Compensation and livelihood restoration	Replacement land to be made available to affected PAPs.	Incomplete restoration of PAP's livelihoods.	PAPs allocated land along the canal.
Operational Phase				
SCE-4	Community development	Stocking of the dam with fish.	Failure to meet project objectives of improved livelihoods for local communities.	Not done. To be assessed.
SCE-5	Community safety	Farmers to be educated about safe methods of chemical handling and control.	Injury or illness.	Not done.
SCE-6	Institutional capacity building	Institute a strong committee or cooperative management structure to ensure a functional irrigation scheme. Devise clear rules and regulations to be complied with by members of the scheme. Foster organised livelihood activities including irrigation and fishing. Public institutions to support irrigation, Sensitise local leadership on the operation of the irrigation scheme.	Lack of capacity to benefit fully from irrigation water supply.	Not done.
SCE-7	Training of beneficiaries	Assist PAPs with training to improve their knowledge of irrigation agriculture, high value crops to cultivate and other enterprises besides agriculture that could assist in income generation.	Lack of capacity to benefit fully from irrigation water supply.	Not done.
SCE-8	Livelihood restoration	Monitoring of livelihood restoration/community development.	Inability to evaluate success of programme to meet development goals and objectives.	Future action.
SCE-9	Community health and safety	Update of the generic Emergency Response Plan to be dam-specific	Inability to effectively manage emergencies caused by the dam	Not done.

8.5.3 Proposed actions

8.5.3.1 Actions to address dam safety risks (structural)

Proposed remedial actions for identified dam safety risks and non-compliances during construction are described in Table 8-41.

Table 8-41. Actions to address structural dam non-compliances and risks (Makaba Dam).

Code	Aspect	Risk	Action required
SFE-1	Structural safety	Overtopping of the embankment.	• Confirm the design flood.
SFE-2	Structural safety	Seepage and embankment failure.	• Regularly monitor seepage (install V-notch weirs to measure flows on the right bank. • Install toe drain filter. • Monitor/remove termites.
SFE-3	Structural safety	Failure of dam embankment due to headward erosion and undermining of the spillway.	• Repair the drop weirs and spillway.

8.5.3.2 Actions to address dam health and safety risks (non-structural)

Proposed remedial actions for identified dam health and safety risks and non-compliances are described in Table 8-42.

Table 8-42. Actions to address dam health and safety non compliances and risks (non-structural).

Code	Aspect	Risk	Action required
Construction Remediation Phase			
HSE-1	Rehabilitation of borrow pits	Failure to rehabilitate causing increased malaria risks and increased risk of children being injured or drowning.	• Comply with ENE-4, ENE-9 action requirements. • Ensure borrow pits free draining to avoid malarial breeding sites and minimise drowning risks.
HSE-3	Access across the river	Lack of a bridge with increased risk of community injury and drowning.	• Design and build alternative access to cross the dam below the dam wall to replace access across the embankment and spillway.
HSE-2	Community health and safety	Drowning due to absence of warning signs.	• Design and erect appropriate hazard notices. • Sensitise communities to risks.
Operational Phase			
HSE-4, HSE-5, HSE-6, HSE-7, HSE-8, HSE-9	Community health and safety	Injury or illness caused by lack of knowledge of dam risks.	• Develop a training programme for communities who live around the dam. • Train communities in accordance with the plan (including drinking water and water borne diseases, avoidance of dangerous spillway crossings,

Code	Aspect	Risk	Action required
			swimming risks, emergency preparedness in floods or dam failure).

8.5.3.3 Actions to address environmental non-compliances and risks

Proposed remedial actions for identified environmental risks and non-compliances are described in Table 8-43. Several non-compliances are combined into a single action in some instances. All actions described are to be included in the ESMP to be developed for the construction remediation phase and operational phase of the dams.

Table 8-43. Actions to address environmental non-compliances and risks (Makaba Dam).

Code	Aspect	Risk	Action required
Construction Remediation Phase			
ENE-1	Demobilisation and restoration plan	Plan ensures structured management to minimise environmental risk of dam construction impacts.	• Prepare plan as part of the requirements of the ESMP.
ENE-2, ENE-3,	Rehabilitation of disturbed works areas	Erosion and sedimentation.	• Conduct detailed site inspections. • Define and map disturbed areas where rehabilitation/erosion control is required. • Develop method statements for each area, including problem statement, method of rehabilitation, resources needed and responsibilities (See ENE-1 above). • Implement rehabilitation and monitor effectiveness over three years.
ENE-5	Rehabilitation of community roads	Loss of community access.	• Rehabilitate community roads used by the contractor. • Close and rehabilitate any informal bush tracks made by the contractor.
ENE-4; ENE-9	Rehabilitation of borrow pits	Erosion and sedimentation. Weed infestation. Entrapment risk to wild animals.	• Conduct detailed site inspections • Prepare detailed rehabilitation plan for each borrow area. Define methodologies for top-soiling and reseeding with natural grass seed mixtures. • Reduce slopes and backfill with inert spoil, where necessary/possible, to create safe conditions that avoid entrapment of animals and accumulation of water. • Monitor effectiveness of rehabilitation over three years.
ENE-6, ENE-8	Waste, construction infrastructure and rubble	Weed infestation, loss of productive land.	• Conduct detailed site inspections. • Prepare snag list defining each area where remedial action is necessary, and the required actions. • Waste/rubble to be removed to government-approved disposal sites.
ENE-10	Sanitary waste	Groundwater and surface water pollution.	• Identify and map location of all pit latrines. • Define methods to ensure safe capping with no pollution risk.

Code	Aspect	Risk	Action required
Construction Remediation Phase			
ENE-7	Hazardous waste, hydrocarbon-polluted soils	Groundwater and surface water pollution.	• Conduct detailed site inspections. • Prepare snag list defining each area where remedial action is necessary, including location of waste oil drums and/or other hazardous chemicals, location of oil-contaminated soils and the required actions. • Define methods for soil remediation. • Implement and monitor recovery. • Hazardous waste to be removed to a government-approved hazardous waste disposal site.
ENE-11	Environmental flow releases	Inability to monitor and assess downstream ecological effects of dam operation.	• Design and install gauge plates. • Undertake assessment of downstream aquatic and riparian conditions as a basis for flow requirements and monitoring to be imposed on the operational phase of the dam. • Undertake assessment of the ecological effect of stocking the dam with fish (particularly *O. nilotica*)
Operational Phase			
ENE-12, ENE-13, ENE-14	Environmental flow releases	Inability to monitor and assess downstream ecological effects of dam operation.	• Ensure adherence to the prescribed environmental flow and other management requirements. • Develop O&M plan to include ecological flow requirements. • Appoint and train flow reader. • Maintain flow records. • Monitor dam impact on aquatic environment (monitoring plan to be determined in the assessment phase above).

8.5.3.4 Actions to address social non-compliances and risks

Proposed remedial actions for identified social risks and non-compliances are described in Table 8-44. Several non-compliances are combined into a single action in some instances. All actions described are to be included in the ESMP to be developed for remediation of the site in the construction remediation phase and the operational phase of the dams.

Table 8-44. Actions to address social non-compliances/risks (Makaba Dam).

Code	Aspect	Risk	Action required
Construction Remediation Phase			
SCE-1	Community irrigation water supply	Failure of project to meet its primary objective.	• Review and redesign irrigation infrastructure.
SCE-2	Compensation for lost crops	Incomplete livelihood restoration.	• Complete. No action required.
SCE-3	Replacement land	Incomplete livelihood restoration.	• Provide PAPs who lost land with replacement irrigation land.
Operational Phase			

Code	Aspect	Risk	Action required
Construction Remediation Phase			
SCE-4	Community development	Food security – failure to stock the dam with fish.	• Stock the dam with fish. Assess fish farming for sustainability.
SCE-5	Community safety	Unsafe handling of pesticides.	• Develop a training programme for PAPs in the irrigation area concerning safe use of pesticides using the integrated pest management programme (IPM) prepared for the project.
SCE-6	Community development	Lack of capacity/training to benefit fully from irrigation water supply.	• Strengthen the dam or irrigation committee to ensure cooperation and spread of benefits to a wider section of the community.
SCE-7	Community development	Lack of capacity/training to benefit fully from irrigation water supply.	• Train PAPs in irrigation agricultural techniques, knowledge of the types of high value crops to cultivate and other enterprises besides agriculture that could assist in income generation.
SCE-8	Livelihood restoration	Inability to evaluate success of programme to meet development goals and objectives.	• Develop and implement a monitoring and evaluation programme based on the requirements of the ARAP.
SCE-9	Community health and safety	Lack of capacity to respond effectively to emergencies related to the dam	• Update Emergency Response Plan

8.6 Dam 6: Nabowa

8.6.1 Characteristics of the dam and surrounding area

8.6.1.1 Dam and catchment characteristics

The Nabowa dam is a new earth fill dam located about 400 km west of Lusaka in Kaoma district of the Western Province of Zambia, 21 km north of Mangango town and 71 kilometres north-west of the Kaoma central business district, off the D792 (Kaoma-Lukulu) road at an altitude of 1,185 m above mean sea level. Access to the site is via a gravel road branching off the D792 road from Mangango approximately 21 km in a north-western direction. The dam is constructed on the Nabowa stream, one of the tributaries of the Luena River.

The dam is classified as a small dam with a life span of between 50 and 100 years. Its purpose is to provide water for irrigation, fishing, animal watering, aquaculture and additional water uses that can be identified by the users. The dam also provides access across the stream via a concrete causeway in the spillway.

Construction of the embankment and spillway is complete, although technical improvements have been recommended. The irrigation infrastructure has been completed.

The main features of the dam and catchment are described in Table 8-45.

Table 8-45. The location and main characteristics of Nabowa Dam.

DAM # 6: NABOWA	Features
Location of the dam	
Province	Zambian Western Province

DAM # 6: NABOWA	Features
District	Kaoma District
Location of the dam (D.ddddd°)	S14.47166° E24.47812°
Name of the river/stream on which the dam was built	Nabowa stream (drains to Luena River)
Dam characteristics and dimensions	
Dam type/material	Zoned earth fill embankment
Size classification (COWI, 2019y)	Small (based on ICOLD)
Hazard Classification	
- Potential loss of lives	Significant
- Potential economic loss	Low
- Potential adverse impact on resource economy	Low
- Maximum hazard classification	Significant
Year dam was constructed	2016
Contractor name	Tawanda
Wall height	10.7 m
Wall length	Design report: 220m Design drawing: 270m
Volume storage	508 484 m^3
Reservoir surface area (at FSL)	12.85 ha
Reservoir catchment area	234.25 km^2
Maximum depth at FSL	7.8 m
Spillway (main)	Open channel at end of left flank with reinforced concrete causeway and gabion drop structures
Spillway (emergency)	Nil
Throwback	1.3 km
1:50 year design flood	129.4 m^3
1:100 year flood	161.1 m^3
Safety Evaluation Flood (SEF)	195.4 m^3
Other	
Foundation	Kalahari Group with fossil seif-dunes
Foundation treatment	Core cut-off trench
Drainage system	Sand blanket drain with rock toe
Outlet works and scour	Concrete encased 150 mm ND black steel low flow pipe with inlet chamber with trash grid at the upstream end. Flow is controlled at the downstream end of the pipe via a 150 mm ND gate valve in a valve chamber. 300 mm ND mild steel irrigation pipe with inlet chamber with trash grid at the upstream and a valve downstream to control the flow
Monitoring instruments	None

Figure 8-23. Satellite view of the Nabowa dam site and surrounding area (imagery date May 2019).

Figure 8-24. Nabowa dam - detail of the wall (imagery date August 2019).

View of the Nabowa Dam from the crest (March 2018).

Main spillway and causeway (March 2018).

Downstream face partially stone pitched (March 2018).

Embankment construction looking towards right flank. Note water impoundment (March 2018).

Borrow area excavation in spillway forebay showing loose rock layers (March 2018).

Downstream view of low flow pipe feeding water into the irrigation channel (March 2018).

Irrigation canal on the right abutment of the dam (March 2018).

Figure 8-25. Nabowa Dam under construction.

8.6.1.2 Physical environment

The area around Nabowa is typically undulating plateau. The dam site is on Nabowa River which is a non-perennial tributary of the Luena River, which flows from east to west through Kaoma, becoming a tributary of the Zambezi River. The site is underlain by Kalahari Group with fossil seif-dunes. Soils are red laterites and clays with loose rock layers, and sandier soils in places.

The hydrology of the study area is complex with drainage in a south westerly direction via a network of small drainage lines fringed with dambos. Many pans exist in the area, some connected to drainage lines and others not. Water quality in the Luena River does not meet the drinking water standard of the Zambia Bureau of Standards (ZABS) mainly due to high total suspended solids, and high levels of lead (Pb) and iron (Fe). No explanation for these elevated metals is provided in the WRDP EPB (2016) or the COWI (2018c) ESMP.

The climate is humid subtropical, with dry winters and hot summers. The hot and wet (rainy) season usually begins in October and ends in April. In a normal rainy season the district receives 1,000 to 1,100 mm of rainfall annually but currently the district receives between 850-1,000 mm. January is the wettest month receiving about 200 mm of rain.

Temperatures in Kaoma district range between the extremes of 5°C and 33°C. May, June and July are normally the coldest months of the year while September, October and November are the hottest months. Frost is common in some parts of the district during the cool-dry season, especially along river valleys.

8.6.1.3 Biological environment

The project area has diverse fauna and flora. Flora in the immediate vicinity of the dam site was identified by WRDP EPBs (2016) by means of field survey. Faunal records for the area were sourced from the Zambia Wildlife Authority.

The flora around the project site is mainly deciduous forest although the dominant forest in the study area is evergreen which (according to WRDP EPBs, 2016) covers most of the land beyond a radius of 2.5 to 5 km from the dam site in all directions. Mutondo (*Julbernardia paniculata*) is the dominant tree species. Other notable species that commonly occur include Mukunku (*Pseudolachnostylis maprouneifolia),* Mupampa (*Securidaca longepeduculata*), Mubanga (*Pericopsis angolensis*) and Mupako (*Erythrophleum africanum*). Harvesting of *Pterocarpus chrysothrix* (rosewood) in the study area was observed by COWI (2018). The demand in Asia for this species has resulted in severe harvesting pressure

affecting local populations. While of least concern in the Red Data listing, the IUCN (2019) notes that it is threatened and declining in Zambia. In August 2019 , it was added to CITES Appendix II, which restricts[7] international trade in the species. Nevertheless, recent articles in the press suggest that illegal trade through cartels is continuing in Zambia (see EIA, 2019).

According to DNRE (2016), almost 100 species of mammal occur or are likely to occur in the district, including large herbivores such as elephant and carnivores such as lion. The area is especially rich in bird life with over 430 species of birds recorded. Various species of reptiles and amphibians, and 36 species of fish, occur. Many Red Data species are likely to be present although these are not listed in the reports nor is the importance of the area as a conservation resource contextualised. From Google Earth imagery, the area clearly has conservation value, with unusual hydrological features (river systems, extensive dambos, both along the rivers and free-standing) and untransformed forests, which extend in more or less untransformed condition over a large area, particularly northward where they reach the border of the north-western province, 50 km from the dam site.

Use of the Integrated Biodiversity Assessment Tool (IBAT) shows 22 potentially occurring Red Data species - 7 mammal, 9 bird, 2 fish and 4 plant species within a 50 km radius of the dam site. Two vulnerable Red Data cichlids are recorded by IBAT. No Key Biodiversity areas (KBAs) fall within this buffer.

Table xx: Red Data species recorded in IBAT within a 50 km radius of the Nabowa dam site

Species (common name)	**Scientific name**	**IUCN Red Data Status**
Mammals		
Black rhinoceros	*Diceros bicornis*	CR
White-backed vulture	*Gyps africanus*	CR
Hooded vulture	*Necrosyrtes monachus*	CR
African wild dog	*Lycaon pictus*	EN
Hippopotamus	*Hippopotamus amphibius*	VU
Leopard	*Panthera pardus*	VU
Temminck's pangolin	*Smutsia temminckii*	VU
Birds		
White-headed vulture	*Trigonoceps occipitalis*	CR

[7] *CITES Appendix II lists species that are not necessarily threatened with extinction but that may become so unless trade is controlled. International trade in specimens of Appendix-II species may be authorized by Government by granting export permits or re-export certificates. No import permit is necessary for these species under CITES. Permits or certificates should only be granted if the relevant authorities are satisfied that certain conditions are met, particularly that trade will not be detrimental to the survival of the species in the wild.*

Species (common name)	Scientific name	IUCN Red Data Status
Steppe eagle	*Aquila nipalensis*	EN
Grey crowned crane	*Balearica regulorum*	EN
Lappet-faced vulture	*Torgos tracheliotos*	EN
Tawny eagle	*Aquila rapax*	VU
Southern ground-hornbill	*Bucorvus leadbeateri*	VU
Wattled crane	*Bugeranus carunculatus*	VU
Martial eagle	*Polemaetus bellicosus*	VU
Secretarybird	*Sagittarius serpentarius*	VU
Fish		
Threespot tilapia	*Oreochromis andersonii*	VU
	Oreochromis macrochir	VU
Plants		
	Nymphoides tenuissima	EN
	Inversodicraea cristata	VU
	Rotala fontinalis	VU
	Rotala smithii	VU

8.6.1.4 Socio-economic environment

The dam site falls within Mangango constituency in Mangango ward, which has an estimated population of 5,279 (consisting of 48 per cent women and 52 per cent men) with 1,006 households. The area falls under Chief Mwene Mutondo's area.

The dam is surrounded by settlements of individual families constituting villages. The major villages around the dam include Iyuvwenu, Makanda, Lubinda, Katongo, Mutambwe and others. People practice mixed farming, with cattle rearing, crop production and timber logging the most important economic activities. Cultivation is concentrated along the rivers, where the dambos are valued for their increased moisture content. Communities also depend on natural forests resources for various ecosystem services (e.g., timber, firewood, medicine, bark, shade, wind breaking, soil erosion prevention, and honey production).

The villages and social services, except for the Mushilo Community School, are about 20 kms from the main road and communities do not have reliable means of transportation. Other social services such as

Nyango and Mangango secondary schools and Mangango Rural Health Centre are 20 kms away along the Kaoma-Lukulu road.

8.6.2 Non-compliance issues and risks

8.6.2.1 Dam safety (structural) risks

The main structural safety concerns are described in Table 8-46. These are summarised from UNOP (2019).

Table 8-46. Dam safety compliance status and risks (Nabowa Dam).

Code	Aspect	Concern/non-compliance	Risk
Construction Remediation Phase			
SFF-1	Structural safety	Embankments slopes too steep – not built to the design standard of 1V:3H U/S and 1V/2H D/S.	Erosion hazard and embankment stability - downstream community safety.
SFF-2		Seepage and tension cracks on the embankment. The right bank berm material may be dispersive.	Erosion hazard and embankment stability - downstream community safety.
SFF-3	Structural safety	Spillway capacity unknown. Spillway not built according to the design drawings.	Uncertain capacity to accommodate design flood – downstream community safety.
SFF-4	Structural safety	Spillway gabion basket drops inadequately tied into the embankment and will be bypassed by flow. Baskets also not level which will result in uneven distribution of flow.	Spillway failure risk – downstream community safety.

8.6.2.2 Dam health and safety (non-structural) risks

The main non-structural community health and safety concerns associated with the dam are described in Table 8-47.

Table 8-47. Dam health and safety compliance requirements and risks.

Code	Aspect	ESMP/ARAP requirement	Risk	Status on site
Construction Remediation Phase				
HSF-1	Community health and safety	Rehabilitation of borrow pits to avoid ponding of water creating of mosquito breeding grounds and risk of drowning or injury.	Increased malaria risks. Increased risk of children drowning or being injured.	Not done.
HSF-2	Community safety	Erection of safety hazard signs around the dam.	Serious or fatal incidents/drownings.	Not done.
HSF-3	Community health and safety	Provision of safe pedestrian access across the river.	Serious or fatal incidents/drownings.	Not done.
HSF-4	Community health	Construction of a borehole at Mushilo Community school or another central place for	Illness due to drinking dam water.	Not done.

Code	Aspect	ESMP/ARAP requirement	Risk	Status on site
		use by both the community and school.		
Operational Phase				
HSF-5	Community safety	Provide dam emergency safety talks/sensitisation and training to local community and dam committee.	Lack of knowledge about actions to take in emergencies.	Not done.
HSF-6	Community safety	Sensitization of community to avoid risk of spillway crossings.	Serious or fatal incidents/drownings.	Not done.
HSF-7	Community safety	Enforcement of dam safety and security measures around the dam.	Serious or fatal incidents/drownings.	Not done.
HSF-8	Community safety	Warning prior to opening of overflow pipes in the event of flooding.	Serious or fatal incidents/drownings.	Not done.
HSF-9	Community Safety	Safety sensitisation and awareness programmes of swimming risks particularly for children.	Serious or fatal incidents/drownings.	Not done.
HSF-10	Community health	Sensitization of community to impacts of drinking untreated water.	Increased prevalence of water borne diseases.	Not done.

8.6.2.3 Environmental risks

The Nabowa dam is situated in a wide flat-bottomed valley fringed with tall woodland. The Nabowa stream is located within the Upper Zambezi Floodplain, where several threatened fish species with restricted ranges are known to occur. The area to the north is scattered with dambos, which would supply water though the year. The dam is located within an area likely to support sensitive aquatic species.

In a broader context, the dam site is within a large area of remarkable habitat, which is mostly untransformed, consisting of deciduous and evergreen forest, particularly to the north (refer to Figure 7-23). Species richness and diversity apparently remain high, with large mammals still present, which is generally an indication of remoteness from human populations. Nevertheless, COWI (2018c) describes evidence of logging of rosewood (*Pterocarpus chrysothrix,* locally known as 'Mukula'), harvested by local people and trucked out on low beds. Mukula is now a protected species in Zambia due to extensive illegal harvesting for export to international destinations, particularly China (Phiri et al, 2015). In August 2019, it was added to CITES Appendix II, which restricts international trade in the species.

The WRDP EPBs (2016) and COWI (2018) provide an inadequate basis for understanding and managing the impacts of the project. A large increase in population farming in the wetlands downstream of the dam may cause direct impacts on the aquatic and wetland environment, but as importantly may increase illegal logging in the surrounding deciduous and evergreen forests and hunting pressures on wildlife. The reports provide no meaningful guidance about the interventions necessary to manage the impacts of increasing habitation on this well conserved ecosystem, referring only to "monitoring and mitigation for adaptive

management in order to quantify and evaluate accumulative environmental impacts after demobilisation".

The inadequacy of the instruments to manage direct and indirect operational impacts on aquatic and terrestrial ecosystems applies to a number of dam sites, and is discussed in more detail in Section 7.11 and Section 8.

Environmental management requirements for the dam (post-construction) in the COWI (2018) ESMP are aimed at responsible demobilisation and site restoration. These requirements are included in Table 8-48, summarised from Section 4.5 and Section 6.1.5 of the ESMP. In addition, COWI (2018c) raises concerns about the erosion damage in the downstream channel below the spillway, and the seepage of iron-enriched water through the base of the embankment.

Table 8-48 shows the project status to be non-compliant with most of the requirements, and remedial action is required in these cases. No structured process of demobilisation and restoration has been followed and the plan required by the ESMP has not been prepared or implemented. A plate gauge has not been installed, as required by the ESMP, and there is no plan in place to monitor aquatic ecological impacts of the dam.

Table 8-48. Environmental compliance status and risks (Nabowa Dam).

Code	Aspect	Safeguard requirement (ESMP/ARAP)	Risk	Compliance status
Construction Remediation Phase				
ENF-1	Demobilisation and Restoration	Prepare demobilisation and restoration plan.	Plan ensures structured management to minimise environmental risk of dam construction impacts.	No plan prepared or implemented.
ENF-2	Rehabilitation of work areas	Rehabilitate disturbed work areas and restore as close as possible to original contours. Restore topsoil from stockpiles. Replant with native plant seed mixes, where natural revegetation likely to be unsuccessful.	Erosion and sedimentation. Alien plant infestation. Loss of use of land.	Top-soiling and grassing done on the downstream embankment slope. Note that incorrect slope of the embankment may necessitate it being redone.
ENF-3	Rehabilitation of work areas	Install drainage structures to reduce uncontrolled runoff. Plant fast growing trees in erosion-prone areas.	Erosion and sedimentation. Loss of habitat.	Not done.
ENF-4	Rehabilitation of borrow pits	Make borrow area safe. Stabilise steep slopes. Backfill to acceptable landform. Prevent accumulation of water. Topsoil. Reseed naturally or with indigenous seed mixtures.	Erosion and sedimentation.	Not done. Extensive unrehabilitated borrow areas on the left bank.

Code	Aspect	Safeguard requirement (ESMP/ARAP)	Risk	Compliance status
ENF-5	Site clean-up and rehabilitation	Repair community roads and paths. Close selected bush paths by ripping and revegetating. Close contractor paths around dam.	Erosion and sedimentation. Alien plant invasion. Loss of use of land.	No repair done.
ENF-6	Site clean-up and rehabilitation	Remove housing, office units, other infrastructure. Hand over any useful units to the community/dam committee. Rehabilitate campsite.	Alien plant invasion. Loss of use of land.	Not done. Campsite abandoned but not rehabilitated.
ENF-7	Hazardous waste	Recycle used hydrocarbons where possible. Dispose off-site in accordance with regulatory requirements. Bioremediate oil-contaminated soil in a land farm or use in-situ remediation where the contamination plume is shallow.	Surface and groundwater pollution. Soil contamination.	Not done. No oil recycling took place during construction. Waste hydrocarbons may be present on site. Hydrocarbon-contaminated soils may also be present, particularly at the camp site refuelling bays and in other areas where drip trays and oil containment measures were not taken. No biological remediation of contaminated soils was done.
ENF-8	Non-hazardous construction waste	Dispose all rubble and other non-hazardous waste at a ZEMA/ local authority certified landfill. Level and rehabilitate heaps of soil.	Water and soil pollution.	No systematic process of site clean-up done.
ENF-9	Non-hazardous construction waste	Use overburden spoil to backfill the borrow pits.	Erosion and sedimentation.	No systematic process of site clean-up and rehabilitation done.
ENF-10	Sanitary waste	Dismantle and bury pit latrines after applying lime.	Groundwater pollution.	Not done.
ENF-11	Downstream ecological flow	Install gauge plates to measure water levels and water releases.	If not done, absence of data to evaluate downstream flow impacts.	Not done.
Operational Phase				
ENF-12	Environmental flow releases	No flow requirement specified.	Impact assessed as ecologically positive due to increased reliability of downstream flow.	No measurement of flow or evaluation of downstream impact.

Code	Aspect	Safeguard requirement (ESMP/ARAP)	Risk	Compliance status
ENF-13	Environmental flow releases	Designated flow gauge reader to record flow results.	If not done, inability to monitor and manage downstream ecological impacts (positive or negative)	Not done.
ENF-14	Performance monitoring	Undertake performance and impact monitoring as a basis for adaptive management.	If not done, failure to understand and manage long term impacts.	Not done.

Figure 8-26. Engineer's temporary site office (March 2018).

Figure 8-27. Borrow area at the spillway (March 2018).

8.6.2.4 Social risks

Compliance requirements for social impact management are included in Table 8-49, summarised from Section 4.5 and Section 6.1.5 of the ESMP (COWI, 2018c) and the Abbreviated Resettlement Action Plan (COWI, 2018i). Compliance relates to the compensation and reinstatement of the livelihoods of PAPs and capacity building of PAPs and institutions to benefit from the irrigation project.

Eight (8) PAPs have been affected by permanent land and crop losses. The 8 PAPs have received cash compensations for all their losses. The local leadership is organizing replacement land for the 8 PAPs. Three households own land on the downstream side where the irrigation canal has been constructed. All the PAPs will be allocated plots in the irrigation area.

Livelihood restoration planning has been completed, and compensation has been paid. Verification by the World Bank is pending. However, Table 8-49 shows that most of the community health and safety requirements to minimise dam risks and the community and institutional support requirements to maximise project benefits are still to be undertaken. Action is required in these cases.

Table 8-49. Social compliance status and risks (Nabowa Dam)

Code	Aspect	ESMP/ARAP requirement	Risk	Status on site
Construction Remediation Phase				

Code	Aspect	ESMP/ARAP requirement	Risk	Status on site
SCF-1	Community Irrigation Water Supply	Construction of irrigation water supply for downstream community.	Failure of project to meet its primary objective.	Irrigation system is complete.
SCF-2	Compensation and livelihood restoration	A resettlement action plan to be prepared to ensure compensation for the lost assets and income.	Failure to restore PAPs livelihoods.	Abbreviated Resettlement Action Plan (ARAP) prepared by COWI (2018). Eight (8) PAPs affected by permanent land loss due to dam inundation and infrastructure. ARAP approved by Zambian authorities and No Objection from World Bank. Compensation payments for lost crops made by government WB verification pending. No grievances logged in the GRM.
SCF-3	Compensation and livelihood restoration	Replacement land to be made available to affected PAPs.	Failure to restore PAP's livelihood.	All PAPs to be allocated land in the irrigation area.
Operational Phase				
SCF-4	Community development	Stocking of the dam with fish.	Failure to meet project objectives of improved livelihoods for local communities.	Not done. To be assessed for sustainability.
SCF-5	Community safety	Farmers to be educated about safe methods of chemical handling and control.	Injury or illness.	Not done.
SCF-6	Institutional capacity building	Institute a strong committee or cooperative management structure to ensure a functional irrigation scheme. Devise clear rules and regulations to be complied with by members of the scheme. Foster organised livelihood activities including irrigation and fishing. Public institutions to support irrigation, Sensitise local leadership on the operation of the irrigation scheme.	Lack of capacity to benefit fully from irrigation water supply.	Not done.
SCF-7	Training of beneficiaries	Assist PAPs with training to improve their knowledge of irrigation agriculture, high value crops to cultivate and other enterprises besides agriculture that could assist in income generation.	Lack of capacity to benefit fully from irrigation water supply.	Not done.

Code	Aspect	ESMP/ARAP requirement	Risk	Status on site
SCF-8	Livelihood restoration	Monitoring of livelihood restoration/community development (4 times after irrigation system established).	Inability to evaluate success of programme to meet development goals and objectives.	Future requirement – not started yet.
SCA-9	Community health and safety	Update of the generic Emergency Response Plan to be dam-specific	Inability to effectively manage emergencies caused by the dam	Not done

Figure 8-28. Existing gardens downstream of Nabowa dam (March 2018).

8.6.3 Proposed actions

8.6.3.1 Actions to address dam safety risks (structural)

Proposed remedial actions for identified dam safety risks and non-compliances during construction are described in Table 8-50.

Table 8-50. Actions to address structural dam non-compliances and risks (Nabowa Dam).

Code	Aspect	Risk	Action required
SFF-1	Structural safety	Embankment slopes too steep.	• Re-slope embankments to design requirement of 1V:3H U/S and 1V/2H D/S. Reinstate topsoil and grass on D/S embankment and rock cladding on U/S embankment
SFF-2	Structural safety	Seepage and tension cracks on the right bank. The right bank berm material may be dispersive.	• Monitor seepage and tension cracks. • Install rock toe drains. • Excavate and replace as much dispersive material as possible.
SFF-3	Structural safety	Spillway capacity unknown. Spillway not built according to the design drawings.	• Confirm spillway meets design flood requirements.

Code	Aspect	Risk	Action required
SFF-4	Structural safety	Gabion baskets poorly tied into embankment and not horizontal.	• Check (and if necessary) re-design gabions. Reconstruct them to be fit for purpose.

8.6.3.2 Actions to address dam health and safety risks (non-structural)

Proposed remedial actions for identified dam health and safety risks and non-compliances are described in Table 8-51.

Table 8-51. Actions to address non-structural dam non-compliances and risks (Nabowa Dam).

Code	Aspect	Risk	Action required
Construction Remediation Phase			
HSF-1	Rehabilitation of borrow pits	Failure to rehabilitate causing increased malaria risks and increased risk of children drowning or injury.	• Comply with ENF-4, ENF-9 action requirements. • Ensure borrow pits free draining to avoid malarial breeding sites and minimise drowning risks.
HSF-2	Community health and safety	Drowning due to absence of warning signs.	• Design and erect appropriate hazard notices. • Sensitise communities to risks.
HSF-3	Access across the river	Lack of a bridge/crossing with increased risk of community injury and drowning.	• Construct pedestrian access across the river downstream of the dam (or in location best suited for convenient community access).
SCF-4	Water Supply	Illness due to drinking dam water.	• Construct a borehole at the Mushilo Community school or another central place for use by both the community and school.
Operational Phase			
HSF-5, HSF-6, HSF-7, HSF-8, HSF-9, HSF-10	Community health and safety	Injury or illness caused by lack of knowledge of dam risks.	• Develop a training programme for communities who live around the dam. • Train communities in accordance with the plan (including drinking water and water borne diseases, avoidance of dangerous spillway crossings, swimming risks, emergency preparedness in floods or dam failure).

8.6.3.3 Actions to address environmental non-compliances and risks

Proposed remedial actions for identified environmental risks and non-compliances are described in Table 8-52. Several non-compliances are combined into a single action in some instances. All actions described are to be included in the ESMP to be developed for the construction remediation phase and operational phase of the dams.

Table 8-52. Actions to address environmental non-compliances and risks (Nabowa Dam).

Code	Aspect	Risk	Action required
Construction Remediation Phase			
ENF-1	Demobilisation and Restoration Plan	Plan ensures structured management to minimise environmental risk of dam construction impacts.	• Prepare plan as part of the requirements of the ESMP.
ENF-2, ENF-3,	Rehabilitation of disturbed works areas	Erosion and sedimentation.	• Conduct detailed site inspections. • Define and map disturbed areas where rehabilitation/erosion control is required. • Develop method statements for each area, including problem statement, method of rehabilitation, resources needed and responsibilities (See ENF-1 above). • Implement rehabilitation and monitor effectiveness over three years.
ENF-5	Rehabilitation of community roads	Loss of community access.	• Rehabilitate community roads used by the contractor. • Close and rehabilitate any informal bush tracks made by the contractor.
ENF-4; ENF-9	Rehabilitation of borrow pits	Erosion and sedimentation. Weed infestation. Entrapment risk to wild animals.	• Conduct detailed site inspections. • Prepare detailed rehabilitation plan for each borrow area. Define methodologies for top-soiling and reseeding with natural grass seed mixtures. • Reduce slopes and backfill with inert spoil, where necessary/possible, to create safe conditions that avoid entrapment of animals and accumulation of water. • Monitor effectiveness of rehabilitation over three years.
ENF-6, ENF-8	Waste, construction infrastructure and rubble	Weed infestation, loss of productive land.	• Conduct detailed site inspections. • Prepare snag list defining each area where remedial action is necessary, and the required actions. • Waste/rubble to be removed to government-approved disposal sites.
ENF-10	Sanitary waste	Groundwater and surface water pollution.	• Identify and map location of all pit latrines. • Define methods to ensure safe capping with no pollution risk.
ENF-7	Hazardous waste, hydrocarbon-polluted soils	Groundwater and surface water pollution.	• Conduct detailed site inspections. • Prepare snag list defining each area where remedial action is necessary, including location of waste oil drums and/or other hazardous chemicals, location of oil-contaminated soils and the required actions. • Define methods for soil remediation. • Implement and monitor recovery. • Hazardous waste to be removed to a government-approved hazardous waste disposal site.
ENF-11	Environmental flow releases	Inability to monitor and assess downstream	• Design and install gauge plates.

Code	Aspect	Risk	Action required
		ecological effects of dam operation.	• Undertake assessment of downstream aquatic and riparian conditions as a basis for flow requirements and monitoring to be imposed on the operational phase of the dam. • Undertake assessment of the ecological effect of stocking the dam with fish (particularly *O. nilotica*)
Operational Phase			
ENF-12, ENF-13, ENF-14	Environmental flow releases	Inability to monitor and assess downstream ecological effects of dam operation	• Ensure adherence to the prescribed environmental flow and other management requirements. • Develop O&M plan to include ecological flow requirements. • Appoint and train flow reader. • Maintain flow records. • Monitor dam impact on aquatic environment (monitoring plan to be determined in the assessment phase above).

8.6.3.4 Actions to address social non-compliances and risks

Proposed remedial actions for identified social risks and non-compliances are described in Table 8-53. Several non-compliances are combined into a single action in some instances. All actions described are to be included in the ESMP to be developed for remediation of the site in the construction remediation phase and the operational phase of the dams.

Table 8-53. Actions to address social non-compliances/risks (Nabowa Dam).

Code	Aspect	Risk	Action required
Construction Remediation Phase			
SCF-1	Community irrigation water supply	Failure of project to meet its primary objective.	• No action. Irrigation system is complete.
SCF-3	Replacement land	Incomplete livelihood restoration.	• Finalise agreements with PAPs regarding replacement land.
Operational Phase			
SCF-4	Community development	Food security – failure to stock the dam with fish.	• Stock the dam with fish. To be assessed.
SCF-5	Community safety	Unsafe handling of pesticides.	• Develop a training programme for PAPs in the irrigation area concerning safe use of pesticides using the integrated pest management programme (IPM) prepared for the project.
SCF-6	Community development	Lack of capacity/training to benefit fully from irrigation water supply.	• Strengthen the dam or irrigation committee to ensure cooperation and spread of benefits to a wider section of the community.
SCF-7	Community Development	Lack of capacity to benefit fully from irrigation water supply.	• Train PAPs in irrigation agricultural techniques, knowledge of the types of high value crops to cultivate and other enterprises besides agriculture that could assist in income generation.

Code	Aspect	Risk	Action required
SCF-8	Livelihood restoration	Inability to evaluate success of programme to meet development goals and objectives.	• Develop and implement a monitoring and evaluation programme based on the requirements of the ARAP.
SCF-9	Community health and safety	Lack of capacity to respond effectively to emergencies related to the dam	• Update Emergency Response Plan

8.7 Dam 7: Kawiko

8.7.1 Characteristics of the dam and surrounding area

8.7.1.1 Dam and catchment characteristics

Kawiko dam is located on the Kakula stream about 10 km north west of the Mwinilunga township along the T5 between Miniwilunga – Ikel'enge. The location of the dam is shown in Figure 8-29. The main features of the dam and catchment are described in Table 8-54. The project involves an increase in storage capacity of this existing dam, which was built some years ago, by raising the spillway by 0,7 m, and constructing an intake chamber, a valve chamber and pillars for the 200 mm pipeline to supply water for the irrigation canals.

Table 8-54. Main features of Kawiko Dam.

DAM # 7: KAWICO	Features
Location of the dam	
Province	Zambian North-western Province
District	Mwinilunga District
Location of the dam (D.ddddd°)	S11.65162° E24.39142°
Name of the river/stream on which the dam was built	Mudyanyama River (drains to West Lunga River) in Kakula Catchment.
Dam characteristics and dimensions	
Dam type/material	Zoned earth fill embankment
Size classification (COWI, 2019)	Small (based on ICOLD)
Hazard Classification	
- Potential loss of lives	Significant
- Potential economic loss	Low
- Potential adverse impact on resource economy	Low
- Maximum hazard classification	Significant
Year dam was constructed	2007/2008
Contractor name	Savenda
Wall height	8 m
Wall length	156 m
Volume storage	1.08 million m^3
Reservoir surface area (at FSL)	2.4 ha
Reservoir catchment area	5.36 km^2
Maximum depth at FSL	8.0 m
Spillway (main)	Reinforced concrete overflow wall in open channel
Spillway (emergency)	Nil
Throwback	0.5 km
1:50 year design flood	19.8 m^3
1:100 year flood	23.5 m^3
Safety Evaluation Flood (SEF)	27.2 m^3
Other	

Foundation	Kundelungu undifferentiated: may include some Mine 'Series' in the north-west. Predominantly shales, siltstones, sandstones and mixtites
Foundation treatment	Core cut-off trench
Drainage system	Sand blanket drain with rock toe
Outlet works and scour	Original Dam: Concrete encased 200mm ND mild steel low flow pipe with inlet chamber with trash grid at the upstream end. Flow is controlled at the downstream end of the pipe via a 200 mm ND gate valve in a valve chamber. Rehabilitation: 200 mm ND mild steel irrigation pipe installed in spillway overflow wall and on pedestals in spillway channel to irrigation canal. Downstream control gate valve.
Monitoring instruments	None

Figure 8-29. Satellite view of the Kawiko Dam and surrounding area (imagery date July 2019).

Figure 8-30. Kawiko Dam – detail of the dam wall (imagery date September 2017).

Dam crest remains unchanged from the old dam (November 2019).

Raised spillway with pedestrian bridge (November 2019).

Valve chamber located in downstream wetland (November 2019).

Irrigation channel (November 2019).

Completed raised spillway and pedestrian bridge (April 2018).

Figure 8-31. Kawiko Dam after construction.

8.7.1.2 Physical environment

North Western Province lies in the Congo basin which receives equatorial rainfall. Perennial water resources are numerous. The dam is located on the Kakula stream, which in turn is a tributary of the Mudanyama River, the Lunga river and the Kabompa River, which finally flows into the Zambesi River,

about 60 km from the project area. Notably, the Kakula is fed by a number of springs lying less than a kilometre from the throwback of the dam.

Terrain is moderately undulating between around 1,350 m to 1,450 masl. Soils in and around the dam area are grey sandy clays, overlying a layer of dark brown clay with a small percentage of gravel, followed by laterite. The upstream and downstream dambo areas are characterised by heavy alluvial clay soils (see Figure 8-32).

Climate is a moderate savanna type, characterised by three seasons: rainy cool and hot/dry. Rainfall ranges between 1,300 mm and 1,500 mm per annum.

8.7.1.3 Biological environment

Mwinilunga lies in the eco region of Central Zambezian miombo woodlands, with dominant trees being of the Brachystegia, and Julbernardia species. Typical miombo woodlands occur around the dam site. The woodlands have been exposed to some human interference and are about 30% transformed. The basal storey consists of good grass cover with abundant emerging woodland saplings. Important tree species found are Mubanga (*Pericopsis angolensis*) and Mukwa (*Pterocarpus angolensis)*. These species are widely used for timber (construction, carving, floors furniture), charcoal, firewood, poles, fence poles and medicine (leaves, bark, roots). Populations of Mukwa are considered to be declining.

Figure 8-32. Springs forming the headwaters of the Kakula stream.

Use of the Integrated Biodiversity Assessment Tool (IBAT) shows 26 potentially occurring Red Data species - 6 mammal, 10 bird, 2 fish and 8 plant species within a 50 km radius of the dam site. Two vulnerable Red Data tilapia species are recorded by IBAT. No Key Biodiversity Areas (KBAs) fall within this buffer. Occurrence of these species in the vicinity of the dam site is possible due to the proximity of the Luakera River Forest Reserve, which is 275 km^2 in area situated within 5km north of the dam site. Three Key Biodiversity Areas occur within the 50 km buffer – Chitunta Plain (<25 km), Hillwood (<50 km), and the Source of the Zambesi (<50km).

Table xx: Red Data species recorded in IBAT within a 50 km radius of the Kawiko dam

Species (common name)	**Scientific name**	**IUCN Red Data Status**
Mammals		

Species (common name)	Scientific name	IUCN Red Data Status
Black rhinoceros	*Diceros bicornis*	CR
Ansell's shrew	*Crocidura ansellorum*	EN
White-bellied pangolin	*Phataginus tricuspis*	EN
African elephant	*Loxodonta africana*	VU
Lion	*Panthera leo*	VU
Leopard	*Panthera pardus*	VU
Birds		
White-backed vulture	*Gyps africanus*	CR
Hooded vulture	*Necrosyrtes monachus*	CR
White-headed vulture	*Trigonoceps occipitalis*	CR
Steppe eagle	*Aquila nipalensis*	EN
Grey crowned crane	*Balearica regulorum*	EN
Tawny eagle	*Aquila rapax*	VU
Southern ground-hornbill	*Bucorvus leadbeateri*	VU
Wattled crane	*Bugeranus carunculatus*	VU
Martial eagle	*Polemactus bellicosus*	VU
Secretarybird	*Sagittarius serpentarius*	VU
Fish		
Threespot tilapia	*Oreochromis andersonii*	VU
	Oreochromis macrochir	VU
Plants		
	Drosera katangensis	CR
	Rotala robynsiana	CR
	Genlisea angolensis	EN
	Nymphoides tenuissima	EN
	Psilotrichum axilliflorum	EN
	Inversodicraea cristata	VU
	Rotala fontinalis	VU
	Rotala smithii	VU

8.7.1.4 Socio-economic environment

The project area falls in Mwinilunga west constituency in Kawiko ward. The ward has a total of 3,162 people (50.1% males, 49.9% females) with 600 households. The ward is one of the least populated in the constituency. The project area falls within the northwest agro ecological zone. This zone is characterised by high rainfall and dense forests. Forest products are important sources of food and income, particularly game, timber and honey. The area was once a leading producer of pineapples in the country, but production has declined since the closure of the processing plant in the late 1990's. At present, the major source of income is from the sale of agricultural products such as maize, cassava and sweet potatoes. The zone is mostly rural and is sparsely populated.

The project beneficiaries are not particularly keen on irrigation activities as evidenced by the limited number of gardens within the irrigation area despite the availability of water from the dam and a new irrigation system developed by the project. They are mainly interested in having their dam stocked with fish.

The area is served by the Nsawa Kunda secondary school (grades 1–10). Health services are provided by the Kawiko health centre and the secondary level Mwinilunga district hospital. The area is not on the national grid although it is only ten kilometres away. Other services from public institutions are rarely provided. In particular, the agricultural extension assistant rarely provides support due to lack of transport and accommodation in the area.

No additional resettlement has been required as a result of the raising of the dam spillway. The main social concern expressed in the ESMP is that the potential benefits of the previous dam were not realised by the local community, due to lack of experience with irrigation, and the present project is likely to suffer the same fate unless efforts are made to capacitate the beneficiaries.

8.7.2 Non-compliance issues and risks

8.7.2.1 Dam safety (structural) risks

The main structural safety concerns are described in Table 8-55. COWI (2018) indicates that the design provided for raising of the embankment by 1 metre, but this has not been done.

Table 8-55. Dam safety compliance status and risks (Kawiko Dam).

Code	Aspect	Concern/non-compliance	Risk
Construction Remediation Phase			
SFG-1	Structural safety	New spillway reduces freeboard on wall to less than 800 mm.	Dam failure through overtopping of the wall - downstream community safety risk.
SFG-2	Structural safety	Leakage around the spillway left flank.	Dam failure through piping around the edge of the spillway – community safety risk.

8.7.2.2 Dam health and safety (non-structural) risks

The main structural safety concerns are described in Table 8-56.

Table 8-56. Dam health and safety compliance requirements and risks.

Code	Aspect	ESMP/ARAP requirement	Risk	Status on site
Construction Remediation Phase				

Code	Aspect	ESMP/ARAP requirement	Risk	Status on site
HSG-1	Community health and safety	Rehabilitation of borrow pits to avoid ponding of water creating of mosquito breeding grounds and risk of drowning or injury.	Increased malaria risks. Increased risk of children drowning.	Not done.
HSG-2	Community safety	Erection of safety hazard signs around the dam	Serious or fatal incidents/drownings.	Not done.
Operational Phase				
HSG-3	Community safety	Provide dam emergency safety talks/sensitisation and training to local community and dam committee.	Lack of knowledge about actions to take in emergencies.	Not done.
HSG-4	Community safety	Sensitization of community to avoid risk of spillway crossings.	Serious or fatal incidents/drownings.	Not done.
HSG-5	Community safety	Enforcement of dam safety and security measures around the dam	Serious or fatal incidents/drownings.	Not done.
HSG-6	Community safety	Warning prior to opening of overflow pipes in the event of flooding.	Serious or fatal incidents/drownings.	Not done.
HSG-7	Community Safety	Safety sensitisation and awareness programmes of swimming risks particularly for children.	Serious or fatal incidents/drownings.	Not done.
HSG-8	Community health	Sensitisation of community to impacts of drinking untreated water.	Increased prevalence of water borne diseases.	Not done.

8.7.2.3 Environmental risks

The main ecological/hydrological concern expressed by COWI (2018c) in the ESMP is the possible effect of the back-flooding caused by raising the spillway on the springs upstream of the dam. Should flooding of the springs and sedimentation in the dam block them, this could, in the consultant's view, critically impact on the source of water for the dam. According to the Department of Water Resource Development Office, the area upstream of the dam immediately above the springs is a forest protected area, designated as a means of protecting the catchment of the springs (COWI, 2018). Neither WRDP EPBs (2016) nor COWI (2018c) define the boundaries of the forested area, but IBAT shows it to be the Luakera River Forest Reserve, roughly 275 km^2 in extent, situated west of the T5 between Mwinilunga and Ikatu. Most of it remains forested, in untransformed condition (refer to Figure 7-29).

There is inadequate knowledge of site conditions to determine the significance of the dam's impact on the springs, nor can the dam's downstream impact on the aquatic and wetland ecosystem as a whole be determined. The ESMP (COWI, 2018c) provides no guidance about the interventions necessary to manage the impacts of flow regulation on the downstream wetland system, referring only to "monitoring and mitigation for adaptive management in order to quantify and evaluate accumulative environmental impacts after demobilisation". Since this issue applies to all of the dams it is discussed in more detail in Section 7.11 'Compliance with World Bank Policies'.

There is also no recognition of the conservation value of the Luakera River Forest Reserve which borders on the northern side of the dam and which could be indirectly impacted by increasing populations attracted to the irrigation opportunities provided by the dam. It is likely that species richness and diversity in these forests remains high, and many of the Red Data species listed by IBAT may be present.

Compliance requirements for demobilisation of the contractor and restoration of the Kawiko dam site are included in Table 8-57, summarised from Section 6.1.3 and Section 7 of the ESMP (COWI, 2018c). Minor environmental issues are associated with the completed construction phase, which included only construction of the heightened spillway, pedestrian bridge and irrigation infrastructure/canal, but there are legacy issues from past borrow for construction of the dam.

Table 8-57. Environmental compliance status and risks (Kawiko Dam)

Code	Aspect	Safeguard requirement (ESMP)	Risk	Compliance status
Construction Remediation Phase				
ENG-1	Demobilisation and restoration	Prepare demobilisation and restoration plan.	Plan ensures structured management to minimise environmental risk of dam construction impacts.	No plan prepared or implemented.
ENG-2	Rehabilitation of work areas	Rehabilitate disturbed work areas and restore as close as possible to original contours. Restore topsoil from stockpiles. Replant with native plant seed mixes, where natural revegetation likely to be unsuccessful.	Erosion and sedimentation. Alien plant infestation. Loss of use of land.	Not done.
ENG-3	Rehabilitation of borrow pits	Landscape the borrow pit(s) along the access route to restore them near to their original state. Planting of grass and trees (two laterite borrow areas identified in COWI, 2018b).	Erosion and sedimentation.	Not done.
ENG-4	Site clean-up and rehabilitation	Close access road into the reservoir to prevent further siltation of the dam.	Erosion and sedimentation. Alien plant invasion. Loss of use of land.	Road into reservoir not closed.
ENG-5	Site clean-up and rehabilitation	Remove housing, office units, other infrastructure. Hand over any useful units to the community/dam committee. Rehabilitate campsite.	Alien plant invasion. Loss of use of land.	Information not available.
ENG-6	Hazardous waste	Recycle used hydrocarbons where possible. Dispose off-site in accordance with	Surface and groundwater pollution. Soil contamination.	Some waste hydrocarbons and hydrocarbon-contaminated soils may be present. No

Code	Aspect	Safeguard requirement (ESMP)	Risk	Compliance status
		regulatory requirements. Bioremediate oil-contaminated soil in a land farm or use in-situ remediation where the contamination plume is shallow.		structured snag list prepared or implemented.
ENG-7	Non-hazardous construction waste	Dispose all rubble and other non-hazardous waste at a ZEMA/ local authority certified landfill. Level and rehabilitate heaps of soil.	Water and soil pollution.	No systematic process of site clean-up done.
ENG-8	Sanitary waste	Dismantle and bury pit latrines after applying lime.	Groundwater pollution.	Not done.
ENG-9	Downstream ecological flow	Install gauge plates to measure water levels and water releases.	If not done, absence of data to evaluate downstream flow impacts.	Not done.
ENG-10	Flooding of springs	Investigate risk of flooding the springs when the dam embankment/spillway is heightened,	Loss of functionality and perennial water supply into the dam	Not done.
Operational Phase				
ENG-11	Environmental flow releases	No flow requirement specified.	Impact assessed as ecologically positive due to increased reliability of downstream flow.	No measurement of flow or evaluation of downstream impact.
ENG-12	Environmental flow releases	Designated flow gauge reader to record flow results.	If not done, inability to monitor and manage downstream ecological impacts (positive or negative).	Not done.
ENG-13	Performance monitoring	Undertake performance and impact monitoring as a basis for adaptive management.	If not done, failure to understand and manage long term impacts.	Not done.

8.7.2.4 Social risks

Compliance requirements for social impact management are included in Table 8-58, summarised from Section 7 of the ESMP (COWI, 2018). No PAPs were directly affected during the contract for the raising of the spillway and construction of the pedestrian bridge and irrigation canals. Social risks are mainly related to lack of capacity of local communities to benefit fully from the irrigation system.

Table 8-58. Social compliance status and risks (Kawiko Dam).

Code	Aspect	ESMP/ARAP requirement	Risk	Status on site
Construction Remediation Phase				
SCG-1	Community irrigation water supply	Construction of irrigation water supply for downstream community.	Failure of project to meet its primary objective.	The irrigation system is existing.
Operational Phase				
SCG-2	Community development	Stocking of the dam with fish.	Failure to meet project objectives of improved livelihoods for local communities.	Not done. To be assessed.
SCG-3	Community safety	Farmers to be educated about safe methods of chemical handling and control.	Injury or illness.	Not done.
SCG-4	Training of beneficiaries	Assist PAPs with training to improve their knowledge of irrigation agriculture, high value crops to cultivate and other enterprises besides agriculture that could assist in income generation.	Lack of capacity to benefit fully from irrigation water supply.	Not done.
SCG -5	Institutional capacity building	Institute a strong committee or cooperative management structure to ensure a functional irrigation scheme. Devise clear rules and regulations to be complied with by members of the scheme. Foster organized livelihood activities including irrigation and fishing. Public institutions to support irrigation, Sensitize local leadership on the operation of the irrigation scheme.	Lack of capacity to benefit fully from irrigation water supply.	Not done.
SCG-6	Livelihood restoration	Monitoring of livelihood restoration/community development.	Inability to evaluate success of programme to meet development goals and objectives.	Future action.
SCG-11	Community health and safety	Update of the generic Emergency Response Plan to be dam-specific	Inability to effectively manage emergencies caused by the dam	Not done

8.7.3 Proposed actions

8.7.3.1 Actions to address dam safety risks (structural)

Proposed remedial actions for identified dam safety risks and non-compliances during construction are described in Table 8-59.

Table 8-59. Actions to address structural dam non-compliances and risks (Kawiko Dam).

Code	Aspect	Risk	Action required
Construction Remediation Phase			
SFG-1	Dam failure	Dam embankment has only 800 mm freeboard after raising the spillway by 0,7 m. Dam wall now at risk of overtopping.	• Repair defects of previous construction works (refer to COWI, 2018). • Either increase the height of the dam wall or remove the raised concrete spillway (refer to UNOP, 2019).

8.7.3.2 Actions to address dam health and safety risks (non-structural)

Proposed remedial actions for identified dam health and safety risks and non-compliances are described in Table 8-60.

Table 8-60. Actions to address non-structural dam non-compliances and risks (Kawiko Dam).

Code	Aspect	Risk	Action required
Construction Remediation Phase			
HSG-1	Rehabilitation of borrow pits	Failure to rehabilitate causing increased malaria risks and increased risk of children drowning or injury.	• Comply with ENG-4, ENG-9 action requirements. • Ensure borrow pits free draining to avoid malarial breeding sites and minimise drowning risks.
HSG-2	Community health and safety	Drowning due to absence of warning signs.	• Design and erect appropriate hazard notices • Sensitise communities to risks.
Operational Phase			
HSG-3, HSG-4, HSG-5, HSG-6, HSG7, HSG-8	Community health and safety	Injury or illness caused by lack of knowledge of dam risks.	• Develop a training programme for communities who live around the dam. • Train communities in accordance with the plan (including drinking water and water borne diseases, avoidance of dangerous spillway crossings, swimming risks, emergency preparedness in floods or dam failure).

8.7.3.3 Actions to address environmental non-compliances and risks

Proposed remedial actions for identified environmental risks and non-compliances are described in Table 8-61. Several non-compliances are combined into a single action in some instances. All actions described are to be included in the ESMP to be developed for the construction remediation phase and operational phase of the dams.

Table 8-61. Actions to address environmental non-compliances and risks (Kawiko Dam).

Code	Aspect	Risk	Action required
Construction Remediation Phase			
ENG-1	Demobilisation and restoration plan	Plan ensures structured management to minimise environmental risk of dam construction impacts.	• Prepare plan as part of the requirements of the ESMP to be prepared for the dam.
ENG-2	Rehabilitation of disturbed works areas	Erosion and sedimentation.	• Conduct detailed site inspections. • Define and map disturbed areas where rehabilitation/erosion control is required. • Develop method statements for each area, including problem statement, method of rehabilitation, resources needed and responsibilities (See ENG-1 above). • Implement rehabilitation and monitor effectiveness over three years.
ENG-3	Rehabilitation of borrow pits	Erosion and sedimentation. Weed infestation. Entrapment risk to wild animals	• Conduct detailed site inspections. • Prepare detailed rehabilitation plan for each borrow area. Define methodologies for top-soiling and reseeding with natural grass seed mixtures. • Rehabilitate and give closure to the borrow pit • Reduce slopes and backfill with inert spoil, where necessary/possible, to create safe conditions that avoid entrapment of animals and accumulation of water. • Restore vegetation • Monitor effectiveness of rehabilitation over three years.
ENG-5, ENG-7	Waste, construction infrastructure and rubble	Weed infestation, loss of productive land	• Conduct detailed site inspections. • Prepare snag list defining each area where remedial action is necessary, and the required actions. • Waste/rubble to be removed to government-approved disposal sites.
ENG-8	Sanitary waste	Groundwater and surface water pollution	• Identify and map location of all pit latrines. • Define methods to ensure safe capping with no pollution risk.
ENG-6	Hazardous waste, hydrocarbon-polluted soils	Groundwater and surface water pollution.	• Conduct detailed site inspections. • Prepare snag list defining each area where remedial action is necessary, including location of waste oil drums and/or other hazardous chemicals, location of oil-contaminated soils and the required actions.

Code	Aspect	Risk	Action required
			• Define methods for soil remediation. • Implement and monitor recovery. • Hazardous waste to be removed to a government-approved hazardous waste disposal site.
ENG-9	Environmental flow releases	Inability to monitor and assess downstream ecological effects of dam operation.	• Design and install gauge plates. • Undertake assessment of downstream aquatic and riparian conditions as a basis for flow requirements and monitoring to be imposed on the operational phase of the dam. • Undertake assessment of the ecological effect of stocking the dam with fish (particularly *O. nilotica*)
ENG-10	Protection of upstream springs	Flooding of springs and loss of functionality.	• Undertake geohydrological assessment to determine impact of flooding of springs, if the raising of the wall results in this. • Restore areas to increase water protection
ENG11	Biodiversity threats	Increase deforestation and poaching	• Develop training to bring awareness on river basin and the importance of forest for water resources protection and role of the Luakera River Forest Reserve • Coordinate restoration actions with the District environmental officer
Operational Phase			
ENG-11, ENG-12. ENG-13	Environmental flow releases	Inability to monitor and assess downstream ecological effects of dam operation.	• Ensure adherence to the prescribed environmental flow and other management requirements. • Develop O&M plan to include ecological flow requirements. • Appoint and train flow reader. • Maintain flow records. • Monitor dam impact on aquatic environment (monitoring plan to be determined in the assessment phase above).

8.7.3.4 Actions to address social non-compliances and risks

Proposed remedial actions for identified social risks and non-compliances are described in Table 8-62. Several non-compliances are combined into a single action in some instances. All actions described are to be included in the ESMP to be developed for remediation of the site in the construction remediation phase and the operational phase of the dams.

Table 8-62. Actions to address social non-compliances/risks (Kawiko Dam).

Code	Aspect	Risk	Action required
Construction Remediation Phase			
SCG-1	Community irrigation water supply	Construction of irrigation water supply for downstream community.	• Irrigation system – existing.
Operational Phase			

Code	Aspect	Risk	Action required
Construction Remediation Phase			
SCG-2	Community development	Food security – failure to stock the dam with fish.	• Stock the dam with fish. Fish is in place because it was only rehabilitated under WRDP.
SCG-3	Community safety	Unsafe handling of pesticides.	• Develop a training programme for the community in the irrigation area concerning safe use of pesticides using the integrated pest management programme (IPM) prepared for the project.
SCG-4	Community development	Lack of capacity/training to benefit fully from irrigation water supply.	• Strengthen the dam or irrigation committee to ensure cooperation and spread of benefits to a wider section of the community.
SCG-5	Community Development	Lack of capacity to benefit fully from irrigation water supply.	• Train the community in irrigation agricultural techniques, knowledge of the types of high value crops to cultivate and other enterprises besides agriculture that could assist in income generation.
SCG-6	Livelihood restoration	Inability to evaluate success of programme to meet development goals and objectives.	• Develop and implement a monitoring and evaluation programme based on the requirements of the ARAP.

8.8 Dam 8: Ndondi

8.8.1 Characteristics of the dam and surrounding area

8.8.1.1 Dam and catchment characteristics

Ndondi is an existing earth fill dam first built in 2008. The 2016 works have included constructed on the Ndondi site is about 36 km from the Zimba urban centre. The main purpose of the dam is for aquaculture, irrigation and stock watering.

The construction works, started in 2016, has included raising the embankment for additional storage and freeboard by 2m, raising the spillway by 1m, constructing the spillway training wall and constructing two new drop structures (COWI, 2018a).

The location of the dam and its main characteristics are described in Table 8-63.

Table 8-63. Location and main characteristics of Ndondi dam.

DAM # 8: NDONDI	Features
Location of the dam	
Province	Zambian Southern Province
District	Zimba District
Location of the dam (D.ddddd°)	S16.73486° E27.38571°
Name of the river/stream on which the dam was built	Ndondi River (drains to Kalomo River)
Dam characteristics and dimensions	
Dam type/material	Zoned earth fill embankment
Size classification (COWI, 2019aa)	Small (based on ICOLD)
Hazard Classification	
- Potential loss of lives	Significant
- Potential economic loss	Low
- Potential adverse impact on resource economy	Low
- Maximum hazard classification	Significant
Year dam was constructed	First constructed in 2008. Additional work in 2016
Contractor name	Savenda
Wall height	8.5 m
Wall length	300 m
Volume storage	1 million m^3
Reservoir surface area (at FSL)	36 ha
Reservoir catchment area	7.86 km^2
Maximum depth at FSL	7 m
Spillway (main)	Open channel at end of left flank
Spillway (emergency)	Nil
Throwback	1,785 m
1:50 year design flood	40.9 m^3/s
1:100 year flood	48.7 m^3/s
Safety Evaluation Flood (SEF)	57.0 m^3/s
Other	
Foundation	Pre-Katanga undifferentiated, predominantly schist, gneiss and granulite
Foundation treatment	Core cut-off trench
Drainage System	Sand blanket drain with rock toe
Outlet works and scour	Concrete encased 300 mm ND mild steel pipe 8mm thick with inlet chamber with trash grid at the upstream end
Monitoring instruments	None

Figure 8-33. Satellite view of Ndondi dam and surrounding area (imagery date January 2018).

Figure 8-34. Ndondi dam – detail of the wall (imagery date Aug 2018).

8.8.1.2 Physical environment

Pemba district lies in both the Zambezi and the Kafue river basins. Tributaries of these two major rivers flow to the south and north of the district, respectively. The Ndondi dam is located on Ndondi River which is a minor tributary of the Zambezi River.

Annual mean temperature of the project area is 19.3 °C, with the hottest month October (30.9 °C) and the coldest month July (4.3 °C). Average monthly rainfall ranges from zero (June to September) to 18 mm in January at the peak of the rainy season.

The Ndondi dam lies on the Choma-Kalomo Block, which is one of the three major topographical features in Southern Province. The project site is located at an altitude of 1,158 masl at the dam site.

The geology around the proposed project site is characterised by metamorphic (essentially undifferentiated schist and quartzite) rocks of the Basement Complex belonging to the Precambrian age. According to MWH (2006) seismic activity does occur in the region, particularly due to impoundment of the Lake Kariba located in middle Zambezi Basin.

The dominant aquifer at the project site is the schist, comprising Muva schist and minor quartzite in which groundwater flow is mainly in fissures, channels and other discontinuities. The aquifers in the area have low or limited water yields between 0-2 litres per second. The groundwater flow direction is mainly from south to north of the project site.

8.8.1.3 Biological environment

Southern Miombo woodland is the major vegetation type found in Pemba district and around the dam site. This vegetation is characterised by scattered (open woodland) trees and shrubs adapted to survive long periods of dryness. The area is dominated by Brachystegia and Julbernardia species with sparse grass cover. Acacia species are commonly occur in the wetter areas of the Miombo Eco-region.

WRDP EPB (2016) lists a variety of wild fauna, none of which are verified as occurring. Fauna are likely to be depauperate due to the intensive hunting pressure by human populations in the area and the transformation of habitats (refer to Figure 8-34).

The frog species *Hyperolius pyrrhodictyon* is endemic to the project area. It is known only from the area of the Kafue river in Zambia and the uplands to the south, but does not extend as far as the Zambesi River. Its distributional limits are not well known. It is classified as 'Least Concern' in the IUCN Red Data list. Its presence has not been confirmed in or around Ndondi dam.

The rivers and dams in Pemba contain a variety of fish species include bream, catfish, barbel and elephant fish are economically important. Significant populations of bream (*Oreochromis niloticus*, *Tilapia rendallii* and *Oreochromis andersonii*) are harvested by the local community from the Ndondi reservoir, although records of tonnage caught per year are not kept.

Use of the Integrated Biodiversity Assessment Tool (IBAT) shows 25 potentially occurring Red Data species - 6 mammal, 15 bird, 3 fish and 1 plant species within a 50 km radius of the dam site. The large mammals are likely to be found to the south in the direction of Lake Kariba. One critically endangered cichlid and two vulnerable cichlids are recorded. The population decline among these species is due to the introduction of *O. niloticus* by anglers and , which is displacing the other cichlids throughout their ranges. Its occurrence in Ndondi dam has been confirmed by local communities.

One Key Biodiversity Area (KBA) falls within the 50 km buffer – the Nkanga River Conservation Area, located some 40 km north west of the dam. This is made up of three private farms which are well known birding destinations, with over 400 species of birds recorded.

Table xx: Red Data species recorded in IBAT within a 50 km radius of the Ndondi dam

Species (common name)	**Scientific name**	**IUCN Red Data Status**
Mammals		
Black rhinoceros	*Diceros bicornis*	CR

Species (common name)	Scientific name	IUCN Red Data Status
African wild dog	*Lycaon pictus*	EN
African elephant	*Loxodonta africana*	VU
Lion	*Panthera leo*	VU
Leopard	*Panthera pardus*	VU
Temminck's pangolin	*Smutsia temminckii*	VU
Birds		
White-backed vulture	*Gyps africanus*	CR
White-headed vulture	*Trigonoceps occipitalis*	CR
Steppe eagle	*Aquila nipalensis*	EN
Madagascar pond-heron	*Ardeola idae*	EN
Grey crowned crane	*Balearica regulorum*	EN
Cape vulture	*Gyps coprotheres*	EN
Lappet-faced vulture	*Torgos tracheliotos*	EN
Tawny eagle	*Aquila rapax*	VU
Southern ground-hornbill	*Bucorvus leadbeateri*	VU
Wattled crane	*Bugeranus carunculatus*	VU
Slaty egret	*Egretta vinaceigula*	VU
Taita falcon	*Falco fasciinucha*	VU
Zambian barbet	*Lybius chaplini*	VU
Martial eagle	*Polemaetus bellicosus*	VU
Secretarybird	*Sagittarius serpentarius*	VU
Fish		
Kariba tilapia	*Oreochromis mortimeri*	CR
Threespot tilapia	*Oreochromis andersonii*	VU
	Oreochromis macrochir	VU
Plants		
	Nymphoides tenuissima	EN

8.8.1.4 Socio-economic environment

Pemba District is well serviced by the Choma–Pemba road linking to the Great North Road and the national railway line. There is also an 8 km gravel road and a pontoon linking the district to Itezhitezhi District. Access to Ndondi dam is by an 8 km feeder road.

According to the 2010 census of population and housing, the Pemba constituency has a population of 64,918. Ndondi Dam lies in Nachibanga Ward which has 1,557 households and a total population of 9,036, where 4,278 are male and 4,758 are female. Pemba District has only one constituency and seven wards.

Subsistence farmers make up the majority of the population in the area. Few people are in formal employment and those who are comprise mainly teachers, agricultural or health workers, as well as NGO staff.

Trust land and traditional land make up the two main forms of land tenure in Pemba District. Most of the trust land is reserved forest area. The administrative part of the district is characterised by commerce with small-scale and emergent farms in peri-urban areas. Cattle rearing is the most important economic activity, followed by crop production.

Six clinics serve the community of Pemba District, namely Pemba main clinic, Kasiya clinic, Kanchomba clinic, Muzoka clinic, Mooya clinic and Ndondi clinic. New health posts are currently being built.

Pemba District has a total of 64 schools, of which 61 are primary schools. Three secondary schools are located in the area - Pemba Secondary School in Pemba ward, Jembo Mission School in Hamaundu ward and Ndondi Secondary School in Nachibanga ward.

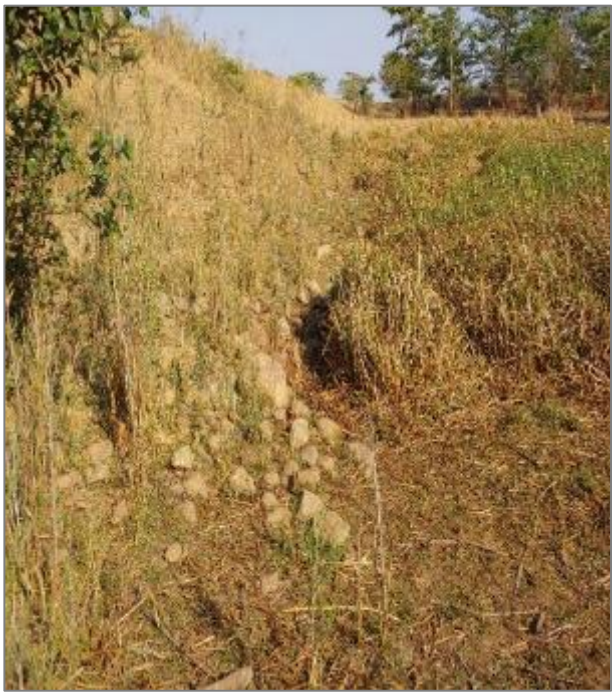
8.8.2 Non-compliance issues and risks

8.8.2.1 Dam safety (structural) risk

The main structural safety concerns are described in Table 8-64. These are summarised from UNOPS (2019).

Table 8-64. Dam safety compliance status and risks (Ndondi Dam).

Code	Aspect	Concern/non-compliance	Risk
Construction Remediation Phase			
SFH-1	Structural safety	Downstream toe of embankment covered by a reedbed, possibly indicative of seepage. Upslope side has benched over the years and has not stone pitching. Uncertain whether any toe drain filters were originally installed.	Erosion and undercutting of the embankment. Downstream community safety.
SFH-4	Structural safety	Crest heavily used as a local thoroughfare for people and livestock.	Erosion and loss of integrity of the embankment.



Reeds on the downstream embankment (November 2019).

Livestock use of the embankment (March 2018).

Figure 8-35. Ndondi dam embankment.

8.8.2.2 Dam health and safety (non-structural) risks

The main non-structural community health and safety concerns associated with the dam are described in Table 8-65.

Table 8-65. Dam health and safety compliance requirements and risks (Ndondi Dam).

Code	Aspect	ESMP/ARAP requirement	Risk	Status on site
Construction Remediation Phase				
HSH-1	Community health and safety	Rehabilitation of borrow pits to avoid ponding of water creating of mosquito breeding grounds and risk of drowning or injury.	Increased malaria risks. Increased risk of children drowning.	Not done.
HSH-2	Community safety	Erection of safety hazard signs around the dam.	Serious or fatal incidents/drownings.	Not done.
HSH-3	Community health and safety	Provision of safe pedestrian access across the river.	Serious or fatal incidents/drownings.	Uncertain. Reference not found in instruments.
Operational Phase				
HSH-4	Community safety	Provide dam emergency safety talks/ sensitisation and training to local community and dam committee.	Lack of knowledge about actions to take in emergencies.	Not done.

Code	Aspect	ESMP/ARAP requirement	Risk	Status on site
HSH-5	Community safety	Sensitization of community to avoid risk of spillway crossings.	Serious or fatal incidents/drownings.	Not done.
HSH-6	Community safety	Enforcement of dam safety and security measures around the dam.	Serious or fatal incidents/drownings.	Not done.
HSH-7	Community safety	Warning prior to opening of overflow pipes in the event of flooding.	Serious or fatal incidents/drownings.	Not done.
HSH-8	Community Safety	Safety sensitisation and awareness programmes of swimming risks particularly for children.	Serious or fatal incidents/drownings.	Not done.
HSH-9	Community health	Sensitization of community to impacts of drinking untreated water.	Increased prevalence of water borne diseases.	Not done.

8.8.2.3 Environmental risks

Ndondi Dam is situated in a fairly heavily settled rural area in a patchwork of natural and modified woodland habitat, being significantly transformed by cultivation, bush clearing for charcoal and firewood (Figure 1). The area is intensively used by livestock. Since the dam is pre-existing and the construction does not involve increasing its capacity, there will be no change to the inundation area.

No terrestrial Red Data species or areas of conservation significance are recorded in the Environmental Project Brief (WRDP, 2016i) or the COWI (2018c) ESMP. The large Red Data mammals recorded in the IBAT 50 km buffer are unlikely to occur within the direct area of influence of the dam, but may be found further to the south, between the dam and Lake Kariba. As a pre-existing dam, the changes in the aquatic environment caused by the project are likely to be small.

Environmental management requirements (post-construction) in the COWI (2018c) ESMP are aimed mainly at responsible demobilisation and site restoration. These requirements are included in Table 8-66, summarised from Section 4.7 and Section 6.1.7 of the ESMP. Table 8-66 shows the project status to be non-compliant with at least some of these requirements, and remedial action is required in these cases. No structured process of demobilisation and restoration has been followed and the plan required by the ESMP has not been prepared or implemented. The D/S embankment appears to have been grassed although intensive use by livestock has caused unevenness and some erosion. Since the works were minor there do not appear to be any borrow areas that were opened up for the construction. For monitoring purposes, a plate gauge has not been installed, as required by the ESMP.

Table 8-66. Environmental compliance status and risks (Ndondi Dam)

Code	Aspect	Safeguard requirement (ESMP/ARAP)	Risk	Compliance status
Construction Remediation Phase				
ENH-1	Demobilisation and restoration	Prepare demobilisation and restoration plan.	Plan ensures structured management to minimise	No plan prepared or implemented.

Code	Aspect	Safeguard requirement (ESMP/ARAP)	Risk	Compliance status
			environmental risk of dam construction impacts.	
ENH-2	Rehabilitation of work areas	Rehabilitate disturbed work areas and restore as close as possible to original contours. Restore topsoil from stockpiles. Replant with native plant seed mixes, where natural revegetation likely to be unsuccessful.	Erosion and sedimentation. Alien plant infestation. Loss of use of land.	
ENH-3	Rehabilitation of work areas	Install drainage structures to reduce uncontrolled runoff. Plant fast growing trees in erosion-prone areas	Erosion and sedimentation. Loss of habitat.	Not required.
ENH-4	Rehabilitation of borrow pits	Make borrow area safe. Stabilise steep slopes. Backfill to acceptable landform. Prevent accumulation of water. Topsoil. Reseed naturally or with indigenous seed mixtures.	Erosion and sedimentation.	No borrow areas noted.
ENH-5	Site clean-up and rehabilitation	Repair community roads and paths. Close selected bush paths by ripping and revegetating. Close contractor paths around dam.	Erosion and sedimentation. Alien plant invasion. Loss of use of land.	No repair done.
ENH-6	Site clean-up and rehabilitation	Remove housing, office units, other infrastructure. Hand over any useful units to the community/dam committee. Rehabilitate campsite.	Alien plant invasion. Loss of use of land.	Not done. Campsite abandoned but not rehabilitated.
ENH-7	Hazardous waste	Recycle used hydrocarbons where possible. Dispose off-site in accordance with regulatory requirements. Bioremediate oil-contaminated soil in a land farm or use in-situ remediation where the contamination plume is shallow.	Surface and groundwater pollution. Soil contamination.	Not done. No oil recycling took place during construction. Waste hydrocarbons may be present on site. Hydrocarbon-contaminated soils may also be present, particularly at the camp site refuelling bays and in other areas where drip trays and oil containment measures were not taken. No biological remediation of contaminated soils was done.

Code	Aspect	Safeguard requirement (ESMP/ARAP)	Risk	Compliance status
ENH-8	Non-hazardous construction waste	Dispose all rubble and other non-hazardous waste at a ZEMA/local authority certified landfill. Level and rehabilitate heaps of soil.	Water and soil pollution.	No systematic process of site clean-up done.
ENH-9	Non-hazardous construction waste	Use overburden spoil to backfill the borrow pits.	Erosion and sedimentation.	No systematic process of site clean-up and rehabilitation done.
ENH-10	Sanitary waste	Dismantle and bury pit latrines after applying lime.	Groundwater pollution.	Not done.
ENH-11	Downstream ecological flow	Install gauge plates to measure water levels and water releases.	If not done, absence of data to evaluate downstream flow impacts.	Not done.
Operational Phase				
ENH-12	Environmental flow releases	No flow requirement specified.	Impact assessed as ecologically positive due to increased reliability of downstream flow.	No measurement of flow or evaluation of downstream impact.
ENH-13	Environmental flow releases	Designated flow gauge reader to record flow results.	If not done, inability to monitor and manage downstream ecological impacts (positive or negative)	Not done.
ENH-14	Performance monitoring	Undertake performance and impact monitoring as a basis for adaptive management.	If not done, failure to understand and manage long term impacts.	Not done. No detailed description of monitoring requirements in the COWI (2018c) ESMP. Refer to Section 5.4.

8.8.2.4 Social risks

There are no PAPs who will suffer losses as a result of the civil works for the dam. The FSL level has not changed and work on the dam has been limited to the spillway and embankment areas. No ARAP was required and social impact management was limited to specifications in the COWI (2018c) ESMP. Compliance relates to matters concerning training and capacity building among project beneficiaries and institutions to encourage the most social benefit from the use of the dam as possible.

Table 8-67. Social compliance status and risks (Ndondi Dam).

Code	Aspect	ESMP/ARAP requirement	Risk	Status on site
Construction Remediation Phase				
SCH-1	Community Irrigation Water Supply	Construction of irrigation water supply for downstream community	Failure of project to achieve	Irrigation system previously functional but apparently no longer so. Central syphon which feeds the

Code	Aspect	ESMP/ARAP requirement	Risk	Status on site
			primary objectives	two canals on either side of the wall is not working (UNOPS (2019). Locals appear to be bucketing water to vegetable gardens downstream.
Operational Phase				
SCH-2	Community development	Stocking of the dam with fish.	Failure to meet project objectives of improved livelihoods for local communities.	The dam is apparently well stocked with fish since it was a rehabilitation under WRDP.
SCH-3	Community safety	Farmers to be educated about safe methods of chemical handling and control.	Injury or illness.	Not done.
SCH-4	Institutional capacity building	Institute a strong committee or cooperative management structure to ensure a functional irrigation scheme. Devise clear rules and regulations to be complied with by members of the scheme. Foster organized livelihood activities including irrigation and fishing. Public institutions to support irrigation, Sensitize local leadership on the operation of the irrigation scheme.	Lack of capacity to benefit fully from irrigation water supply.	Not done, although existing irrigation infrastructure is in place and is used by downstream beneficiaries.
SCH-5	Training of beneficiaries	Assist PAPs with training to improve their knowledge of irrigation agriculture, high value crops to cultivate and other enterprises besides agriculture that could assist in income generation.	Lack of capacity to benefit fully from irrigation water supply.	Not done, although existing irrigation infrastructure is in place and is used by downstream beneficiaries.
SCH-6	Community health and safety	Update of the generic Emergency Response Plan to be dam-specific	Inability to effectively manage emergencies caused by the dam	Not done.

8.8.3 Proposed actions

8.8.3.1 Actions to address dam safety risks (structural)

Proposed remedial actions for identified dam safety risks and non-compliances during construction are described in Table 8-68.

Table 8-68. Actions to address structural dam non compliances and risks (Ndondi Dam).

Code	Aspect	Risk	Action required
SFH-1	Structural safety	Seepage from the downstream toe.	• Check filter system. • Install toe drain, if required. • Repair uneven embankment slopes. • Consider stone pitching below the stilling basin.
SFH-2	Structural safety	Crest heavily used as a local thoroughfare for people and livestock.	• Consider stone pitching on the U/S side of the embankment.

8.8.3.2 Actions to address dam health and safety risks (non-structural)

Proposed remedial actions for identified dam health and safety risks and non-compliances are described in Table 8-69.

Table 8-69. Actions to address non- structural dam non-compliances and risks (Ndondi Dam).

Code	Aspect	Risk	Action required
Construction Remediation Phase			
HSH-1	Rehabilitation of borrow pits	Failure to rehabilitate causing increased malaria risks and increased risk of children being injured or drowning.	• Comply with ENH-4, ENH-9 action requirements. • Ensure borrow pits free draining to avoid malarial breeding sites and minimise drowning risks.
HSH-2	Community health and safety	Drowning due to absence of warning signs.	• Design and erect appropriate hazard notices. • Sensitise communities to risks.
HSH-3	Access across the river	Lack of a bridge/crossing with increased risk of community injury and drowning.	• Construct pedestrian access across the river downstream of the dam (or in location best suited for convenient community access).(there is accesibility as there is an alternative road on the ownstream)
Operational Phase			
HSH-4, HSH-5, HSH-6, HSH-7, HSH-8, HSH-9	Community health and safety	Injury or illness caused by lack of knowledge of dam risks.	• Develop a training programme for communities who live around the dam. • Train communities in accordance with the plan (including drinking water and water borne diseases, avoidance of dangerous spillway crossings, swimming risks, emergency preparedness in floods or dam failure, risks of interactions with wildlife).

8.8.3.3 Actions to address Environmental Non Compliances and Risks

Proposed remedial actions for identified environmental risks and non-compliances are described in Table 8-70. Several non-compliances are combined into a single action in some instances. All actions described are to be included in the ESMP to be developed for the construction remediation phase and operational phase of the dams.

Table 8-70. Actions to address environmental non-compliances and risks (Ndondi Dam).

Code	Aspect	Risk	Action required
Construction Remediation Phase			
ENH-1	Demobilisation and Restoration Plan	Plan ensures structured management to minimise environmental risk of dam construction impacts.	• Prepare plan as part of the requirements of the ESMP.
ENH-2, ENH-3,	Rehabilitation of disturbed works areas	Erosion and sedimentation.	• Conduct detailed site inspections. • Define and map disturbed areas where rehabilitation/erosion control is required. • Develop method statements for each area, including problem statement, method of rehabilitation, resources needed and responsibilities (See ENH-1 above). • Implement rehabilitation and monitor effectiveness.
ENH-5	Rehabilitation of community roads	Loss of community access.	• Rehabilitate community roads used by the contractor. • Close and rehabilitate any informal bush tracks made by the contractor.
ENH-4; ENH-9	Rehabilitation of borrow pits	Erosion and sedimentation. Weed infestation. Entrapment risk to wild animals.	• Conduct detailed site inspections. • If any borrow areas identified, prepare detailed rehabilitation plan for each borrow area. Define methodologies for top-soiling and reseeding with natural grass seed mixtures. • Reduce slopes and backfill with inert spoil, where necessary/possible, to create safe conditions that avoid entrapment of animals and accumulation of water. • Monitor effectiveness of rehabilitation.
ENH-6, ENH-8	Waste, construction infrastructure and rubble	Weed infestation, loss of productive land.	• Conduct detailed site inspections. • Prepare snag list defining each area where remedial action is necessary, and the required actions. • Waste/rubble to be removed to government-approved disposal sites.
ENH-10	Sanitary waste	Groundwater and surface water pollution.	• Identify and map location of all pit latrines • Define methods to ensure safe capping with no pollution risk
ENH-7	Hazardous waste,	Groundwater and surface water pollution.	• Conduct detailed site inspections. • Prepare snag list defining each area where remedial action is necessary, including location of

Code	Aspect	Risk	Action required
	hydrocarbon-polluted soils		waste oil drums and/or other hazardous chemicals, location of oil-contaminated soils and the required actions. • Define methods for soil remediation. • Implement and monitor recovery. • Hazardous waste to be removed to a government-approved hazardous waste disposal site.
ENH-11	Environmental flow releases	Inability to monitor and assess downstream ecological effects of dam operation.	• Design and install gauge plates. • Undertake assessment of downstream aquatic and riparian conditions as a basis for flow requirements and monitoring to be imposed on the operational phase of the dam. • Undertake assessment of the ecological effect of stocking the dam with fish (particularly *O. nilotica)*
Operational Phase			
ENH-12, ENH-13, ENH-14	Environmental flow releases	Inability to monitor and assess downstream ecological effects of dam operation.	• Ensure adherence to the prescribed environmental flow and other management requirements. • Develop O&M plan to include ecological flow requirements. • Appoint and train flow reader. • Maintain flow records. • Monitor dam impact on aquatic environment (monitoring plan to be determined in the assessment phase above).

8.8.3.4 Actions to address social non-compliances and risks

Proposed remedial actions for identified social risks and non-compliances are described in Table 8-71. Several non-compliances are combined into a single action in some instances. All actions described are to be included in the ESMP to be developed for remediation of the site in the construction remediation phase and the operational phase of the dams.

Table 8-71. Actions to address social non-compliances/risks (Ndondi Dam).

Code	Aspect	Risk	Action required
Construction Remediation Phase			
SCH-1	Community irrigation water supply	Failure of project to meet its primary objective.	ir the irrigation syphon sytem
Operational Phase			
SCH-2	Community development	Food security – failure to stock the dam with fish.	• Stock the dam with fish. To be assessed.
SCH-3	Community health and safety	Injury or illness caused by use of pesticides.	• Develop a training programme for PAPs in the irrigation area concerning safe use of pesticides

Code	Aspect	Risk	Action required
			using the integrated pest management programme (IPM) prepared for the project.
SCH-4	Community development	Lack of capacity/training to benefit fully from irrigation water supply.	• Strengthen the dam or irrigation committee to ensure cooperation and spread of benefits to a wider section of the community.
SCH-5	Community Development	Lack of capacity to benefit fully from irrigation water supply.	• Train PAPs in irrigation agricultural techniques, knowledge of the types of high value crops to cultivate and other enterprises besides agriculture that could assist in income generation.
SCH-6	Community health and safety	Lack of capacity to respond effectively to emergencies related to the dam	• Update Emergency Response Plan

8.9 Dam 9 Ngolongozya

8.9.1 Characteristics of the dam and surrounding area

8.9.1.1 Dam and catchment characteristics

Ngolongozya dam is a new earth fill dam constructed on the Ngolongozya River in Zimba District. The site is about 36 km from the Zimba urban centre. The main purpose of the dam is for aquaculture, irrigation and stock watering.

The construction works, started in 2016, has included raising the embankment for additional storage and freeboard by 2m, raising the spillway by 1m, constructing the spillway training wall and constructing two new drop structures (COWI, 2018s).

The location of the dam and its main characteristics are described in Table 8-72.

Table 8-72. Location and main characteristics of Ngolongozya Dam.

DAM # 9: NGOLONGOZYA	Features
Location of the dam	
Province	Zambian Southern Province
District	Zimba District
Location of the dam (D.ddddd°)	S17.36850° E26.53992°
Name of the river/stream on which the dam was built	Ngolongozya River (drains to Kalomo River)
Dam characteristics and dimensions	
Dam type/material	Zoned earth fill embankment
Size classification (COWI, 2019ab)	Small (based on ICOLD)
Hazard Classification	
- Potential loss of lives	Significant
- Potential economic loss	Low
- Potential adverse impact on resource economy	Low
- Maximum hazard classification	Significant
Year dam was constructed	2016
Contractor name	Savenda
Wall height	10.5 m
Wall length	300 m
Volume storage	1 million m^3
Reservoir surface area (at FSL)	36 ha
Reservoir catchment area	89.4 km^2
Maximum depth at FSL	8.5 m but raised by some amount
Spillway (main)	Open channel at end of left flank
Spillway (emergency)	Nil
Throwback	1,785 m
1:50 year design flood	133.1 m^3/s

1:100 year flood	159.8 m^3/s
Safety Evaluation Flood (SEF)	187.7 m^3/s
Other	
Foundation	Pre-Katanga undifferentiated, predominantly schist, gneiss and granulite
Foundation treatment	Core cut-off trench
Drainage system	Sand blanket drain with rock toe
Outlet works and scour	Concrete encased 300 mm ND mild steel pipe 8mm thick with inlet chamber with trash grid at the upstream end
Monitoring instruments	None

Figure 8-36. Satellite view of Ngolongozya dam wall and surrounding area (imagery date September 2019).

Figure 8-37. Ngolongozya dam – detail of the wall (imagery date Aug 2019).

8.9.1.2 Physical environment

The dam is built on the Ngolongozya River, which contributes seasonal flow to the Kalomo River which drains the southern part of the district before joining the Zambezi River. The Ngolongozya is an ungauged river with no historical records of water flow. The river has a catchment area of 89.4 km^2, which is 1.4% of the total catchment area of Kalomo River. The runoff contribution from Ngolongozya River is therefore estimated as a proportion of the main river catchment. Based on historical records of the flow of Kalomo River at Kalomo, Ngolongozya ranges between 0.0014m^3/s and 3.42m^3/s.

Zimba District lies at 1,300 masl. The district is drained by the Zambezi River and the Ngwezi, Kalomo and Nalutabi rivers. It has several streams which are mostly seasonal; these include Mweemba, Dongo and the Kalimabukede. There is significant stream regulation, with 48 man-made dams throughout the district.

Elevations in the Ngolongozya dam catchment area range from 1166 m to 1100 m above mean sea level (amsl), with the highest elevations in the north- and south-eastern areas.

The Ngolongozya dam site comprises metamorphic (migmatites and gneiss) rocks but upstream the area is mainly underlain by granites. The granite formation extends from the headwaters area of Ngolongozya catchment, through the dam site and up to the mouth with the Kalomo River. The site is characterised by rock outcrops in selected parts of the site, particularly on the upstream side.

The common soils underlying the dam site areas are moderately leached and are reddish to brownish clayey loams. These soils are commonly referred to as ferric acrisols and ferric luvisols. An extensive area is covered by this soil type and covers the entire catchment of the dam site.

Surface water quality in the river does not meet the drinking water standard set by the Zambia Bureau of Standards (ZABS), mainly due to high total suspended solids. The rest of the parameters are within the acceptable quality range, although the sample followed heavy storms which may have elevated sediment loads while decreasing other inorganic parameter values.

The district experiences a relatively subtropical climate. Average rainfall is between 700 to 800 mm per year. Night frost occurs frequently in June. The average maximum temperature about 35^{o}C occurs in October while the average minimum temperature is (5^{o}C) which occurs in July.

8.9.1.3 Biological environment

Mopane woodland (comprising mainly *Colophospermum mopane*) is the predominant vegetation type in the project area, with scattered elements of munga woodland dominated by various species of Acacia and Combretum, dry forests, grassland and open woodland. The mopane is one-storeyed woodland with an open canopy 6 to 18 m high. Besides mopane, along the rivers, edaphic grassland is predominant. This includes dambo grassland, riverine grassland, and floodplain grassland. Areas with open woodland have the Miombo tree species of the genera Brachystergia, Julbernadia and Pterocarpus.

Zimba district has one gazetted forest which is the Zimba Hills local forest, P10, with an estimated total land area of 18,800 hectares. This forest lies about 40 km south-west of Zimba town along Nyawa road. The Ngwezi and Nalutabi rivers form the forest's natural boundaries on the north and the south.

Mammals reported in the project area include waterbuck (*Kobus defassa*), porcupine (*Atherurus africanus*), bush pig (*Potamochoerus porcus*) and hare (*Lepus victoriae*). Smaller animals such as monkey (*Cercopithecus aethiops*) and rodents are also common.

WRDP EPB (2016) lists a variety of wild fauna, being based on anecdotal accounts and none of which are verified as occurring. Fauna are likely to be depauperate due to the intensive hunting pressure by human populations in the area and the transformation of habitats (refer to Figure 1).

Fishing in the district is mainly related to aquaculture development. Three types of bream species are cultured, namely the three spotted bream (*Oreochromis andersonii*), red breasted bream (*Tilapia rendalli*) and green headed bream (*Oreochromis macochir*).

Use of the Integrated Biodiversity Assessment Tool (IBAT) shows 24 potentially occurring Red Data species – 5 mammal, 14 bird, 3 fish and 2 plant species within a 50 km radius of the dam site. One critically

endangered cichlid and two vulnerable cichlids are recorded in the catchment. The population decline amoung these species is due to the introduction of *O. niloticus* by anglers and aquaculturalists, which is displacing the other cichlids throughout their ranges.

No Key Biodiversity Area (KBA) falls within the 50 km buffer around the dam.

Table xx: Red Data species recorded in IBAT within a 50 km radius of the Ngolongozya Dam

Species (common name)	Scientific name	IUCN Red Data Status
Mammals		
Black rhinoceros	*Diceros bicornis*	CR
African elephant	*Loxodonta africana*	VU
Lion	*Panthera leo*	VU
Leopard	*Panthera pardus*	VU
Temminck's pangolin	*Smutsia temminckii*	VU
Birds		
White-backed vulture	*Gyps africanus*	CR
Hooded vulture	*Necrosyrtes monachus*	CR
White-headed vulture	*Trigonoceps occipitalis*	CR
Steppe eagle	*Aquila nipalensis*	EN
Grey crowned crane	*Balearica regulorum*	EN
Lappet-faced vulture	*Torgos tracheliotos*	EN
Tawny eagle	*Aquila rapax*	VU
Southern ground-hornbill	*Bucorvus leadbeateri*	VU
Wattled crane	*Bugeranus carunculatus*	VU
Slaty egret	*Egretta vinaceigula*	VU
Taita falcon	*Falco fasciinucha*	VU
Zambian barbet	*Lybius chaplini*	VU
Martial eagle	*Polemaetus bellicosus*	VU
Secretarybird	*Sagittarius serpentarius*	VU
Fish		
Kariba tilapia	*Oreochromis mortimeri*	CR
Threespot tilapia	*Oreochromis andersonii*	VU
	Oreochromis macrochir	VU
Plants		

Species (common name)	Scientific name	IUCN Red Data Status
	Nymphoides tenuissima	EN
	Inversodicraea warmingiana	VU

8.9.1.4 Socio-economic environment

Zimba District comprises one constituency (Mapatizya) and seven wards (Zimba, Chidi, Luyaba, Mulamfu, Mbwiko, Simwatachela and Siamafumba). The district covers a total area of approximately 5,000 square kilometers.

A total of 13,284 households and a population of 66,725, broken down as 32,186 males and 34,539 female, reside in Zimba District. The population density is 16.9% per square kilometre, while the annual population growth rate is estimated at 2.9 %.

Farming (crop and livestock husbandry) is the main economic activity in the district. This is also the case in the project area where most of the population are subsistence farmers growing crops such as maize, groundnuts, cotton, sunflower, cowpeas, beans and sweet potatoes and rearing livestock, including cattle, chickens, goats and sheep.

The local community draws its drinking water mainly from the boreholes, shallow wells and scoop holes near the Ngolongozya River. The surface water is used mainly for washing and other domestic and economic uses like irrigation and livestock watering.

The largest employer in the district is government. Other employers are private mines and farms.

Ten health facilities (including a mission hospital, eight rural health centres and a health post) and 63 learning institutions are located in Zimba District. The project area is served by a number of schools. Siamoono School is closest to the proposed project site with a total enrolment of 226 pupils.

8.9.2 Non-compliance issues and risks

8.9.2.1 Dam safety (structural) risk

The main structural safety concerns are described in Table 8-73. These are summarised from UNOP (2019).

Table 8-73. Dam safety compliance status and risks (Ngolongozya Dam).

Code	Aspect	Concern/non-compliance	Risk
Construction Remediation Phase			
SFI-1	Structural safety	Dam has a large catchment for a 'small dam' and requires a non-erodible spillway. Spillway thought to be undersized. Dam embankment apparently overtopped during construction.	Exceeding the capacity of the spillway during design floods. Downstream community safety
SFI-2	Structural safety	Spillway return drop weirs founded on erodible materials with no proper anchoring. Spillway discharging into the river very near the embankment toe. Spillway return will erode	Causeway damage and loss of integrity. Downstream community safety

Code	Aspect	Concern/non-compliance	Risk
		badly without appropriate drop weirs, possibly threatening the causeway	
SFI-3	Structural safety	Secondary spillway has caused incised gullying near the embankment	Causeway damage and loss of integrity. Downstream community safety
SFI-4	Structural safety	Crest heavily used as a local thoroughfare for people and livestock and requires remedial work	Erosion and loss of integrity of the embankment

Dam crest.

Erosion of the cam embankment partly cause by livestock.

Toe seepage and livestock damage.

Failed downstream drop weir.

Offset seepage and gullying.

Gullying in the return channel.

Figure 8-38. Ngolongozya Dam (November 2019).

8.9.2.2 Dam health and safety (non-structural) risks

The main non-structural community health and safety concerns associated with the dam are described in Table 8-74.

Table 8-74. Dam health and safety compliance requirements and risks (Ngolongozya Dam).

Code	Aspect	ESMP/ARAP requirement	Risk	Status on site
Construction Remediation Phase				
HSI-1	Community health and safety	Rehabilitation of borrow pits to avoid ponding of water creating of mosquito breeding grounds and risk of drowning or injury.	Increased malaria risks. Increased risk of children drowning.	Not done.
HSI-2	Community safety	Erection of safety hazard signs around the dam.	Serious or fatal incidents/drownings.	Not done.
HSI-3	Community health and safety	Provision of safe pedestrian access across the river.	Serious or fatal incidents/drownings.	Uncertain. Reference not found in instruments.
Operational Phase				
HSI-4	Community safety	Provide dam emergency safety talks/ sensitisation and training to local community and dam committee.	Lack of knowledge about actions to take in emergencies.	Not done.
HSI-5	Community safety	Sensitization of community to avoid risk of spillway crossings.	Serious or fatal incidents/drownings.	Not done.

Code	Aspect	ESMP/ARAP requirement	Risk	Status on site
HSI-6	Community safety	Enforcement of dam safety and security measures around the dam.	Serious or fatal incidents/drownings.	Not done.
HSI-7	Community safety	Warning prior to opening of overflow pipes in the event of flooding.	Serious or fatal incidents/drownings.	Not done.
HSI-8	Community Safety	Safety sensitisation and awareness programmes of swimming risks particularly for children.	Serious or fatal incidents/drownings.	Not done.
HSI-9	Community health	Sensitization of community to impacts of drinking untreated water.	Increased prevalence of water borne diseases.	Not done.

8.9.2.3 Environmental risks

Ngolongozya Dam is situated in a fairly heavily settled rural area and habitats are modified being significantly transformed by cultivation, bush clearing for charcoal and firewood, and overgrazing (Figure 8-36). The area is intensively used by livestock. No Red Data species are recorded in the Environmental Project Brief (WRDP, 2016i) or the COWI (2018c) ESMP, apart from a reference to the African python (COWI, 2018c), which is regarded as 'Vulnerable' in the latest IUCN listing.

The terrestrial species listed by IBAT within a 50 km radius of the dam are unlikely to occur within the direct area of influence of the dam, where habitat loss is extensive. In the context of the dam's impact on the aquatic environment, the site may be important in supplementing water supply to downstream (and possibly less impacted) systems draining into Lake Kariba, in which *Clariallabes platyprosopo, Oreochromis macrochir*, *Oreochromis andersonii* and *Oreochromis mortimeri* are present.

Environmental management requirements for the dam (post-construction) in the COWI (2018c) ESMP are aimed mainly at responsible demobilisation and site restoration. These requirements are included in Table 8-75, summarised from Section 4.8 and Section 6.1.8 of the ESMP. Table 8-75 shows the project status to be non-compliant with most of the requirements, and remedial action is required in these cases. No structured process of demobilisation and restoration has been followed and the plan required by the ESMP has not been prepared or implemented. The D/S embankment has not been effectively grassed and there is pressure from livestock, exacerbating erosion of all disturbed areas. There has been extensive and uncontrolled borrow from the right bank downstream of the dam wall. None of this has been rehabilitated. For monitoring purposes, a plate gauge has not been installed, as required by the ESMP.

Table 8-75. Environmental compliance status and risks (Ngolongozya Dam).

Code	Aspect	Safeguard requirement (ESMP/ARAP)	Risk	Compliance status
Construction Remediation Phase				
ENI-1	Demobilisation and Restoration	Prepare demobilisation and restoration plan.	Plan ensures structured management to minimise environmental risk of	No plan prepared or implemented.

Code	Aspect	Safeguard requirement (ESMP/ARAP)	Risk	Compliance status
			dam construction impacts.	
ENI-2	Rehabilitation of work areas	Rehabilitate disturbed work areas and restore as close as possible to original contours. Restore topsoil from stockpiles. Replant with native plant seed mixes, where natural revegetation likely to be unsuccessful.	Erosion and sedimentation. Alien plant infestation. Loss of use of land.	Not done.
ENI-3	Rehabilitation of work areas	Install drainage structures to reduce uncontrolled runoff. Plant fast growing trees in erosion-prone areas	Erosion and sedimentation. Loss of habitat	Not done.
ENI-4	Rehabilitation of borrow pits	Make borrow area safe. Stabilise steep slopes. Backfill to acceptable landform. Prevent accumulation of water. Topsoil. Reseed naturally or with indigenous seed mixtures.	Erosion and sedimentation	Not done. Extensive borrow on the right bank downstream of the wall
ENI-5	Site clean-up and rehabilitation	Repair community roads and paths. Close selected bush paths by ripping and revegetating. Close contractor paths around dam.	Erosion and sedimentation. Alien plant invasion. Loss of use of land.	No repair completed.
ENI-6	Site clean-up and rehabilitation	Remove housing, office units, other infrastructure. Hand over any useful units to the community/dam committee. Rehabilitate campsite.	Alien plant invasion. Loss of use of land.	Not done. Campsite abandoned but not rehabilitated
ENI-7	Hazardous waste	Recycle used hydrocarbons where possible. Dispose off-site in accordance with regulatory requirements. Bioremediate oil-contaminated soil in a land farm or use in-situ remediation where the contamination plume is shallow.	Surface and groundwater pollution. Soil contamination.	Not done. No oil recycling took place during construction. Waste hydrocarbons may be present on site. Hydrocarbon-contaminated soils may also be present, particularly at the camp site refuelling bays and in other areas where drip trays and oil containment measures were not taken. No biological remediation of contaminated soils was done.

Code	Aspect	Safeguard requirement (ESMP/ARAP)	Risk	Compliance status
ENI-8	Non-hazardous construction waste	Dispose all rubble and other non-hazardous waste at a ZEMA/ local authority certified landfill. Level and rehabilitate heaps of soil.	Water and soil pollution.	No systematic process of site clean-up done.
ENI-9	Non-hazardous construction waste	Use overburden spoil to backfill the borrow pits.	Erosion and sedimentation.	No systematic process of site clean-up and rehabilitation done.
ENI-10	Sanitary waste	Dismantle and bury pit latrines after applying lime.	Groundwater pollution.	Not done.
ENI-11	Downstream ecological flow	Install gauge plates to measure water levels and water releases.	If not done, absence of data to evaluate downstream flow impacts.	Not done.
Operational Phase				
ENI-12	Environmental flow releases	No flow requirement specified.	Impact assessed as ecologically positive due to increased reliability of downstream flow.	No measurement of flow or evaluation of downstream impact.
ENI-13	Environmental flow releases	Designated flow gauge reader to record flow results.	If not done, inability to monitor and manage downstream ecological impacts (positive or negative)	Not done.
ENI-14	Performance monitoring	Undertake performance and impact monitoring as a basis for adaptive management.	If not done, failure to understand and manage long term impacts.	Not done. No detailed description of monitoring requirements in the COWI (2018c) ESMP. Refer to Section 5.4.

8.9.2.4 Social risks

There are no PAPs who will suffer losses as a result of the civil works for the dam. The increase in FSL level has not impacted on any cultivated land or assets for which compensation would be required. No ARAP was specified for this dam and social impact management was limited to specifications in the COWI (2018c) ESMP. Compliance relates to matters concerning training and capacity building among project beneficiaries and institutions to encourage the most social benefit from the use of the dam as possible.

Table 8-76. Social compliance status and risks (Ngolongozya Dam).

Code	Aspect	ESMP/ARAP requirement	Risk	Status on site
Construction Remediation Phase				

Code	Aspect	ESMP/ARAP requirement	Risk	Status on site
SCI-1	Community Irrigation Water Supply	Construction of irrigation water supply for downstream community.	Failure of project to achieve primary objectives.	Irrigation system not complete nor functional. Appears to be a poorly designed canal system, partially constructed on the right bank, which stops at the spillway return and is built to a negative slope - clearly not functional even if water could be delivered to it (UNOPS, 2019).
Operational Phase				
SCI-2	Community development	Stocking of the dam with fish.	Failure to meet project objectives of improved livelihoods for local communities.	Not done. To be assessed.
SCI-3	Community safety	Farmers to be educated about safe methods of chemical handling and control.	Injury or illness.	Not done.
SCI-4	Institutional capacity building	Institute a strong committee or cooperative management structure to ensure a functional irrigation scheme. Devise clear rules and regulations to be complied with by members of the scheme. Foster organized livelihood activities including irrigation and fishing. Public institutions to support irrigation, Sensitize local leadership on the operation of the irrigation scheme.	Lack of capacity to benefit fully from irrigation water supply.	Not done.
SCI-5	Training of beneficiaries	Assist PAPs with training to improve their knowledge of irrigation agriculture, high value crops to cultivate and other enterprises besides agriculture that could assist in income generation.	Lack of capacity to benefit fully from irrigation water supply.	Not done.
SCI-6	Community health and safety	Update of the generic Emergency Response Plan to be dam-specific	Inability to effectively manage emergencies caused by the dam	Not done.

8.9.3 Proposed actions

8.9.3.1 Actions to address dam safety risks (structural)

Proposed remedial actions for identified dam safety risks and non-compliances during construction are described in Table 8-77.

Table 8-77. Actions to address structural dam non-compliances and risks (Ngolongozya Dam).

Code	Aspect	Risk	Action required
SFI-1	Structural safety	Spillway capacity.	• Check spillway capacity against design flood requirements, • Consider secondary flow path on the right bank to minimise embankment overtopping risks. • Consider monitoring flow in the two channels using temporary V-notches.
SFI-2	Structural safety	Spillway return drop weirs and erosion.	• Redesign and reconstruct appropriate drop weirs.
SFI-3	Structural safety	Secondary spillway gullying.	• Consider remedial action (unspecified).
SFI-4	Structural safety	Livestock use.	• If possible, restrict cattle access to the D/S embankment by stone pitching it.

8.9.3.2 Actions to address dam health and safety risks (non-structural)

Proposed remedial actions for identified dam health and safety risks and non-compliances are described in Table 8-78.

Table 8-78. Actions to address non- structural dam non-compliances and risks (Ngolongozya Dam).

Code	Aspect	Risk	Action required
Construction Remediation Phase			
HSI-1	Rehabilitation of borrow pits	Failure to rehabilitate causing increased malaria risks and increased risk of children being injured or drowning.	• Comply with ENI-4, ENI-9 action requirements. • Ensure borrow pits free draining to avoid malarial breeding sites and minimise drowning risks.
HSH-2	Community health and safety	Drowning due to absence of warning signs.	• Design and erect appropriate hazard notices. • Sensitise communities to risks.
HSH-3	Access across the river	Lack of a bridge/crossing with increased risk of community injury and drowning.	• Construct pedestrian access across the river downstream of the dam (or in location best suited for convenient community access).(A drift alresdy exists and a gazetted road downstream)
Operational Phase			
HSH-4, HSH-5, HSH-6, HSH-7,	Community health and safety	Injury or illness caused by lack of knowledge of dam risks.	• Develop a training programme for communities who live around the dam. • Train communities in accordance with the plan (including drinking water and water borne diseases,

Code	Aspect	Risk	Action required
HSH-8, HSH-9			avoidance of dangerous spillway crossings, swimming risks, emergency preparedness in floods or dam failure, risks of interactions with wildlife).

8.9.3.3 Actions to address environmental non-compliances and risks

Proposed remedial actions for identified environmental risks and non-compliances are described in Table 8-79. Several non-compliances are combined into a single action in some instances. All actions described are to be included in the ESMP to be developed for the construction remediation phase and operational phase of the dams.

Table 8-79. Actions to address environmental non-compliances and risks (Ngolongozya Dam).

Code	Aspect	Risk	Action required
Construction Remediation Phase			
ENI-1	Demobilisation and Restoration Plan	Plan ensures structured management to minimise environmental risk of dam construction impacts.	• Prepare plan as part of the requirements of the ESMP.
ENI-2, ENI-3,	Rehabilitation of disturbed works areas	Erosion and sedimentation.	• Conduct detailed site inspections. • Define and map disturbed areas where rehabilitation/erosion control is required. • Develop method statements for each area, including problem statement, method of rehabilitation, resources needed and responsibilities (See ENI-1 above). • Implement rehabilitation and monitor effectiveness over three years.
ENI-5	Rehabilitation of community roads	Loss of community access	• Rehabilitate community roads used by the contractor. • Close and rehabilitate any informal bush tracks made by the contractor.
ENI-4; ENI-9	Rehabilitation of borrow pits	Erosion and sedimentation. Weed infestation. Entrapment risk to wild animals	• Conduct detailed site inspections. • Prepare detailed rehabilitation plan for each borrow area. Define methodologies for top-soiling and reseeding with natural grass seed mixtures. • Reduce slopes and backfill with inert spoil, where necessary/possible, to create safe conditions that avoid entrapment of animals and accumulation of water. • Monitor effectiveness of rehabilitation over three years.
ENI-6, ENI-8	Waste, construction infrastructure and rubble	Weed infestation, loss of productive land	• Conduct detailed site inspections. • Prepare snag list defining each area where remedial action is necessary, and the required actions. • Waste/rubble to be removed to government-approved disposal sites.

Code	Aspect	Risk	Action required
ENI-10	Sanitary waste	Groundwater and surface water pollution.	• Identify and map location of all pit latrines. • Define methods to ensure safe capping with no pollution risk.
ENI-7	Hazardous waste, hydrocarbon-polluted soils	Groundwater and surface water pollution.	• Conduct detailed site inspections. • Prepare snag list defining each area where remedial action is necessary, including location of waste oil drums and/or other hazardous chemicals, location of oil-contaminated soils and the required actions. • Define methods for soil remediation. • Implement and monitor recovery. • Hazardous waste to be removed to a government-approved hazardous waste disposal site.
ENI-11	Environmental flow releases	Inability to monitor and assess downstream ecological effects of dam operation.	• Design and install gauge plates. • Undertake assessment of downstream aquatic and riparian conditions as a basis for flow requirements and monitoring to be imposed on the operational phase of the dam. • Undertake assessment of the ecological effect of stocking the dam with fish (particularly *O. nilotica*)
Operational Phase			
ENI-12, ENI-13, ENI-14	Environmental flow releases	Inability to monitor and assess downstream ecological effects of dam operation.	• Ensure adherence to the prescribed environmental flow and other management requirements. • Develop O&M plan to include ecological flow requirements. • Appoint and train flow reader. • Maintain flow records. • Monitor dam impact on aquatic environment (monitoring plan to be determined in the assessment phase above).

8.9.3.4 Actions to address social non-compliances and risks

Proposed remedial actions for identified social risks and non-compliances are described in Table 8-80. Several non-compliances are combined into a single action in some instances. All actions described are to be included in the ESMP to be developed for remediation of the site in the construction remediation phase and the operational phase of the dams.

Table 8-80. Actions to address social non-compliances/risks (Ngolongozya Dam).

Code	Aspect	Risk	Action required
Construction Remediation Phase			
SCI-1	Community irrigation water supply	Failure of project to meet its primary objective	• Review irrigation system design • Construct revised irrigation design
Operational Phase			
SCI-2	Community development	Food security – failure to stock the dam with fish	• Stock the dam with fish. To be assessed.

Code	Aspect	Risk	Action required
SCI-3	Community health and safety	Injury or illness caused by use of pesticides.	• Develop a training programme for PAPs in the irrigation area concerning safe use of pesticides using the integrated pest management programme (IPM) prepared for the project.
SCI-4	Community development	Lack of capacity/training to benefit fully from irrigation water supply	• Strengthen the dam or irrigation committee to ensure cooperation and spread of benefits to a wider section of the community.
SCI-5	Community Development	Lack of capacity to benefit fully from irrigation water supply	• Train PAPs in irrigation agricultural techniques, knowledge of the types of high value crops to cultivate and other enterprises besides agriculture that could assist in income generation
SCI-6	Community health and safety	Lack of capacity to respond effectively to emergencies related to the dam	• Update Emergency Response Plan

8.10 Dam 10 Nachibanga

8.10.1 Characteristics of the dam and surrounding area

8.10.1.1 Dam and catchment characteristics

Nachibanga dam is an old earth fill dam constructed around 1968 by the Ministry of Agriculture and then rehabilitated in 1998. It was built solely for livestock watering and thus has no outlet. It is situated 21 km south of Pemba in Pemba District on the Lunyiwamakubi stream. Access to the site is off the D363 near the village of Muzoka via a 1,5 km track. All of the roads are in poor condition.

The construction works, started in 2016, has included raising the embankment for additional storage and freeboard by 2m, raising the spillway by 1m, constructing the spillway training wall and constructing two new drop structures (COWI, 2018a).

The location of the dam and its main characteristics are described in Table 8-81.

Table 8-81. Location and main characteristics of Nachibanga dam.

DAM # 10: NACHIBANGA	Features
Location of the Dam	
Province	Zambian Southern Province
District	Pemba District
Location of the dam (D.ddddd°)	S16.71120° E27.34200°
Name of the river/stream on which the dam was built	Lunywamakubi Stream
Dam Characteristics and Dimensions	
Dam type/material	Zoned earth fill embankment
Size classification (COWI, 2019ac)	Small (based on ICOLD)
Hazard Classification	
- Potential loss of lives	Low
- Potential economic loss	Low
- Potential adverse impact on resource economy	Low
- Maximum hazard classification	Low
Hazard Potential Classification	Low
Year dam was constructed	Unknown
Contractor name	Tawanda
Wall height	8.5 m
Wall length	128 m
Volume storage	50,000 m^3
Reservoir surface area (at FSL)	ha
Reservoir catchment area	2.17 km^2
Maximum depth at FSL	5.8 m to be raised by 1m
Spillway (main)	Open channel at end of left flank with one reinforced concrete drop structure

Spillway (emergency)	Nil
Catchment area	2.17 km^2
Throwback	Unknown
1:50 year design flood	19.1 m^3/s
1:100 year flood	22.7 m^3/s
Safety Evaluation Flood (SEF)	26.6 m^3/s
Other	
Foundation	Unknown
Foundation treatment	Unknown
Drainage system	Unknown
Outlet works and scour	Unknown
Monitoring instruments	None

Figure 8-39. Satellite view of Nachibanga dam and surrounding area (imagery date July 2011).

Figure 8-40. Nachibanga dam - detail of the wall.

8.10.1.2 Physical environment

The project site (Nachibanga dam) is located in the Pemba District of Southern Province. The site is about 80 km south of Pemba town. Pemba District lies in both the Zambezi and the Kafue river basins. Tributaries of these two major rivers flow to the south and north of the district, respectively. Nachibanga dam is located on the Lunywamakubi River, a tributary of the Zambezi River.

The climate in Southern Province of Zambia is humid subtropical, with dry winters and hot summers. Mean temperatures of the project area are 19.3 °C, with the hottest month in October (30.9 °C) and the coldest month in July (4.3 °C). The mean seasonal rainfall from October to May varies between 700 and 800 mm with average total rainfall of 757 mm for the province.

Geology around the proposed project site is characterised by metamorphic (essentially undifferentiated schist and quartzite) rocks of the Basement Complex belonging to the Older PreCambrian age. The dominant aquifer is the schist comprising Muva schist and minor quartzite in which groundwater flow is mainly in fissures, channels and other discontinuities, but the aquifers in the area have low or limited water yields.

The area around Nachibanga is typically undulating plateau and the altitude at the dam is 1,245 masl. Land use in the area is characterised by forest, grassland, agriculture, rural settlement and water bodies. Local people practice mixed farming with cattle and crop production being the most important economic activities.

The local community draws its drinking water mainly from the boreholes and shallow wells near the Nachibanga dam. The surface water is used mainly for washing and other domestic and economic uses such as irrigation and livestock watering. A sample of water from the dam in March 2015 showed water quality does not meet the drinking water standard set by the Zambia Bureau of Standards (ZABS), mainly due to high total suspended solids. There is a possibility of pollution from agriculture (application of fertilisers and pesticides). The water is generally suitable for irrigation.

8.10.1.3 Biological environment

The project area consists of wooded grasslands (nearest to the project site) and deciduous forest further away to the north and east. The wooded grasslands are a naturally treeless and grassy area while the deciduous forest has features of Munga woodland on heavy soils characterised by Combretum, Acacia and Syzygium tree species.

WRDP EPB (2016) lists a variety of wild fauna, none of which are verified. Fauna are likely to be depauperate due to the intensive hunting pressure by human populations in the area and the transformation of habitats (refer to Figure 1). The wild dog (*Lycaon pictus*) is listed but it is unlikely that its range will extend into this highly developed rural environment.

The frog species *Hyperolius pyrrhodictyon* is endemic to the project area. It is known only from the area of the Kafue river in Zambia and the uplands to the south, but does not extend as far as the Zambesi River. Its distributional limits are not well known. It is classified as 'Least Concern' in the IUCN Red Data list. Its presence has not been confirmed in or around Nachibanga dam.

Hippopotamus (*Hippopotamus amphibius*), a Red Data species listed as 'Vulnerable', is also found in areas around the Nachibanga Dam. Given its wide ranging habits, it is possible that it is resident in the dam although this is not confirmed in WRDP EPB (2016).

Around twenty fish species occur in the water bodies in Pemba (identified from a fish manual and information obtained from local communities). The Nachibanga reservoir has significant populations of fish harvested by the local community. Three Cichlids (Bream) are recorded, namely *Oreochromis niloticus, Tilapia rendallii* and *Oreochromis andersonii,* but despite ongoing fishing activities over the years, there are no accurate catch statistics.

Use of the Integrated Biodiversity Assessment Tool (IBAT) shows 27 potentially occurring Red Data species - 6 mammal, 16 bird, 3 fish and 2 plant species within a 50 km radius of the dam site. The large mammals and most of the birds are unlikely to occur in the near vicinity of the dam site, where habitats are heavily transformed by cultivation and rural settlement, but may be found to the south in the direction of Lake

Kariba where there are two Forest Reserves (Forest Reserve 92, 54 km^2 in area and Forest Reserve Simwami-Wuzuma, 800 km^2 in area), which extend south westward towards the upper end of the lake.

One critically endangered cichlid and two vulnerable cichlids are recorded in the river system. The population decline amoung these species is due to the introduction of *O. niloticus* by anglers and aquaculturalists, which is displacing the other cichlids throughout their ranges. Its occurrence in Nachibanga dam has been confirmed by local communities.

One Key Biodiversity Area (KBA) falls within the 50 km buffer – the Nkanga River Conservation Area, located some 40 km north west of the dam. This is made up of three private farms which are well known birding destinations, with over 400 species of birds recorded.

Table xx: Red Data species recorded in IBAT within a 50 km radius of the Nachibanga Dam

Species (common name)	**Scientific name**	**IUCN Red Data Status**
Mammals		
Black rhinoceros	*Diceros bicornis*	CR
African wild dog	*Lycaon pictus*	EN
African elephant	*Loxodonta africana*	VU
Lion	*Panthera leo*	VU
Leopard	*Panthera pardus*	VU
Temminck's pangolin	*Smutsia temminckii*	VU
Birds		
White-backed vulture	*Gyps africanus*	CR
Hooded vulture	*Necrosyrtes monachus*	CR
White-headed vulture	*Trigonoceps occipitalis*	CR
Steppe eagle	*Aquila nipalensis*	EN
Madagascar pond-heron	*Ardeola idae*	EN
Grey crowned crane	*Balearica regulorum*	EN
Cape vulture	*Gyps coprotheres*	EN
Lappet-faced vulture	*Torgos tracheliotos*	EN
Tawny eagle	*Aquila rapax*	VU
Southern ground-hornbill	*Bucorvus leadbeateri*	VU
Wattled crane	*Bugeranus carunculatus*	VU
Slaty egret	*Egretta vinaceigula*	VU
Taita falcon	*Falco fasciinucha*	VU
Zambian barbet	*Lybius chaplini*	VU
Martial eagle	*Polemaetus bellicosus*	VU
Secretarybird	*Sagittarius serpentarius*	VU

Species (common name)	Scientific name	IUCN Red Data Status
Fish		
Kariba tilapia	*Oreochromis mortimeri*	CR
Threespot tilapia	*Oreochromis andersonii*	VU
	Oreochromis macrochir	VU
Plants		
	Nymphoides tenuissima	EN
	Oreochromis macrochir	VU

8.10.1.4 Socio-economic environment

Pemba District is well serviced by the Choma–Pemba road linking to the Great North Road and the national railway line. There is also an 8 km gravel road and a pontoon linking the district to Itezhitezhi District. Access to Nachibanga dam is by an 8 km feeder road.

According to the 2010 census of population and housing, the Pemba constituency has a population of 64,918. Nachibanga Dam lies in Nachibanga Ward which has 1,557 households and a total population of 9,036, where 4,278 are male and 4,758 are female. Pemba District has only one constituency and seven wards.

Subsistence farmers make up most of the population. Few people are in formal employment and comprise mainly teachers, agricultural or health workers and NGO staff. Trust land and traditional land make up the two main forms of land tenure in the district. Most of the trust land is reserved forest area. The administrative part of the district is characterised by commerce with small-scale and emergent farms in peri-urban areas. Cattle rearing is the most important economic activity, followed by crop production.

A total of six clinics serve the community of Pemba District, namely Pemba main clinic, Kasiya clinic, Kanchomba clinic, Muzoka clinic, Mooya clinic and Ndondi clinic. New health posts are currently being built.

Pemba District has a total of 64 schools, of which 61 are primary schools. Three secondary schools are located in the area - Pemba Secondary School in Pemba ward, Jembo Mission School in Hamaundu ward and Ndondi Secondary School in Nachibanga ward.

Kasiya Business and Secretarial College, located 11 km west of Pemba town centre, is graded as a level one college by the Technical Education, Vocational and Entrepreneurship Training Authority (TEVETA).

8.10.2 Non-compliance issues and risks

8.10.2.1 Dam safety (structural) risk

The main structural safety concerns are described in Table 8-82. These are summarised from UNOP (2019).

Table 8-82. Dam safety compliance status and risks (Nachibanga Dam).

Code	Aspect	Concern/non-compliance	Risk
Construction Remediation Phase			
SFJ-1	Structural safety	Dam has a large catchment for a 'small dam' and requires a non-erodible spillway. Spillway thought to be undersized.	Exceeding the capacity of the spillway during design floods. Downstream community safety.
SFJ-2	Structural safety	Abutments inadequate and can be bypassed by a flood.	Erosion hazard and embankment stability - downstream community safety.
SFJ-3	Structural safety	Drop structure constructed on weathered granite has been undermined and temporarily propped with sand bags.	Uncertain capacity to accommodate design flood – downstream community safety.
SFJ-4	Structural safety	No obvious seepage from the dam but uncertain whether there are rock toe drains installed.	Seepage and embankment instability – downstream community safety.
SFJ-5	Structural safety	Heavy livestock use impacts on integrity of the embankment. No stone pitching on U/S side.	Embankment erosion – downstream community safety.

Dam crest in the dry season (November 2019).

Dam crest in the wet season (March 2018).

Concrete causeway (November 2019) in the dry season. Note cattle presence and gulley eroding back to the spillway.

Gulleying in spillway channel (March 2018).

Second drop weir (November 2019). Undermining evident.

Figure 8-41. Nachibanga Dam.

8.10.2.2 Dam health and safety (non-structural) risks

The main non-structural community health and safety concerns associated with the dam are described in Table 8-83.

Table 8-83. Dam health and safety compliance requirements and risks.

Code	Aspect	ESMP/ARAP requirement	Risk	Status on site
Construction Remediation Phase				
HSJ-1	Community health and safety	Rehabilitation of borrow pits to avoid ponding of water creating of mosquito breeding grounds and risk of drowning or injury.	Increased malaria risks. Increased risk of children drowning.	Not done.
HSJ-2	Community safety	Erection of safety hazard signs around the dam.	Serious or fatal incidents/drownings.	Not done.
HSJ-3	Community health and safety	Provision of safe pedestrian access across the river.	Serious or fatal incidents/drownings.	Uncertain. Reference not found in instruments.
Operational Phase				
HSJ-4	Community safety	Provide dam emergency safety talks/ sensitisation and training to local community and dam committee.	Lack of knowledge about actions to take in emergencies.	Not done.
HSJ-5	Community safety	Sensitization of community to avoid risk of spillway crossings.	Serious or fatal incidents/drownings.	Not done.

Code	Aspect	ESMP/ARAP requirement	Risk	Status on site
HSJ-6	Community safety	Enforcement of dam safety and security measures around the dam.	Serious or fatal incidents/drownings.	Not done.
HSJ-7	Community safety	Warning prior to opening of overflow pipes in the event of flooding.	Serious or fatal incidents/drownings.	Not done.
HSJ-8	Community Safety	Safety sensitisation and awareness programmes of swimming risks particularly for children.	Serious or fatal incidents/drownings.	Not done.
HSJ-9	Community health	Sensitization of community to impacts of drinking untreated water.	Increased prevalence of water borne diseases.	Not done.

8.10.2.3 Environmental risks

Nachibanga Dam is situated in modified habitats that have been significantly transformed by cultivation, bush clearing for charcoal and firewood, and overgrazing. No Red Data species are recorded in the Environmental Project Brief (WRDP, 2016) or the COWI (2018) ESMP, apart from a reference to the African wild dog (WRDP, 2016:3), which is highly unlikely to occur. The increased area of inundation does not appear to have affected any habitats of exceptional conservation value, although there is little information in the existing reports to support a proper evaluation. The IBAT listing of Red Data species within a 50 km provides an indication of possible occurrence in the forest reserves, two of which extend from near the dam towards the upper end of Lake Kariba, covering a combined area of around 892 km^2.

Environmental management requirements (post-construction) in the COWI (2018) ESMP are aimed at responsible demobilisation and site restoration. These requirements are included in Table 8-84, summarised from Section 4.6 and Section 6.1.6 of the ESMP. Table 8-84 shows the project status to be non-compliant with most of the requirements, and remedial action is required in these cases. No structured process of demobilisation and restoration has been followed and the plan required by the ESMP has not been prepared or implemented. A plate gauge has not been installed, as required by the ESMP.

Table 8-84. Environmental compliance status and risks (Nachibanga Dam).

Code	Aspect	Safeguard requirement (ESMP/ARAP)	Risk	Compliance status
Construction Remediation Phase				
ENJ-1	Demobilisation and Restoration	Prepare Demobilisation and Restoration Plan.	Plan ensures structured management to minimise environmental risk of dam construction impacts	No plan prepared or implemented
ENJ-2	Rehabilitation of work areas	Rehabilitate disturbed work areas and restore as close as possible to original	Erosion and sedimentation. Alien	Grass cover on both U/S and D/S embankment slopes. Whether topsoil was spread is unknown.

Code	Aspect	Safeguard requirement (ESMP/ARAP)	Risk	Compliance status
		contours. Restore topsoil from stockpiles. Replant with native plant seed mixes, where natural revegetation likely to be unsuccessful.	plant infestation. Loss of use of land.	
ENJ-3	Rehabilitation of work areas	Install drainage structures to reduce uncontrolled runoff. Plant fast growing trees in erosion-prone areas	Erosion and sedimentation. Loss of habitat	Not done.
ENJ-4	Rehabilitation of borrow pits	Make borrow area safe. Stabilise steep slopes. Backfill to acceptable landform. Prevent accumulation of water. Topsoil. Reseed naturally or with indigenous seed mixtures.	Erosion and sedimentation	Not done.
ENJ-5	Site clean-up and rehabilitation	Repair community roads and paths. Close selected bush paths by ripping and revegetating. Close contractor paths around dam.	Erosion and sedimentation. Alien plant invasion. Loss of use of land.	No repair completed.
ENJ-6	Site clean-up and rehabilitation	Remove housing, office units, other infrastructure. Hand over any useful units to the community/dam committee. Rehabilitate campsite.	Alien plant invasion. Loss of use of land.	Not done. Campsite abandoned but not rehabilitated
ENJ-7	Hazardous waste	Recycle used hydrocarbons where possible. Dispose off-site in accordance with regulatory requirements. Bioremediate oil-contaminated soil in a land farm or use in-situ remediation where the contamination plume is shallow.	Surface and groundwater pollution. Soil contamination.	Not done. No oil recycling took place during construction. Waste hydrocarbons may be present on site. Hydrocarbon-contaminated soils may also be present, particularly at the camp site refuelling bays and in other areas where drip trays and oil containment measures were not taken. No biological remediation of contaminated soils was done.
ENJ-8	Non-hazardous construction waste	Dispose all rubble and other non-hazardous waste at a ZEMA/ local authority certified landfill. Level and rehabilitate heaps of soil.	Water and soil pollution.	No systematic process of site clean-up done.

Code	Aspect	Safeguard requirement (ESMP/ARAP)	Risk	Compliance status
ENJ-9	Non-hazardous construction waste	Use overburden spoil to backfill the borrow pits.	Erosion and sedimentation.	No systematic process of site clean-up and rehabilitation done.
ENJ-10	Sanitary waste	Dismantle and bury pit latrines after applying lime.	Groundwater pollution.	Not done.
ENJ-11	Downstream ecological flow	Install gauge plates to measure water levels and water releases.	If not done, absence of data to evaluate downstream flow impacts.	Not done.
Operational Phase				
ENJ-12	Environmental flow releases	No flow requirement specified.	Impact assessed as ecologically positive due to increased reliability of downstream flow.	No measurement of flow or evaluation of downstream impact.
ENJ-13	Environmental flow releases	Designated flow gauge reader to record flow results.	If not done, inability to monitor and manage downstream ecological impacts (positive or negative)	Not done.
ENJ-14	Performance monitoring	Undertake performance and impact monitoring as a basis for adaptive management.	If not done, failure to understand and manage long term impacts.	Not done. No description of monitoring requirements in the COWI (2018) ESMP.

Figure 8-42. Approximate position of drop structures in the downstream return channel (March 2016).

8.10.2.4 Social risks

There are no PAPs who will suffer losses as a result of the civil works for the dam. The increase in FSL level has not impacted on any cultivated land or assets for which compensation would be required. No ARAP was specified for this dam and social impact management was limited to specifications in the COWI (2018) ESMP. Compliance relates to matters concerning training and capacity building among project beneficiaries and institutions to encourage the most social benefit from the use of the dam as possible.

Table 8-85. Social compliance status and risks (Nachibanga Dam).

Code	Aspect	ESMP/ARAP requirement	Risk	Status on site
Construction Remediation Phase				
SCJ-1	Community Irrigation Water Supply	Construction of irrigation water supply for downstream community	Failure of project to consider secondary objectives	It is not clear why irrigation usage for farmers downstream of this dam was not considered in the design (Note: the COWI, 2018c ESMP refers to irrigation but it appears this was cut and paste). This dam is mainly use for watering livestock.
Operational Phase				
SCJ-2	Community development	Stocking of the dam with fish.	Failure to meet project objectives of improved livelihoods for local communities	Not done. To be assessed.
SCJ-3	Siltation of dam	Farmers to identify designated points of stock watering to avoid siltation due to animal stampede	Erosion and sedimentation of dam	Not done.
SCJ-4	Institutional capacity building	Institute a strong committee or cooperative management structure to ensure appropriate use of the water. Devise clear rules and regulations to be complied with by members of the scheme. Foster organized livelihood activities including fishing.	Lack of capacity to benefit fully from irrigation water supply	Not done.
SCJ-5	Training of beneficiaries	Assist PAPs with training to improve their knowledge of irrigation agriculture, high value crops to cultivate and other enterprises besides agriculture that could assist in income generation.	Lack of capacity to benefit fully from irrigation water supply.	Not done.
SCJ-6	Community health and safety	Update of the generic Emergency Response Plan to be dam-specific	Inability to effectively manage emergencies caused by the dam	Not done.

Existing gardens downstream of the dam benefitting from the dambo (November 2019).

Bucketing water for gardens downstream of the dam (November 2019).

8.10.2.5 Actions to address dam safety risks (Structural)

Proposed remedial actions for identified dam safety risks and non-compliances during construction are described in Table 8-9.

Table 8-86. Actions to address structural dam non compliances and risks (Nachibanga Dam).

Code	Aspect	Risk	Action required
Construction Remediation Phase			
SFJ-1	Structural safety	Embankment slopes too steep	• Re-slope embankments to design requirement of 1V:3H U/S and 1V/2H D/S. Reinstate topsoil and grass on D/S embankment and rock cladding on U/S embankment
SFJ-2	Structural safety	Seepage and tension cracks on the right bank. The right bank berm material may be dispersive	• Monitor seepage and tension cracks. • Install rock toe drains. • Excavate and replace as much dispersive material as possible.
SFJ-3	Structural safety	Spillway capacity unknown. Spillway not built according to the design drawings	• Confirm spillway meets design flood requirements
SFJ-4	Structural safety	Gabion baskets poorly tied into embankment and not horizontal	• Check (and if necessary) re-design gabions. Reconstruct them to be fit for purpose.

8.10.2.6 Actions to address dam health and safety risks (non-structural)

Proposed remedial actions for identified dam health and safety risks and non-compliances are described in Table 8-87.

Table 8-87. Actions to address non-structural dam non-compliances and risks (Nachibanga Dam).

Code	Aspect	Risk	Action required
Construction Remediation Phase			

Code	Aspect	Risk	Action required
HSJ-1	Rehabilitation of borrow pits	Failure to rehabilitate causing increased malaria risks and increased risk of children drowning or injury.	• Comply with ENJ-4, ENJ-9 action requirements. • Ensure borrow pits free draining to avoid malarial breeding sites and minimise drowning risks.
HSJ-2	Community health and safety	Drowning due to absence of warning signs.	• Design and erect appropriate hazard notices. • Sensitise communities to risks.
HSJ-3	Access across the river	Lack of a bridge/crossing with increased risk of community injury and drowning.	• Construct pedestrian access across the river downstream of the dam (or in location best suited for convenient community access).
Operational Phase			
HSJ-4, HSJ-5, HSJ-6, HSJ-7, HSJ-8, HSJ-9	Community health and safety	Injury or illness caused by lack of knowledge of dam risks.	• Develop a training programme for communities who live around the dam. • Train communities in accordance with the plan (including drinking water and water borne diseases, avoidance of dangerous spillway crossings, swimming risks, emergency preparedness in floods or dam failure, risks of interactions with wildlife).

8.10.2.7 Actions to address Environmental Non-Compliances and Risks

Proposed remedial actions for identified environmental risks and non-compliances are described in Table 8-88. Several non-compliances are combined into a single action in some instances. All actions described are to be included in the ESMP to be developed for the construction remediation phase and operational phase of the dams.

Table 8-88. Actions to address environmental non compliances and risks (Nachibanga Dam).

Code	Aspect	Risk	Action required
Construction Remediation Phase			
ENJ-1	Demobilisation and Restoration Plan	Plan ensures structured management to minimise environmental risk of dam construction impacts	• Prepare plan as part of the requirements of the ESMP
ENJ-2, ENJ-3	Rehabilitation of disturbed works areas	Erosion and sedimentation	• Conduct detailed site inspections • Define and map disturbed areas where rehabilitation/erosion control is required • Develop method statements for each area, including problem statement, method of rehabilitation, resources needed and responsibilities (See ENJ-1 above).

Code	Aspect	Risk	Action required
			• Implement rehabilitation and monitor effectiveness over three years.
ENJ-5	Rehabilitation of community roads	Loss of community access	• Rehabilitate community roads used by the contractor • Close and rehabilitate any informal bush tracks made by the contractor
ENJ-4; ENJ-9	Rehabilitation of borrow pits	Erosion and sedimentation. Weed infestation. Entrapment risk to wild animals	• Conduct detailed site inspections • Prepare detailed rehabilitation plan for each borrow area. Define methodologies for top-soiling and reseeding with natural grass seed mixtures. • Reduce slopes and backfill with inert spoil, where necessary/possible, to create safe conditions that avoid entrapment of animals and accumulation of water • Monitor effectiveness of rehabilitation over three years
ENJ-6, ENJ-8	Waste, construction infrastructure and rubble	Weed infestation, loss of productive land	• Conduct detailed site inspections • Prepare snag list defining each area where remedial action is necessary, and the required actions • Waste/rubble to be removed to government-approved disposal sites
ENJ-10	Sanitary waste	Groundwater and surface water pollution	• Identify and map location of all pit latrines • Define methods to ensure safe capping with no pollution risk
ENJ-7	Hazardous waste, hydrocarbon-polluted soils	Groundwater and surface water pollution	• Conduct detailed site inspections • Prepare snag list defining each area where remedial action is necessary, including location of waste oil drums and/or other hazardous chemicals, location of oil-contaminated soils and the required actions • Define methods for soil remediation • Implement and monitor recovery • Hazardous waste to be removed to a government approved hazardous waste disposal site
ENJ-11	Environmental flow releases	Inability to monitor and assess downstream ecological effects of dam operation	• Design and install gauge plates. • Undertake assessment of downstream aquatic and riparian conditions as a basis for flow requirements and monitoring to be imposed on the operational phase of the dam. • Undertake assessment of the ecological effect of stocking the dam with fish (particularly *O. nilotica*)
Operational Phase			
ENJ-12, ENJ-13, ENJ-14	Environmental flow releases	Inability to monitor and assess downstream ecological effects of dam operation	• Ensure adherence to the prescribed environmental flow and other management requirements. • Develop O&M plan to include ecological flow requirements. • Appoint and train flow reader. • Maintain flow records. • Monitor dam impact on aquatic environment (monitoring plan to be determined in the assessment phase above).

8.10.2.8 Actions to address Social Non-Compliances and Risks

Proposed remedial actions for identified social risks and non-compliances are described in Table 8-89. Several non-compliances are combined into a single action in some instances. All actions described are to be included in the ESMP to be developed for remediation of the site in the construction remediation phase and the operational phase of the dams.

Table 8-89. Actions to address social non-compliances/risks (Nachibanga Dam).

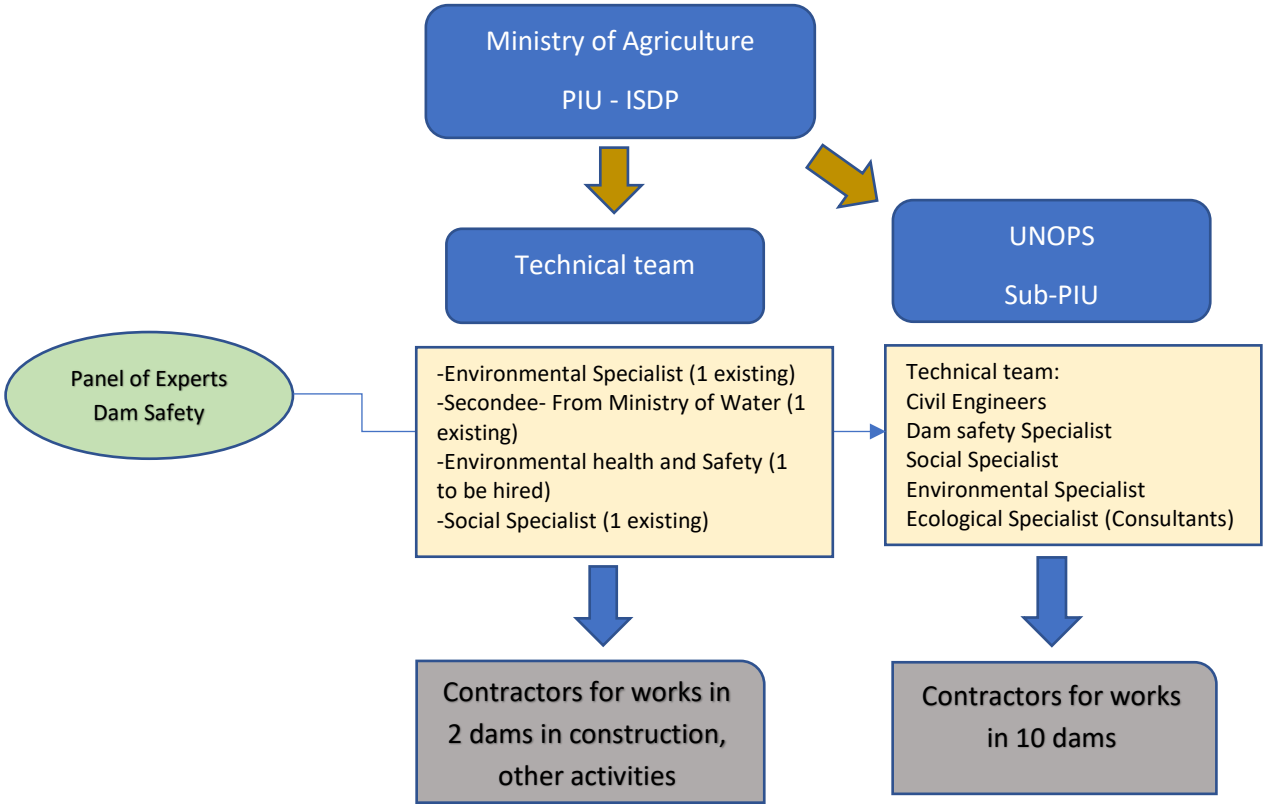
Code	Aspect	Risk	Action required
Construction Remediation Phase			
SCJ-1	Community irrigation water supply	Failure of project to meet its primary objective	• Dam used for livestock. Trough can be built by community.
Operational Phase			
SCJ-2	Community development	Food security – failure to stock the dam with fish	• Stock the dam with fish. To be assessed.
SCJ-3	Erosion and sedimentation in the dam	Uncontrolled stock watering	• Stock watering points and management of cattle access to the dam not determined
SCJ-4	Community development	Lack of capacity/training to benefit fully from irrigation water supply	• Strengthen the dam committee to ensure cooperation and spread of benefits to a wider section of the community.
SCJ-5	Community Development	Lack of capacity to benefit fully from irrigation water supply	• V1CTrain beneficiaries in livestock management related issues
SCJ-6	Livelihood restoration	Inability to evaluate success of programme to meet development goals and objectives	• Develop and implement a monitoring and evaluation programme based on the requirements of the ARAP
SCJ-7	Community health and safety	Lack of capacity to respond effectively to emergencies related to the dam	• Update Emergency Response Plan

9 Measures and procedure for the preparation of the ESIA/ESMP for the dam remedial works.

9.1 Institutional arrangements for environmental and social management

The Government of Zambia and the World Bank have agreed to implement this AF in the following scheme:

1. The PIU of the ISDP is placed within the Ministry of Agriculture and will have overall responsibility for the fiduciary management of the funds and the management of the environmental and social implementation in the AF.
2. The PIU of ISDP will remain responsible for the implementation of the additional funds from the AF for the current project activities under Component 1 that includes the construction of two large dams, Drought Emergency Response which include the purchase of seeds and fertilizers, among other things.
3. The PIU of ISDP will hire two environmental consultants with experience in Health and safety to support the supervision of the ongoing dam construction and overall supervision. Terms of reference are described in Annex 1.
4. The PIU of ISDP will provide support to the dam remediation activities through a dam safety panel of experts who will have oversight over the works, remediation plans, safety plans, etc and who will monitor compliance with OP/BP 4.37 Dam safety and the policy requirement for large dams.
5. The PIU will hire the United Nations Office for Project Services (UNOPS) to implement the AF activities related to the remediation of the dams including the environmental and social management and implementation of the measures described in this ESA and the ESMPs and remediation plans to be prepared for each dam.
6. The UNOPS technical team will include, among others (as described in the figure below):
    a. One Environmental Specialist and one Social Specialist who will fulfill the Terms of reference described in Annex. 1; and
    b. Specialist aquatic and terrestrial ecologists to undertake the biodiversity assessment described in the Terms of reference in Annex. 1
    c. One Dam Safety Expert.



9.2 Action Plan to bring the dams into compliance with World Bank Safeguard Policies

Table 2 described the triggered WB Safeguards policies for the WRDP, the ISDP parent project and the AF operation. The Mid-Term Review of the WRP in April 19, 2017 identified non-compliance with the World Bank's safeguards policies and quality issues at the dams constructed under the project and recommended corrective measures for safeguards compliance at these dams. Many of the recommended corrective measures were not implemented. As detailed in the Implementation Completion Report (ICR) of the WRDP[8],the project closed with non-compliance with several of the WB Safeguard policies. The findings of this ESA confirm that significant risks, environmental and social liabilities are still pending resolution for these 10 dams and thus the implementation of the proposed remedial works under this AF are critical to reduce risks and mitigate the current environmental and social impacts caused.

This ESA used the agreed measures, environmental and social instruments approved by the World Bank before appraisal of the WRDP and the evaluations and assessment prepared during implementation to manage the environmental and social impacts[9] of these dams to assess the level of risks and compliance with the WB Safeguard Policies and National Regulations. While some of these instruments were only developed when construction was already underway, they were in place by the time the contracts were canceled.

[8] http://documents.worldbank.org/curated/en/712211582563576867/Zambia-ZM-Water-Resources-Development
[9] COWI (2018a, 2018b, 2018c), ESMPs, COWI (2018 j-s), ARAPs (see Reference section)

The next section describes specific risks and actions to be taken to comply with the WB Safeguards Policies that are mandatory for the preparation of the ESMP and the design of remedial works during the construction and operational phases of the project. The PIU of ISDP will verify that UNOPS fully complies with the requirements, actions, instruments and protocols, described in this ESA.

9.2.1 Environmental Assessment

Relevant World Bank Policy: OP 4.01 Environmental Assessment

1. **National requirements.** The PIU of ISDP will confirm with the Zambia Environmental Management Authority, the need for an ESIA or for EPB, according to consultations during the preparation of this ESA, it was not going to be necessary.

2. **Instrument to be prepared to comply with OP 4.01.** Since these are existing dams and the main objective is to mitigate existing environmental and social impacts and liabilities, it has been agreed with the government that the instrument to be prepared is an ESMP for each dam.

3. **The ESMPs will focus in each specific site and specific measures** will be included for both construction and operation phases. The ESMP will consider the works, repair or rebuild sections of the dams that were inadequately designed or are failing due to poor construction methods; and to reinstate areas which were disturbed but not rehabilitated during the previous contract.

4. **The civil works team will work closely with the environmental and social team** in the preparation of the ESMP. Since the ESMP measures will require integration with the technical design team (e.g. on issues such as ecological flows). The ESMPs must be completed and approved before the contractor for the Remedial works establishes on site. The ESMPs should cover the management of all work up to the end of the Contractor's liability period.

5. **Measures to address all environmental risk, existing environmental and social impact** and liabilities left by the project must be resolved through this AF. Also, the ESMPs will include gender equality and gender-based violence measures as described below.

6. **The World Bank requires the application of the country regulations applicabl**e to the remediation works and these include EIA, labour and working conditions, waste management, water pollution, noise, and other as needed. Contractors and subcontractors hired through the AF will have to comply with these regulations including with the Zambian labour law and to provide fair working conditions and decent accommodation, clean water for drinking for workers, among other measures described in this ESA. For unskilled labour, the contractor should hire from the local area in consultation with the traditional authorities.

7. **Other Instruments.** The AF will prepare instruments that are needed to manage the impact of the dams on **community health and safety plans, ecosystems and operational risk** and these must be prepared and implemented in the project areas.

8. **Community Health and safety** interventions were outlined in the ESMPs for the previous contracts but, as shown in the audit, have not been fulfilled yet. They include physical structures, in some instances, such as pedestrian bridges providing alternative access across the rivers / dams (Chibalashi and possibly elsewhere); but are mainly about training of communities to minimise health and safety risks in relation to the dam and working with local institutions to improve capacity to manage these problems in the future.

9. Finalising the requirements for river / dam crossings must be done in consultation with communities in the design phase of the Remedial works and include in the tender documents for the Contractor. A separate process fo**r training and capacity building** during the course of the Remedial works must be planned. This will allow separation of the instruments required for the construction contract and community training.

10. Work necessary to determine ecological interventions required at the dam sites must be prioritized so that any structural requirements can be implemented while the contractors are still on site.

9.2.2 Stream Regulation

Relevant World Bank Policy: OP 4.04 Natural Habitats

Aquatic ecosystems and ecological flows. The impact of the operation of the dams on downstream flow and the induced impacts of increasing human populations on both aquatic and terrestrial ecosystems was poorly assessed in the previous safeguard instruments. Neither the Environmental Project Briefs, originally used as the basis for approval of the projects, nor the subsequent work done by consultants to prepare the ESIAs for Katembula and Chibalashi, and to improve the ESMPs, provided an adequate basis for the assessment of these impacts. No baseline studies were done, and experienced specialist ecologists were not involved in the preparation of the instruments. IBAT indicates the possibility of the presence of critically endangered, endangered and vulnerable aquatic species in the dam areas. By definition of OP 4.04, if these species are present, these areas may qualify as critical habitats.

The previously developed safeguard instruments listed some of the ecological impacts associated with dams and flow regulation but argued in favour of the dams as a means of guaranteeing flow in the downstream system in the dry season and during times of drought. This presupposes that flows will be managed to benefit downstream ecology, which, given capacity limitations and cost, has not occurred; and while there may be benefit in supplementing ecological baseflows in dry periods, this does justify the potential negative impacts on aquatic ecosystems of altered flow regime.

Cumulative changes brought about by the dams may negatively affect the downstream aquatic and wetland environment and may also impact upstream on the river system as a whole by creating a barrier to the movement of aquatic species. Depending on the trap efficiency of the dams, they may also starve the downstream areas of sediment, increasing the erosive potential of flows and the risk of channelling and drying out the wetlands.

Action: The specialist ecological team will assess in the field (with field data collection, where necessary) the presence of critically endangered, endangered and migratory species. Together with the technical team the specialists will determine the technical and structural actions needed during the design of the remediation works to ensure that appropriate ecological flows can be released at each dam. The capacity and effectiveness of the existing systems to release of water from the dams at times when there is not flow over the spillway will be reviewed in relation to ecological flow requirements.

9.2.3 Terrestrial Habitat and Biodiversity Losses

Relevant World Bank Policy: OP 4.04 Natural Habitats and OP 4.06 Forests

The previously developed safeguard instruments provide no meaningful account of the terrestrial impact of the dams. No baseline studies were done, the lists of species provided were unverified and incomplete and no critical analysis of possible direct, indirect or induced impacts was undertaken.

The impacts of habitat loss in the dam footprints may be the lesser part of the impact, at least in the case of some dams. Increasing populations supported by the irrigation schemes will create additional pressure on surrounding habitats, which may be important in the cases where the dams are in habitats with little transformation. The audit has shown that three of the dam sites – Nabowa, Kawiko and Chikowa are associated with substantial areas of adjacent forest lands). IBAT indicates the possibility of presence of critically endangered, endangered and vulnerable species within the area of influence of the dams. By definition of OP 4.04 if these species are present, these areas may qualify as critical habitats. With the operation of the dams and irrigation systems the risk of increasing human settlement and cultivation affecting these remaining forest patches and wild animal populations, as well as increased risk of poaching and fragmentation of habitats, is likely to be significant.

Action:

- Screen and, where necessary, prepare detailed field assessments of the impacts of the dams on terrestrial habitats, flora and fauna, where there is a likelihood of significant induced biodiversity impact and losses (forested areas). Prepare management and monitoring recommendations based on the outcome of the screening and field assessments, taking into account the likely effect of increasing human populations in the area (e.g. increased risk of poaching etc.).
- Remediation work can start prior to the completion of any detailed biodiversity investigations undertaken under Phase 2 of the Biodiversity Impact Assessment as long the biological studies are finished in time for any construction-related mitigation actions that need to be done by the contractor.

9.2.4 Cultural Heritage

Relevant World Bank Standard: OP 4.11 Physical Cultural Resources

The previously developed safeguard instruments made provision for reporting archaeological and cultural relics, in the event that they were found, and of avoiding graveyards which had already been identified. A Chance Find Procedure was not developed, hence no structured mechanism existed to guide actions in the event that relics were found. Grave sites that exist within the area of influence of the construction sites at the dams have already been identified although their extent does not appear to have been demarcated and it is not recorded how they were protected during construction. Provision is made in some of the ESMPs prepared in the past, provided alternative access to grave sites.

Action: Survey and map each grave site / graveyard and include specific requirements for management, such as temporary fencing, during the Remediation works. Verify through the Stakeholder Engagement process any other graves or culturally sensitive sites that have not been recorded. Where alternative access to graveyards / culturally sensitive sites is required, determine reasonable options for implementation in consultation with the affected communities.

9.2.5 Dam Safety

Relevant World Bank Policy: OP 4.37 Safety of Dams

Dam classification. All ten of the dams were initially classified as 'small' in the WRDP ISDS (February, 2013). This classification was not revisited during the detailed designs and construction phase of the dams. COWI (2019t-ac) continued to classify the dams as small, based primarily on ICOLD criteria, in their flood

hydrology reports. The most recent preliminary review by UNOPS (2019), based on the World Bank OP 4.37 policy, suggests that five of the dams should be reclassified as large dams, taking into consideration the as-built dam heights, the catchment size and characteristics, foundation stability and other issues associated with the integrity of the embankments. These large dams are Katambula, Chilabashi, Makaba, Nabowa and Ngolongozya.

Actions to be considered for the ESMP and remedial works:

Dam classification will be reviewed and agreed with the World Bank and once UNOPS completes the Phase 1 of their investigation.

Dam safety instruments. Dam safety plans will be prepared for all dams following the concept of proportionality; for small dams the O&M plan may be limited to a few pages to define roles and responsibilities to carry out regular maintenance (grass cutting, slope protection, outlet works maintenance) and regular inspections to detect any potential deficiency.

Emergency Preparedness Plan. The EPP will be tailored to each site depending on the dimensions of the dam and reservoir and clearly on risks, including downstream consequences of dam failure.

Panel of experts. A panel of experts will be appointed for the review of the investigations, design, construction, dam safety plans and the start of operation of the large dams.

9.2.6 Compensation and livelihood restoration

Relevant World Bank Policy: OP 4.12 Involuntary Resettlement

The ARAPs have provided a reasonable basis for compensating PAPs for lost crops. While being late (with all of the requirements for compensation and land replacement only being identified after construction began), the ARAPs introduced the necessary rigour into the process for identifying PAPs, determining their eligibility for compensation, calculating temporary losses and establishing compensation amounts to be paid to each PAP. **This work was done by independent consultants and payment to all but a few PAPs has been completed and verified by the Bank.**

While recognising the importance of land replacement to restore the livelihoods of most of the PAPs, and setting out the responsibilities for managing this process, the ARAPs do not cover this aspect in detail. The ARAPs note the lead institutions responsible for land replacement (the Traditional Leadership and the Dam Committees, with assistance from Ministry of Agriculture and DWRD) and that this process will be ongoing until solutions are found and agreed between the parties. This process takes time, since there are host communities involved and in some cases replacement land is not readily available. *At Chibalashi Dam, for example, there are over a hundred PAPs who lost land and the proposal to give them land parcels 15 km from their present dwellings has not been well received.* The PAPs are instead demanding cash compensation for the lost land, on the grounds that the location is too far from where they live, and the land quality is inadequate compared with what they had. The Bank's resettlement policy generally will not support cash compensation in lieu of land replacement as a means of livelihood restoration and Government is continuing its efforts to find a solution to this problem.

Other aspects of livelihood restoration (for PAPs) and community development (for the community as a whole) include training of stakeholders to make the best use of the water resource, and assistance with options to do so. Planned support includes training in relation to the use and management of the fishery in the dam, agricultural extension support with regard to crops, methods of planting, use of fertiliser and

pesticides and various other services. Strengthening of the governance of local institutions is also a commitment defined in the previous ESMPs, both to assist beneficiaries of the project and to maintain the irrigation systems. The responsibility for this lies with the various local Government ministries and the dam committees. While the audit has shown that few of these interventions have taken place yet - and while the importance of this in support of the principal objectives of the project is recognised - the Bank has no direct mandate in this regard and it is excluded from Additional Financing and the future safeguard instruments.

Nevertheless, failure to resolve land replacement issues and restore the livelihoods of the affected PAPs is a significant reputational risk for the Bank. Since it does not finance these aspects of the project, the Bank's role in the process is primarily one of guidance, to ensure compliance with OP 4.12.

Action: Emphasize in the Additional Financing agreements that a satisfactory resolution of the problems of land replacement and livelihood restoration is to be demonstrated, in accordance with the requirements of OP 4.12, and that an appropriate period of monitoring and evaluation of the restoration of PAPs livelihoods must be done and reported to the Bank.

9.2.7 Gender Equality

Relevant World Bank Policy: OP 4.20 Gender and Development

Gender equality was not addressed in the previous safeguard instruments, nor in the contractual agreement with the contractor. No provisions were made to preferentially employ women where reasonably practical.

Action: Include reasonable measures to promote gender equality in the ESMP and contract documents.

9.2.8 Gender Violence

Relevant World Bank Policy: *OP 4.20 Gender and Development*

Gender Based Violence (GBV) was not addressed in the previous safeguard instruments, nor in the contractual agreement with the contractor. No measures were included to manage gender violence through training of the workforce or penalties for harassment or violence against women.

Action: Gender violence training for contract employees should be included in the ESMP.

9.2.9 Stakeholder Engagement and Grievance Redress

A simple GRM is included in the ARAPs, which built upon the traditional systems of grievance management established in the communities. It is not clear from existing documentation available to the auditor how systematic this process was and how effectively it worked. It is also likely that many affected stakeholders, whose views and concerns should be heard, did not take their issues to community leaders, in the absence of encouragement or consultation during the construction of the dams.

Potential GRM to be in place during the implementation of the AF (dams)

Mechanism	Responsible	Verification method
Monthly meetings with affected communities, leaders	The contractor and government officials	Minutes of the meetings

Phone number from the District office	Environmental District Officer	Report to be sent to PIU of the Irrigation Support Development Project (ISDP)
Website of the ISDS project	Environmental/Social Specialist from the (ISDP)	Monthly Env/Soc reports of PIU to the Bank
Others to agree with the communities through the SEP		

The value of a formal Stakeholder Engagement Plan during construction contracts is that it helps the proponent to remain in touch with community concerns and respond to them in a meaningful way. This can form the basis of grievance redress. Questions of access across the dam are a case in point – while there is information available about the need for alternative access in preference to potentially dangerous crossings at the spillways, there does not appear to have been any systematic process of consultation to discuss and report on this. Other relevant issues and actions may also emerge from well structured, ongoing, stakeholder engagement prior to and during construction.

Action: Develop and implement a Stakeholder Engagement Plan (SEP) for the period of the Remedial Works contract. The preparation of a SEP will be requested in the ESMP for all dams. The contractors and the government will be responsible for its implementation. Community leaders must be informed of the GRM that will be installed.

9.3 Procedures for the Environmental and Social Management of the dams

UNOPS, or the designated government entity responsible for this AF for the dams, will be responsible to:

1.Have one qualified Environmental specialist and one qualified Social specialist to prepare the ESMP for each dam following this ESA and other measures as needed during the review of the proposed civil works. These consultants are already included in the contract with UNOPS.

2.Hire aquatic and terrestrial biodiversity experts to prepare an assessment of biodiversity impacts of the dams.

3.Retain an Environmental and Social specialist throughout the implementation of the AF related to the dam's remediation in order to provide proper supervision and monitoring of the compliance of the AF works with the agreed ESA, WB safeguard policies and National regulations.

4.Coordinate visits with the existing ISDP environmental and social team to engage national and local authorities (district, villages councils, etc) in the supervision efforts to increase capacity to supervised these type of works, align all environmental and social teams under the AF and increase ownership of the local governments in the future operation of the dams.

5.Maintain on the ISDP website the safeguard documents cleared by the Bank (this ESA), the future ESMPs, reports and photos, to comply with the access to information policy.

6.Several instruments are required to be prepared by the UNOPS team to comply with the WB Safeguards Policies triggered (Table 6.1) and achieve compliance during this AF.

Instruments preparation and timeline

Instruments	Dams	Timeline
ESMP	All	May 30, 2020
Stakeholder Engagement Plan	All	May 30, 2020
Biodiversity action plan **(for screened sites not requiring detailed assessment)**	All	May 30, 2020
Biodiversity and ecological management plan **(for screen sites requiring detailed assessment)**	Preliminary[10]: Katembula, Chibalashi, Makaba, Nabowa	June 30, 2020
Dam safety plan	These will be defined based on the results of the ongoing field works by UNOPS	May, 20, 2020

Procedure for Environmental and Social Management

UNOPS or the designated government entity responsible for this AF for the dams will be responsible to

1. Environmental and Social s**creening (using the screening checklist Annex 2 and, for biodiversity screening, the ToR in Annex. 2), identification of the risks to the** remediation works to be done per dam, review of designs, preparation of ESMP and review of tender documents and contracts to ensure the environmental and social clauses are included to make the ESMP mandatory to contractors.

2**.Prohibited list.** No blasting operations will be allowed for the proposed remediation works in the dam or quarry sites. No planting or introduction of exotic species will be performed using funding for all the activities supported with the AF. No interventions in protected areas will be supported.

3. **Dewatering.** At this stage it is not possible to confirm if dewatering will be necessary for the remediation works. The environmental and social team in coordination with the technical engineering team will discuss this based on the specific interventions per dam. Dewatering might be needed only if works on the upstream embankment is required or if current dam stability conditions are very poor/critical. Dewatering could have significant negative social, environmental and economic impacts and these should be avoided. The ESMP shall include a protocol to deal with dewatering of the reservoirs if needed to reduce impacts and ensure safety.

[10] Each dam will be visited and screened according to the screening study Terms of Reference and checklist. Where determined by the screening study additional investigation and actual biological sampling and field data will be collected as a basis for defining mitigation and monitoring requirements in the Biodiversity Action Plan.

4**. Preparation of the ESMP a**nd other plans such as assessment of biodiversity impacts, community safety, health and safety for workers, camp areas, road safety, etc. The ESMP shall include all measures described in this Environmental and Social Audit which has been cleared, disclosed and consulted according to the OP 4.01 requirements.

The ESMP for each of these dams will include as a minimum the following actions to cover 4 main sections

A. Measures and actions to prevent and mitigate impacts related to common construction works, transportation of materials, camps, waste management, etc. (refer to Table 9-1)
B. Measures and actions to prevent and mitigate impacts related to the remediation works (refer to Table 9.2)
C. Measures and actions to reduce impacts on biodiversity (terrestrial and aquatic) and improve ecological flow downstream of the dams
D. Supervision and operation responsibilities, budget allocation for each dam, monitoring parameters (number of accidents, number of trees planted, number and type of claims, etc)
E. Communication and community engagement

In the following section and Tables 9-3-9.5 more details are provided of the expected contents for the ESMPs.

5.**In the preparation of the tender documents specific** clauses will be included that makes mandatory the implementation of the ESMP and any additional clause to ensure community and workers safety, remediate existing environmental liabilities and reduce additional impacts during construction and operation of the such dams. See below table for more details.

5**. Monitoring.** A supervision and monitoring report will be prepared every month and shared with the PIU of ISDP and the World Bank. The contents of this report will include: progress of the civil works, implementation of the ESMP, confirmed the supervision of environmental and social specialist on site, photos records of works, camp areas, use of PPE, waste management, restoration efforts, grievances, accidents, communication, training, among others.

9.3.1 Design and Construction phase

The Table 9-1 describes the actions required during the planning and construction phases of the Remedial works.

Table 9-1. Completion of the remedial works.

No.	Aspect	Responsibility	Requirements
REMEDIAL WORKS Phase 1: Planning and Design			
1.	Design phase personnel	IDSP PIU/UNOPS	• Environmental and social specialists with at least 20 years of experience of civil construction projects shall prepare the ESMP, the stakeholder health and safety training programme, and the safeguards for inclusion in the construction contract tender documents; and shall participate in the review of tender bids and ensure contracts have all mandatory requirements set up here in this ESA and the ESMP to be cleared and approved by the Bank

No.	Aspect	Responsibility	Requirements
2.	ESMP	IDSP PIU /UNOPS	• The ESMPs will comply with all the WB Safeguard Policies applied this AF and explain in sections before. • The ESMP will assess the potential impacts and risk of the proposed engineering and remedial works in each dams; proposed measures to prevent, reduce, mitigate, and compensate for potential impacts those works will carry and all necessary measures to remediate non-compliance / incomplete work by the previous contractors in each site. • The ESMPs shall be prepared as a separate free-standing document, for each dam, for ease of use by the contractor and the supervising engineering and environmental and social team at each locality. • The ESMPs shall include measures and plan to prevent, reduce, mitigate and compensate environmental and social risks. Measures and plans will address: - non-hazardous waste - hazardous materials and waste - surface and groundwater pollution - protection measures for terrestrial and aquatic fauna and flora - air quality and noise - labour and working conditions - sanitation - gender equality - gender based violence - stakeholder engagement - cultural heritage (and chance finds) - provision of flow during construction - environmental remediation and rehabilitation - maintenance and monitoring. • The ESMP will include a budget for the environmental and social prevention and mitigation measures, training and costing items for the contractor to cost (restoration, reduce erosion, PPE, Signs, first aid kit, insurance, camps, covid19 prevention measures, etc). • The tender documents and contract will include specific clauses to make the implementation of the ESMP mandatory by contractors and subcontractors. The ESMPs shall be available for the tendering process of contractors. UNOPS and ISDP must coordinate this with the procurement teams. • The ESMP can be modified during construction to include any additional remedial work required as a result of the contractor's activities on site prior clearance of the Bank. • Where necessary, the ESMP shall call for method statements to be prepared by the contractor, where additional detail is needed based on the contractor's knowledge of his own activities. • If any new borrow pits are needed, the ESMP shall specify general rehabilitation standards. Rock for additional

No.	Aspect	Responsibility	Requirements
			cladding of embankments shall be obtained from existing licensed sources wherever possible. Any licensing requirements must be met by the contractor.
3.	Stakeholder engagement plan	IDSP PIU /UNOPS	• A stakeholder engagement plan will be prepared which provides a structured methodology for ongoing communication with stakeholders during the Remediation works. The plan shall identify the stakeholders to be consulted at each dam site, the resources required for and frequency of meetings (formal and informal), venues, the methods to be used, notification, assistance to vulnerable people, required participants from the project team, methods of recording meetings, comments and grievances, and feedback to stakeholders.
4.	Pedestrian infrastructure	IDSP PIU /UNOPS	• Communities affected by each dam shall be surveyed to discuss issues about access for people and livestock and to reach agreement about any actions to be taken • A report shall be prepared, based on the consultation with communities, that defines access requirements at each dam • Any structures that are required, or other physical safety measures taken, based on the report, shall be designed and included in the tender and cost estimates for the Remediation works.
5.	Community health and safety training plan	IDSP PIU /UNOPS	• A health and safety training programme, to be administered among dam communities, shall be prepared. The plan shall cover all relevant aspects of community health and safety associated with the dams, including: - swimming and drowning risks - first aid in the event of potential drownings - risks of crossing at the dam spillways - management of livestock around the dam - malaria prevention and management - bilharzia prevention and management - management of other water borne diseases - use of dam water for drinking - emergency preparedness - interactions with wild animals.
6.	Tender documents	IDSP PIU /UNOPS	• The ESMP shall be provided to tenders to inform their bids • Specifications for environmental and social safeguards derived from this ESA and the ESMP shall be included in the tender documents. • Requirements for competent health and safety, environmental and social specialist shall be included in the specifications describing the contractor's personnel.
REMEDIAL WORKS Phase 2: Implementation			
7.	Contract supervision	IDSP PIU /supervising engineer and	• The supervising engineer's team shall include competent social and environmental officers on site and a senior specialist available for support from a regional office.

No.	Aspect	Responsibility	Requirements
		environmental specialist	
8.	Contract implementation	Construction contractor	• In accordance with the requirements of the contract documents, the contractor shall have the necessary expertise to carry out the work required by the ESMP.
9.	Safeguards supervision	IDSP PIU /supervising engineer and environmental specialist	• The social and environmental officers shall prepare monthly compliance reports for distribution to the client and the Bank. • Non compliances shall be recorded and actioned for rectification, with due dates.
10.	Health and safety training of stakeholders	IDSP PIU / environmental and social specialist	• The Environmental and social specialist will prepare training material and lead a training plan to local communities during the course of Remediation works at each dam site to reduce risks to accident, prevent issues with the contractors, etc. • Records of training shall be kept.

Table 9-2. Requirements for the environmental remediation plan.

Aspect		Description
1.	Prepare rehabilitation specifications for embankments, borrow pits, access roads / tracks created during past construction/ and any areas of downstream erosion / embankment destabilization that has been caused by the previous construction works and the initial operation of the dam	• Prepare detailed specifications for all areas where interventions are required as a result of the previous works. Use high definition, current, satellite imagery, where appropriate. • Where major erosion has occurred as a result of the works, which requires civil earthworks to rectify, prepare detailed drawings showing the final contouring. Where necessary, use a drone to provide survey data. • For borrow pits, survey the affected area and provide detailed drawings of the final contouring. Ensure borrow pits are free draining. • Define areas of temporary access, created by the contractor, that must be rehabilitated and closed. • Include details of sub-base preparation, top-soiling, fertilising and seeding for each area which requires rehabilitation. • Where topsoil is unavailable, consider options for obtaining it from the dam basin or elsewhere. • Where reinstatement by natural succession is considered to be an effective rehabilitation methodology, specify this in preference to seeding interventions. • Develop a schedule for implementation – wherever possible, an early start to rehabilitation activities must be planned so that recovery is demonstrable by the end of the contractor's liability period. • Develop a follow up monitoring and maintenance schedule, to be implemented during the contractor's liability period. • Prepare budget estimates for the measures and works.
2.	Prepare snag lists to clean up contractor waste and	• Conduct thorough site walkovers of all areas affected by the previous civil works.

	construction rubble from the previous construction works	• Prepare a snag list which identifies, logs with GPS coordinates, and define rectification measures for each intervention. • Snag lists to include builders' rubble, old equipment, waste concrete, temporary fencing, electrical and other scrap, waste oil or other chemicals, plastic and any other rubbish lying on site. • Where hydrocarbon spills have occurred, define the means of soil clean-up.
3.	Prepare specifications to close pit latrines from the previous construction works	• Identify sites and define method of closure including removal of any building structures.

Table 9-3: Preparation of a Biodiversity Action Plan (BAP) and ecological flow remediation actions

No.	Aspect	Responsibility	Requirements
1.	Ecological baseline studies and impact assessment	IDSP PIU /specialist ecologists	• Aquatic and terrestrial impact studies of the dam sites shall be prepared as follows: - *Screening:* an initial field assessment of each dam to determine an appropriate scope of work, and to exclude those dams where the level of existing disturbance is high and the habitat cannot be classify as a critical habitat. Apply the OP 4.04 definition, and the screening checklist in Annex 2. - *Detailed Evaluation:* a detailed assessment of the selected dam sites where either aquatic or terrestrial impacts are likely to be significant and where structured interventions may help to minimise the impacts.
2.	Specialist competence	IDSP PIU /specialist ecologists	• The appointed ecologists shall be recognized experts in aquatic and terrestrial ecology with experience of dam impacts and of African (and preferably) Zambian conditions.
3.	Timing of the work	IDSP PIU /specialist ecologists	• The work shall be completed in time to implement any construction interventions that are agreed, as a basis for impact management, before the construction contractor leaves site. This means that an early start to the ecological investigations must be prioritized.
4.	Management actions and monitoring	IDSP PIU /specialist ecologists	• The study is to include any necessary management actions to regulate flows downstream and/or protect terrestrial and aquatic fauna and flora, together with a full monitoring plan, including monitoring parameter, monitoring methodology, monitoring frequency, personnel and reporting requirements. • The ecological management and monitoring requirements shall be included as a part of the ESMP in a Biodiversity Action Plan (BAP) and in the Operational and Maintenance Manual for each dam.
5	Ecological Flow	IDSP PIU / specialist ecologists	• Aquatic and terrestrial impact studies of the dam sites will screen each dam site (incl. field assessment) to determine an appropriate scope of work (refer to Annex. 1). Where further assessment is deemed necessary (impacts likely to be significant), a detailed assessment of the aquatic impacts at the selected dam sites will be carried out. Both the initial

			screening, and subsequent detailed assessment, cover the immediate dam site areas as well as the downstream areas. The detailed assessment will include an assessment of presence of critical endangered, endangered and migratory species. • The detailed assessment shall evaluate the impact of the dams on the flow regime and downstream environment. The detailed assessment shall consider any downstream impact on quantity, timing and quality of freshwater flows and levels necessary to sustain aquatic ecosystems and the communities that depend on them. If necessary, the detailed assessment will determine an Ecological Flow Requirement (EFR) to be imposed on the dam operation as a mitigation measure. Small gates can provide some minimum flow downstream of the affected stream which can benefit the dammed ecosystem. Technical and structural limitations of the dams shall be considered during the determination of the EFR. • The EFR to be imposed on dam operation shall be detailed in an Environmental Flow Management Plan (EFMP). The EFMP shall include monitoring and reporting procedures for key indicator parameters.

9.3.2 Operational phase

Table 9-4 describes the actions required to plan and implement environmental and social safeguards for the operational phase of the project.

Table 9-4. Operational phase of the IDSP AF project.

No.	Aspect	Responsibility	Requirements
1.	Biodiversity Action Plan (BAP)	IDSP PIU	• Implement the required management and monitoring actions in the BAP.
2.	Emergency Response Plan	IDSP PIU	• The generic Emergency Response Plan (prepared by Cowi, 2018), shall be updated to be specific to each dam, and shall include information that is relevant to the area in which the plan is applicable.
3.	Environmental Flow Management Plan	IDSP PIU	• The Environmental Flow Management Plan (EFMP) for the specific dam sites, if applicable, shall be incorporated into the dam management procedures.

10 Consultation and disclosure

The PIU of the IDSP, in coordination with the local district officers, coordinated several consultation meetings of the project and a summary of this ESA. Consultation were carried out in the local languages. Consultation was done during the Covid-19 global pandemic and therefore restricted to country regulations and possibilities to exchange communication with the relevant stakeholders. Additionally, there were security issues affecting the rural areas.

The two main issues that constrained consultations were:

- Worldwide outbreak and spread of the Covid-19 virus: The need to conduct the stakeholder consultation exercise arose amidst the worldwide health concerns related to the Covid-19 virus. This situation is still ongoing and as such, the team conducting the consultations had to do so under the strictest conditions possible as prescribed through the Government directive issued under Cabinet office and other documentation relevant to ensuring the safety of the stakeholders and the team.
- Recent security unrest within Zambia: the first quarter of 2020 was also characterized by insecurity due to unrest in some quarters. Subsequently, in both rural and urban areas, it was life threatening to hold public meetings as mobs would sometimes be agitated.

Nevertheless, the PIU held stakeholder consultations at four (4) of the ten (10) dam sites. At the four sites visited, the IDSP Team met with representatives from the community, District and Provincial Offices. The selection of a representative sample in terms of the ZWRDP sites, community members, district officials, and provincial officers was in light of the prevailing circumstances during the stakeholder consultation exercise. Annex 4 includes a detailed description of the consultation, feedback from stakeholders and recommendations for the ESA and ESMP. The PIU and UNOPS need to review carefully the guidance of this consultation results

Consultation team. In view of the foregoing, IDSP put together a team comprising the Dam specialist and the Environmental & Social Safeguards Specialist to undertake the assignment and finalise the ESA requirement for the extension of the project.

Sites selected. The sites visited included the Zimba (Ngolongozya dam site, Zimba District Office, Southern Provincial office); Namwala (Makaba dam site); Lufwanyama (Katembula dam site and the Lufwanyama District Council) and Mansa (Chibalashi dam site; District office; and the provincial office).

Timing. The consultations and disclosure of the ESA summary were carried out from 23rd to 28th March 2020 in each of the communities visited.

RESULTS

Stakeholders consulted in the project have been affected for several years by the conditions of these dams. However, despite the dam safety and environmental issues still prevailing, most of them indicated that the dams have also brought benefits the community and their livelihoods. However, they expressed their concerns on several aspect of these dams and request the project to take into consideration their views and recommendations. The detail feedback on the consultation is included in Annex 4.

Many of the comments and concerns made in the consultation were related to the legacy issues of the dams including, erosion, spillway cracks, lack of remediation of borrow pits and access roads.

Other were related to the need to reduce risks for the communities because open pits, unfinished paths, slop erosion, etc and also to the need of training for the communities to manage and operate the dam connected to the irrigation system.

The consulted stakeholders also requested remediation of canals and other works related to the irrigation system. These aspects will be important to consult with the government since the remediation of the dams is focused on the safety of the dams and not on the irrigation system. However, a dam that does not serve the irrigation system loses functionality for the community. Thus, the small repair of channels and completion of channels unfinished should be considered in this AF or by other donors to achieve full benefit for the communities.

Two important aspects indicated by the stakeholders were: i) the importance to connect the project areas with the Disaster Mitigation and Management Unit (DMMU) to support any future emergencies related to floods and droughts; ii) there are not resettlement issues pending.

Below a summary of the some of the feedback received during the consultation of this AF (details in Annex 4):

- *Complete all outstanding works on each dam site.*
- *Repair spillway with an alternative design resilient to the prevailing conditions at the dam*
- *Complete the rehabilitation of borrow pits and access roads*
- *do ground levelling, re-vegetation, and other ESMP related works to ensure complete rehabilitation.*
- *Increase the canal length to carter for all affected farmers.*
- *Replace pipes with a more durable make, preferably galvanized or HDPI.*
- *Construct a kraal along with drinking troughs for livestock.*
- *Complete construction of the canal*
- *Provide access by constructing a bridge*
- *Construction of the drifts on the access and exit points at the dam*
- *Sensitize the community on the dangers of the risk being undertaken and encourage safe practices.*
- *Conduct training in water management and dam maintenance. water-wise irrigation; agribusiness; afforestation and dam operation and maintenance*
- *Conduct training to empower communities with information and hands on experience in*
- *Where applicable, do ground levelling, re-vegetation, and other ESMP related works to ensure rehabilitation.*
- *District Commissioner's office to engage the Office of the Vice President through the Disaster Mitigation and Management Unit (DMMU).*
- *All PAPs were paid for crop losses.*

Consultations performed for this AF. Zambia. March23-28,2020

11 Irrigation works of existing ISDP

Environmental Non-compliance of the Parent IDSP Project and Remedial Action Plan

About 50% of the funding from the Additional Finance will be allocated to the works ongoing under the parent IDSP project. Since this ESA is the instrument selected to prepare for appraisal, it needs to report on the ongoing project works. This section summarizes the current status of the environmental performance of the three sub-projects under the parent IDSP project (Mwomboshi Dam and Irrigation Scheme, Mushakashi Irrigation Scheme, and Lusitu Irrigation Scheme) and the necessary remedial action plans under the Additional Finance (AF). The section is based on current environmental safeguards non-compliance as reported in the September 2019 Implementation Support Mission. The section concisely highlights the various performance gaps/non-compliance with the World Bank safeguard instruments (ESIAs and site-specific ESMPs) prepared to guide the project implementation process, while recommending realistic action plans that must be implemented to bring the sites into full compliance. The section is intended to complement the ESA by:

a. Reviewing the extent of non-compliance with the sub-project's ESIAs and site-specific ESMPs, including other requirements that are necessary to improve the environmental sustainability of the project.
b. Developing a list of action plans to be implemented under the Additional Finance to bring the project into full compliance with the Bank's safeguards policies.

Site-specific Non-compliance Issues and Proposed Action Plan (ISDP sub-projects)

The main actions to be implemented under this AF and to support the ongoing civil works and activities of the ISDP sub-projects are:

a. To hire one environmental consultant with experience in occupational health and safety for each dam under construction to improve project supervision, provide training and generate monitoring reports to the PIU and the Bank
b. Improve the on-site communication, GRM and supervision of the contractors.
c. Oversight of the compliance of the project with best construction practice in dams, national regulations and the agreed ESIA/ESMP and Licenses (certificates) given to the project.

The Table below identifies the project non-compliance issues on each of the three sub-project sites, including the associated human and environmental risk and the proposed action plan to remedy the issues in the AF. The budget needed to implement these additional measures and hiring of additional environmental-health and safety requested in Table 11.1 will be covered under Activity 2 of the AF.

Table 11.1: Zambia. Environmental Compliance Status and Risk of the current parent IDSP project.

Aspect	Non-compliance Issue	Potential Risk	Proposed Action Plan in the AF
1. Mwomboshi Dam and Irrigation Scheme:			
Performance monitoring	Absence of qualified environmental specialist to monitor and guide project implementation in line with the ESIA/ESMP.	Increased risk of environmental and safety negligence at the project sites.	A qualified environmental safeguard specialist will be hired under the AF to supervised and support the supervising consultants This new specialist will have experience in health and safety and should provide routine (a minimum of once a week) to the implementation of the site-specific ESMP, oversight at the project site and ***prepare a monthly monitoring report to be submitted to the PIU in line with the ESMP requirements.***
Community health and safety	Uncontrolled fugitive dust emissions from the access roads leading to the project sites – ESIA/ESMP required daily sprinkling of water to suppress dust buildup on the roads.	Exposure of the project affected parties (PAPs) and construction workers to respiratory diseases and other health risks associated with dust inhalation.	The sub-project shall implement the ESMP-recommended dust control measures. ***Compliance should be monitored by the environmental safeguard specialist and reported to the PIU.***
Occupational health and safety (OHS)	Absence of good OHS housekeeping, which included donning of proper PPEs, posting of safety signages, safety	Increased risk of exposure (workers and site visitors) to	The site should implement good OHS/CHS practices, such as use of suitable PPEs, posting of safety signages, access barriers, etc. Project workers and the environmental specialists shall

Aspect	Non-compliance Issue	Potential Risk	Proposed Action Plan in the AF
	briefing of visitors prior to entry into the project sites, absence of trained OHS specialist on the sites, etc.	worksite related accidents.	receive basic OHS. ***The implementation outcome should be monitored by the PIU.***
2. Mushakashi Irrigation Scheme			
Performance monitoring	Absence of qualified environmental specialist to monitor and guide project implementation in line with the ESIA/ESMP requirements.	Increased of risk of environmental and safety negligence at the project sites.	A qualified environmental safeguard specialist will be hired under the AF to supervise and support the supervising consultants This new specialist will have experience in health and safety and should provide routine (a minimum of once a week) to the implementation of the site-specific ESMP, oversight at the project site and ***prepare a monthly monitoring report to be submitted to the PIU in line with the ESMP requirements.***
Community health and safety	Uncontrolled fugitive dust emissions from the access roads to the project sites – ESIA/ESMP required daily sprinkling of water to suppress dust buildup on the roads.	Exposure of the project affected parties (PAPs) and construction workers to respiratory diseases and other health risks associated with dust inhalation.	The sub-project shall implement the ESMP-recommended dust control measures. ***Compliance should be monitored by the environmental safeguard specialist and reported to the PIU.***
Occupational health and safety (OHS)	Absence of good OHS housekeeping, which	Increased risk of exposure (workers and	The site should implement good OHS/CHS practices, such as use of suitable PPEs, posting of

Aspect	Non-compliance Issue	Potential Risk	Proposed Action Plan in the AF
	included donning of proper PPEs, posting of safety signages, safety briefing of visitors prior to entry into the project sites, absence of trained OHS specialist on the sites, etc.	site visitors) to worksite related accidents.	safety signages, access barriers, etc. Project workers and the environmental specialists shall receive basic OHS. ***The implementation outcome should be monitored by the PIU.***
Community Health and Safety	*Pump station site* (steep terrain created by earth moving equipment around the bank of Kafue River): lack of proper barricade/access barriers around active construction site, poor safety signage, hazardous working environmental around the primary pump housing, etc.	The pump station site presented significant environmental and safety risks to community members.	Proper access barrier with gate shall be constructed around the primary pump station housing area. Security should be provided to limit third party movement in and out of the site. **The implementation shall be monitored environmental specialist and reported to the AF PIU safeguard team**
Community health and safety	Unattended deep-water reticulation trenches (excavations) with significant vegetation regrowth.	Risk of community members, especially children accidentally falling into deep trenches.	The vegetation regrowth around the water pipeline excavation shall be cleared and proper monitoring provided to prevent community members from falling into the trenches. **The PIU should ensure that contractor expedites the backfilling of open trenches.**
3. Lusitu Irrigation Scheme			

Aspect	Non-compliance Issue	Potential Risk	Proposed Action Plan in the AF
Community Health and Safety	Absence of sustainable source of potable water to project-affected community due to severely contaminated groundwater.	PAPs and their livestock are exposed to health risk associated with ingestion of contaminated.	The PIU shall: 1. Carry out groundwater analysis to determine the source and nature of groundwater contamination around the project area. The result of the groundwater analysis shall be submitted to the Bank. 2. Continue to work with the Water Ministry Resources provide temporary water supply to the community to help mitigate the water scarcity problem. 3. Carry out a one-day groundwater contamination awareness campaign in the project affected area to disseminate the health impacts of contaminated water to PAPs.
Occupational/Community health and safety	a. Project area inundated with steep excavations with minimum access barrier. b. Children have unrestricted access to active worksites.	Risk of community exposure to construction hazards.	1. The site shall implement good OHS/CHS practices, such as use of suitable PPEs, posting of safety signages, proper access barriers, etc. The workforce shall be required to receive basic OHS training. **The implementation should be monitored and reported to the PIU by the site environmental specialist.** 2. Children's access to active work sites shall be closely monitored and proper warning signages posted to strategic locations around the construction area. **This should be monitored and reported by the PIU.**
Performance monitoring	Absence of qualified environmental specialist	Increased risk of environmental and	A qualified environmental safeguard specialist, working with the supervising consultants should

Aspect	Non-compliance Issue	Potential Risk	Proposed Action Plan in the AF
	to monitor and guide project implementation in line with the ESIA/ESMP requirements.	safety negligence at the project sites.	provide routine (a minimum of once a week) site-specific ESMP implementation oversight to the project site and ***prepare a monthly monitoring report to be submitted to the PIU consistent with the ESMPs.***
Community health and safety	Uncontrolled fugitive dust emissions from the access roads leading to the project sites – ESIA/ESMP required daily sprinkling of water to suppress dust buildup on the roads.	Exposure of the project affected parties (PAPs) and construction workers to respiratory diseases and other health risks associated with dust inhalation.	The sub-project shall implement the ESMP-recommended dust control measures. ***Compliance should be monitored by the environmental safeguard specialist and reported to the PIU.***

12 References

COWI 2018a. Remedial Environmental Impact Statement for the Chibalashi Dam under the Water Resources Development Programme. On behalf of the Ministry of Water Development Sanitation and Enviromental Protection. October 2018.

COWI 2018b. Remedial Environmental Impact Statement for the Katembula Dam under the Water Resources Development Programme. On behalf of the Ministry of Water Development Sanitation and Environmental Protection. October 2018.

COWI 2018c. Remedial Environmental and Social Management Plans of Eight (8) Dams under the Water Resources Development Programme. On behalf of the Ministry of Water Development Sanitation and Environmental Protection. September 2018.

COWI 2018d. Abbreviated Resettlement Action Plan for Katembula Project Site – WRDP. On behalf of the Ministry of Water Development, Sanitation andEnviromentalProtection. November 2018.

COWI 2018e. Abbreviated Resettlement Action Plan for Chibalashi Project Site – WRDP. On behalf of the Ministry of Water Development, Sanitation and Enviromental Protection. November 2018.

COWI 2018f. Abbreviated Resettlement Action Plan for Chikowa Project Site – WRDP. On behalf of the Ministry of Water Development, Sanitation and Enviromental Protection. November 2018.

COWI 2018g. Abbreviated Resettlement Action Plan for Kanyika Project Site – WRDP. On behalf of the Ministry of Water Development, Sanitation and EnviromentalProtection. November 2018.

COWI 2018h. Abbreviated Resettlement Action Plan for Makaba Project Site – WRDP. On behalf of the Ministry of Water Development, Sanitation and Environmental Protection. November 2018.

COWI 2018i. Abbreviated Resettlement Action Plan for Nabowa Project Site – WRDP. On behalf of the Ministry of Water Development, Sanitation and Environmental Protection. November 2018.

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COWI 2018k. Project Review Report for near complete Chibalashi Dam. Design and construction supervision of small-scale water resources - technical assistance assignment. On behalf of the Ministry of Water Development, Sanitation and Environmental Protection. April 2018.

COWI 2018l. Project Review Report for completed Chikowa Dam. Design and construction supervision of small-scale water resources - technical assistance assignment. On behalf of the Ministry of Water Development, Sanitation and Environmental Protection. April 2018.

COWI 2018m. Project Review Report for proposed Kanyika Dam. Design and construction supervision of small-scale water resources - technical assistance assignment. On behalf of the Ministry of Water Development, Sanitation and Environmental Protection. April 2018.

COWI 2018n. Project Review Report for Makaba Dam Rehabilitation. Design and construction supervision of small-scale water resources - technical assistance assignment. On behalf of the Ministry of Water Development, Sanitation and Environmental Protection. March 2018.

COWI 2018o. Project Review Report for proposed Nabowa Dam. Design and construction supervision of small-scale water resources - technical assistance assignment. On behalf of the Ministry of Water Development, Sanitation and Environmental Protection. March 2018.

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COWI 2018x. Flood Hydrology, Nakaba Dam, 18 June 2019.

COWI 2018y. Flood Hydrology, Nabowa Dam, 18 June 2019.

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Annex 1. Terms of reference for the Environmental Specialists to be hired to support AF implementation.

The following Tors are for hiring:

i) Environmental Specialists - health and safety for the ISDP
ii) Environmental Specialists - biodiversity experts for the UNOPS team

1.1 TERMS OF REFERENCE FOR THE HIRING OF ENVIRONMENTAL CONSULTANTS TO SUPPORT SUPERVISION OF CIVIL WORKS OF THE ISDP OF TWO LARGE DAMS

1.Introduction

The Government of Zambia (GoZ) has prepared the Irrigation Development Support Project (IDSP, P102459, IDA Credit #48740) in the amount of SDR74.70 million (US$115 million), approved on April 7, 2011. The project original objective was to "*increase yields per hectare and value of diverse products marketed by smallholders benefitting from investments in irrigation in selected sites served by the project.*" Originally the project had four components: (i) Irrigated Agricultural Support Services, (ii) Public Infrastructure; (iii) Private and Cooperative Investment; and (iv) Management and Coordination.

In March 2020, the government requested an Additional Funding of US$ 30 million and a time extension of 24 months to allow: (i) the completion of the ongoing works under IDSP and cost replenishment (US$ 14 million); (ii) the implementation of Phase 2 of the remedial works for the ten WRDP dams (US$ 15 million) and (iii) Drought Emergency Response (USD 1 million).

2.Specific Tasks for two Environmental Specialist consultants - for the ISDP activities (Irrigation activities)

The specific tasks of the Environmental Specialist to support the ongoing supervision of two large dams:

Provide guidance, support to the PIU and orientation to increase environmental and social good practice and improve Environmental Management in the ISDP project and the AF.

Support the overall environmental management of the project and its subcomponents, especially in the supervision of contractors, subcontractors and consultants hired for the construction of two dams and its ancillary infrastructure (irrigation channels, etc) in the project as well other activities as needed.

Coordinate closely with the PIU team including the Environmental and Social specialist in the team anything related to the environmental aspects of the project, supervision, monitoring, consultations, stakeholder's involvement, participation in project development in order to reduce environmental and social impacts.

Interact and coordinate closely with the supervision consultant hired, Engineers, Supervising consultants and any other party involved in the construction works.

Interact and coordinate with other national agencies (ZEMA, Ministry of Water, Ministry of Environment) the Environmental Officers at the district and local level, and other stakeholders to maintain a clear dialogue between the project, National institutions and the local stakeholders.

- Provide training, capacity building activities as described in this ESA, ESIA/ESMP, certificate to increase contractors and subtractors capacities in occupational health and safety, reduce pollution, increase safety for the local people, prevent accidents, ensure water availability for the works, the workers.
- Coordinate visits by ZEMA to the project area to ensure compliance with the ZEMA EIA certificate.
- Ensure mandatory compliance with the World Bank Safeguards documents ESMF, ESIA, ISDS, bidding Documents, contracts and this ESA to ensure the proper environmental and social management of the project by contractors.
- Prepare supervision and monitoring reports (monitoring reports always specific measurements like water quality, number of accidents, number of Grievances, solution of Grievances, number of workers in the camp sites, etc).
- Monitor timely environmental and social performance of the project, contractors and subcontracts and other parties.
- Develop capacity building activities to increase environmental management capacity of contractors and UG counterparts.

3.Qualifications

The Environmental Specialist Specialist- Occupational Health and Safety should have the following qualifications:

a) A professional degree in Occupational Health and Safety, Environmental Management, Engineering, Ecology or related field.
b) At least five years of experience in Environmental impact assessment of civil works and working as environmental supervision, inspection, monitoring of environmental management plan.
c) The professional should be registered in ZEMA
d) Must have knowledge and experience in the country environmental regulations (health and safety, EIA) and permitting processes (civil works, water, waste management, etc.)
e) Fluency in English and local language, good communication and writing skills.
f) Must be an organized person to keep track of different contractor activities
g) It will be a plus if the professional have experience in the World Bank Safeguards Policies and projects

4.0 Reporting

The Environmental Specialist will report to the Environmental Specialist to the PIU. He/She will be required to submit the following reports.

- Weekly reports to the PIU
- Monthly progress report to the Bank
- Half year Report
- Annual Report

All reports will be required to highlight project application of the measures and actions agreed in the Environmental and Social Audit, the Environmental and Social Management Plans, and other instruments approved for the Project by the World Bank and in the application of national regulations. Reports will be share with the Bank when requested.

5.0 Duration.

The assignment will be based on periodic contracts spread over the life of the project and renewable subject to satisfactory performance.

1.2 TORS OF REFERENCE FOR THE HIRING OF ENVIRONMENTAL -BIODIVERSITY SPECIALISTS TO SUPPORT UNOPS

Introduction

1.The Government of Zambia (GoZ) has prepared the Irrigation Development Support Project (IDSP, P102459, IDA Credit #48740) in the amount of SDR74.70 million (US$115 million), approved on April 7, 2011. The project original objective was to "*increase yields per hectare and value of diverse products marketed by smallholders benefitting from investments in irrigation in selected sites served by the project.*" Originally the project had four components: (i) Irrigated Agricultural Support Services, (ii) Public Infrastructure; (iii) Private and Cooperative Investment; and (iv) Management and Coordination.

In March 2020, the government requested an Additional Funding of US$ 30 million and a time extension of 24 months to allow: (i) the completion of the ongoing works under IDSP and cost replenishment (US$ 14 million); (ii) the implementation of Phase 2 of the remedial works for the ten WRDP dams (US$ 15 million) and (iii) Drought Emergency Response (USD 1 million).

Ten dams have been built on selected rivers in Zambia as a part of the Zambia Water Resources Development Project. These are all earth fill dams, with walls varying in height from 8 m and 10.7 m. Four of the dams were pre-existing and were rehabilitated while the remainder were new dams. Most of the construction was completed between 2016 and 2018. In late 2018, work was stopped due to persistently poor performance by the contractors. A performance review of dam safety and safeguard concerns, including a review of all safeguard instruments, was undertaken for each dam site to guide the requirements for completion of remedial work under the Additional Financing.

The Environmental and Social Audit Report (ESA), prepared in April 2020, required additional work to comply with the World Bank's policy on Natural Habitats (OP 4.04). Data on all the dams is found in the ESA and in the Environmental Project Briefs (EPBs) by the Zambia Water Resources Development Project (WRDP) Project Management Unit.The additional work will be done as a part of the Additional Financing program for the remedial works.

Ecological Risks

The impact of the operation of the dams on the stream flow regime, and the induced impacts on both aquatic and terrestrial ecosystems, was insufficiently assessed in the previous safeguard instruments. Neither the Environmental Project Briefs, originally used as the basis for regulatory approval of the projects, nor the subsequent work done by consultants to prepare the ESIAs for Katembula and Chibalashi dams, and to improve the dam site ESMPs, provided an adequate basis for the assessment of the ecological impacts. No baseline studies were done, and experienced

specialist ecologists were not involved. The ESIA/ESMPs listed some of the ecological impacts associated with dams and flow regulation, but argued in favour of the dams as a means of guaranteeing flow in the downstream system in the dry season and during times of drought.

The existing instruments provide no meaningful account of the terrestrial impact of the dams. No baseline studies were done, the lists of species provided were unverified and incomplete and no critical analysis of possible direct, indirect or cumulative impacts was undertaken. The impacts of habitat loss in the dam footprints may be the lesser part of the impact, at least in the case of some dams. Increasing populations supported by the irrigation schemes may create additional pressure on surrounding habitats, which could be important where the dams are in or close to habitats that have experienced little transformation. The audit has shown that three of the dam sites - Nabowa, Kawiko and Chikowa - are associated with substantial areas of untransformed habitat and, in the case of Nabowa, at least, large herbivores and predators are apparently still well represented. The indirect impact of increasing human settlement and cultivation on these remaining wild animal populations, as well as increased risk to their habitats, may be significant.

The preliminary assessment prepared for these dams and application of the IBAT tool indicates the presence of threatened species, including critically endangered species, endemic, vulnerable species, in the river systems. It is necessary to defined if the catchment areas and dam project areas (upstream and downstream) contain Critical Habitats as defined in the OP 4.04 and they do define actions to protect, restore or improve conditions to reduce impact on biodiversity. Cumulative changes brought about by the dams and the irrigation schemes were not considered. These may include negative impacts on the downstream aquatic and wetland environment and may also impact upstream on the river system as a whole by creating a barrier to the movement of aquatic species.

2.STUDY OBJECTIVES

The objectives of the study are:
- to determine the significance of aquatic and terrestrial ecological impacts caused by the dams, taking direct, indirect and cumulative impacts into consideration, and to recommend any mitigation and monitoring that should be included in the remedial works and operation of the dams to mitigate negative impacts and enhance potential benefits.
-Describe the potential structural and non structural measures to increase ecological flow below the dams

3.SCOPE OF WORK

The work will be divided into two phases:

- Phase 1: an initial screening assessment of each dam site to determine the ecological importance and sensitivity of the section of river in which the dam is situated; the probable impact of each dam; any necessary management and monitoring requirements for inclusion in the project ESMP; and an appropriate scope of work for detailed studies in Phase 2, for those dam sites where there is a higher level of ecological risk that requires more detailed field investigation. Consultant to comple screening checklist in Annex 2 of this ESA.

- Phase 2: a detailed assessment of the selected dam sites where either aquatic or terrestrial impacts are likely to be more significant and where structured interventions may help to minimize the negative impacts and enhance the possible benefits to Biodiversity.

Task 1: Inception

The consultant shall prepare an inception report defining the logistics for the completion of the Phase 1 work, the methodologies to be used and a detailed schedule for the field work and report preparation.

Task 2: Field Screening – aquatic biodiversity

The consultant shall undertake a screening level assessment of each dam site. It is not the intention of this phase of the work to do detailed aquatic field surveys. The consultant is expected to use existing available information, consultation with other knowledgeable individuals and organisations, information that can be determined from a brief site visit (estimated to be no more than 2 days per site) and professional judgement to screen the ecological risks. Sampling of water quality or biota is anticipated to verify reports of endangered species. To the extent that it is reasonably practical in a screening study, the consultant shall follow a recognised approach to the determination of aquatic habitat integrity and ecological importance and sensitivity, such as that of Kleynhans (see King et al, 2008[11]). Minimum data set requirements for habitat classification and typical biotic and habitat indicators to be considered in the scoring of the importance of the river systems and the screening of aquatic impact significance of the ten dams is presented in Table 2.

Table 2: Minimum data set requirements for habitat classification

Component	Description
Minimum Data Set for Habitat Classification	General information on land use in the catchment (high resolution recent satellite imagery)
	General information on the hydrological character of the river and the extent of water abstraction and flow regulation (available data, satellite imagery, site visit)
	Videography or at least low level aerial photography (eg: drone photography) of the section of the river under investigation (5-10 km upstream and downstream)
	Some water quality information, or an informed judgement on the water quality as related to the structure and functioning of the aquatic system (existing data, professional judgement from site inspection)
	Some information on the aquatic biota or at least an informed opinion on the attributes of the biota in the river section (existing data, professional judgement based on site visit)

Table 3: Typical indicators to be considered in the screening of aquatic impact significance of the ten dams

Component	Description
Instream and Riparian Biotic Determinants for Assessment of	Rare and endangered biota: biota that are rare or endangered on a local, provincial or national scale (based on review of existing records of distribution of the species and an initial assessment of habitat suitability)

[11] King, J.M., Tharme, R.E., and de Villiers, M.S. (2008) (ed.). Environmental Flow Assessments for Rivers: Manual for the Building Block Model Methodology. Report to the Water Research Commission of South Africa. Prepared by the Freshwater Research Unit, University of Cape Town. Updated version edited by CL Malan and published as WRC report TT 354/08

Ecological Importance and Sensitivity	Unique biota, including endemic or uniquely isolated species or populations (or taxa in the case of invertebrates) that are not rare or endangered (based on review of existing records of distribution of the species and an initial assessment of habitat suitability)
	Intolerant biota, including those that are known or suspected of being intolerant of decreased or increased flow conditions as well as to flow-related changes in physical habitat and water quality (based on review of existing records of distribution of the species and an initial assessment of habitat suitability).
	Species / taxon richness, based on the grouping of similar rivers
Instream and Riparian Habitat Determinants for Assessment of Ecological Importance and Sensitivity	Diversity of aquatic habitat types or features – habitats include riffles, rapids, runs, pools and backwaters and the associated marginal areas and substratum types; and lotic wetlands including source sponges, floodplain habitat types and the riparian zone
	Refuge value of habitat types - Assess the functionality of habitat types present in terms of their ability to provide refugia to biota during periods of environmental stress
	Sensitivity of habitat to flow changes - Consider the size and flow of the river/stream in terms of its sensitivity to water quality changes. Smaller streams may be more vulnerable due to lower discharges
	Migration route / corridor for instream and riparian biota
	National Parks, wilderness areas, nature reserves, forest reserves, Key Biodiversity Areas, Natural habitats, Modified habitats – proximity to protected or otherwise important natural areas places additional emphasis on the value of a section of stream/river.
Combined Determinants	Critical, Natural or Modified Habitats – determination of classification in accordance with IFC/WB criteria. Scoring guidelines for habitat integrity, ecological importance and sensitivity can be obtained from King et al (2008) or other references.

On the basis of the Phase 1 screening assessment, the consultant shall classify the river sections for each dam site in terms of ecological importance and sensitivity and shall assess the likely impacts / risks caused by the dams in these sections. The consultant shall distinguish between (i) dams resulting in low aquatic ecological risks for which no specific aquatic monitoring is required (ii) dams resulting in limited risks where some management actions and monitoring is required, to be specified for inclusion in the revised project ESMP; and (iii) dams resulting in moderate to high levels of risk where detailed field investigation is required as the basis for the preparation of a Biodiversity Action Plan. Such sites may be those that potentially impact on endangered or critically endangered species. Any detailed assessment required from under item (iii) above will be the subject of the Phase 2 investigation. The consultant shall provide a detailed scope of work for this investigation as a deliverable of Phase 1.

Task 3: Field Screening – terrestrial biodiversity

The consultant shall undertake screening level investigations for terrestrial biodiversity within the area of influence of each dam site, taking into consideration the indirect effects of downstream irrigation and a possible increase in populations, encouraged by the improved agricultural productivity. The consultant shall use professional judgement, based on a brief field visit to the project area of influence, informal consultation with local people, review of existing references and satellite imagery and communication with conservation authorities and local experts to:

- Determine whether the habitats within the dam's area of influence are natural or modified
- Determine the likelihood of species or communities of conservation concern occurring within the dam's area of influence
- Determine existing threats to species of conservation concern
- Assess the significance of any additional threats caused by the direct or indirect impact of the dam
- Propose practical mitigation or monitoring measures that should be considered as a part of the operational plan for the dam.
- Identify any sites where the significance of the risks caused by the direct or indirect impact of the dam warrants further detailed assessment and provide a scope of work for this assessment.

The consultant shall pay particular attention to those dam sites where there remain significant areas of natural forest habitat within the indirect area of influence of the site (Nabowa, Kawiko and Chikowa).

Task 4: Screening Report

The consultant shall prepare a Screening Report which consists of two components:

Aquatic Ecology: describing the baseline conditions in the reach of river potentially affected by each dam, including habitat integrity, ecological importance and sensitivity; short, medium and long term impacts that could result from the operation of the dam and associated downstream irrigation and water use. The report shall include a description of the dam's impact on the water resources (water quantity, quality, and sediments) in the project area, and the upstream and downstream area specifically. The report shall screen the sites into the categories defined in Phase 1 Task 2 above, namely (i) dams resulting in low aquatic ecological risks for which no specific aquatic monitoring is required (ii) dams resulting in limited risks where some management actions and monitoring are required, to be specified for inclusion in the revised project ESMP; and (iii) dams resulting in moderate to high levels of risk where detailed field investigation is required as the basis for the preparation of a Biodiversity Action Plan. A detailed scope of work shall be prepared for any sites which require further assessment, as described under item (iii).

Terrestrial Ecology: describing the baseline conditions associated with the direct and indirect area of influence of each dam site, including determination of important habitats (conservation areas, key biodiversity areas, forest reserves, national parks, other); the likely / confirmed occurrence of threatened species; short, medium and long term impacts that could result from the operation of the dam. The screening report shall make recommendations for any impact mitigation and monitoring in the areas of direct or indirect influence of each dam site, will prepare a Biodiversity Action Plan for inclusion in the revised project ESMP.

Should more detailed field work be necessary in areas of identified higher risk, and where a Biodiversity and Ecological Management Plan will be required, the details of the scope of work shall be included in the screening report.

Deliverables

The deliverables for the Phase 1 study are as follows:

- Inception Report
- Screening Report (including the recommended scope, time frames and costs of Phase 2)

All deliverables shall be submitted in electronic form and in hardcopies (color). Deliverables shall include all data files, maps, GIS data, digital data, excel file and text files. Text of all reports shall

be in Word, with Times New Roman Font size 12. Deliverables will be considered "draft" upon initial receipt. Draft reports will be reviewed, and comments provided within two weeks of receipt, or as specified in the above-table of deliverables. All reports for this contract shall be submitted in English. Costs to produce reports will be borne by the consultant.

4.QUALIFICATIONS

The following personnel are a minimum requirement for the work:

Aquatic ecologist: An aquatic ecologist who is a recognized expert on river systems in the southern African region, with at least 10 years of experience, preferably with extensive experience of Zambian river systems. Demonstration of a thorough knowledge of flow-related impacts caused by dams is required, together with knowledge of the use of river health rating systems.

Terrestrial ecologist: A terrestrial ecologist with at least an M.Sc. post graduate degree in biological sciences and at least 10 years of experience in African ecosystems, preferable with extensive knowledge of Zambian ecosystems, local conditions and threats to biodiversity within the country.

Personnel required for Phase 2 work shall be determined by the Phase 1 study.

5.TIMEFRAME

The work shall be completed as a part of the Phase 1 study for dam remediation[12]. The work shall be prioritized so that additional field work in Phase 2 (if required) can be completed in time to implement any construction interventions that are agreed, as a basis for impact management, before the construction works.

[12] See Zambia Ministry of Agriculture (2019) Terms of Reference for Phase 1: Emergency Dam Risk Mitigation and Preparation for Remediation Works at 10 dams.

Annex 2. Screening Checklist to be used by UNOPS specialist team before the preparation of the ESMP.

CHECKLIST 1- IDENTIFICATION OF ENVIRONMENTAL AND SOCIAL RISKS RELATED TO THE REMEDIATION OF TEN - LEGACY DAMS - IN ZAMBIA

GOVERNMENT OF ZAMBIA

1-Date of the visit:		
Name of the Environmental Specialist filling this checklist:		
Job Position:		
Have completed training in the Environmental and Social Safeguards of the World Bank: Yes / No		
Have read the Environmental and Social Audit report and the ISDS prepared for the Additional Financing of the project: Yes / No		
Have you read the information available of this dam: Yes / No		
Note: if you marked No in any of these questions, you are not ready to fill this checklist. Please coordinate with the PIU team to provide you with these reports.		
2-Information about the Dam		
Name of the Dam:		
Location	**Region** **District**	
Villages /communities		
Geographical location	**Coordinate East**	**Coordinate North**
3-Remediation works- please indicate the main proposed works that could cause environmental and social impacts		
Slope works		
Outlets		
Infiltration		
Other		
4.MATERIALS NEEDED		
Does the project need aggregate or a new borrow pit		
Indicate potential sources to buy or extract the construction materials:		
Aggregates		
Sand/ clay		
Wood		
Diesel for transportation		
Water source for the construction		
Water source for drinking for workers		

Contractors/builders			
Estimated Number of workers to be hired for the construction works		**Who will pay in case of accidents or fatal accidents**	
Who will hire the workers			
Insurance provided to the workers	Yes □ No □	Are contractors registered in Zambia in case compensations for accidents are needed	
5-General environmental conditions			
Is the dam is located within a protected area, KBA, or other sensitive location?		Yes □ No □	Name of the protected area:
What are the conditions of the forest or natural vegetation in the project site		Explain:	
6-Evaluation of impacts and mitigation measures to be included in the ESMP (you can use additional paper)			
Main environmental and social impacts: describe	**Possible mitigation measures**		
Vegetation:			
Will the construction works needs to cut trees	Yes □ No □		
If the project needs to cut trees – the project will need to plant 3 trees per 1 tree cut	Indicate local native species and fruit species that the contractor will need to plant Location Number of trees		
Water:			
Roads:			
Safety			
Hazardous waste			
Other:			
7-LEGACY ISSUES /REMEDIATION			
PLEASE INDICATE. Any of these legacy issues that are environmental legacies that need to be resolved by the project, costed and included in the contract of contractors. recommend measures so the engineering team can include them in the remediation plans.			
Legacies	**Measures to be included in the ESMP**		
○ **Solid waste (Wood, plastic, etc)**			
○ **Hazardous wastes (diesel containers, old machinery, batteries, paints, metals, contaminated waters or soil,**			

○ **Borrow pits**	
○ **Unsafe paths**	
○ **Unfinished crossing points for communities**	
○ **Other**	
8- Ecological Flow. Have you to coordinate with the technical team the options to improve ecological flows below the dams Yes No (you need to coordinate)	
What is the flow below the dam (m^3/s)	
Are wetlands below the dam	**Are critical species present in the wetland or rivers: No Yes (indicate below species)**
Are people using the water below the dam? What for?	
Based on these findings, please indicate if it is possible to install a structural solution to improve the ecological flow **No** **Explain:**	**Yes** **Explain:** **Structural measures** **Operational measures**
9) Biodiversity. It is expected that you performed survey to the area or collect data with experts on diversity of the area for each dam. Please indicate what groups have been investigated in the project area and preliminary observations.	
Plants	Mammals
Fish	Amphibians
Macroinvertebrates	Other groups
Please indicate issues of poaching, illegal trade, and other issues affecting the area	
Presence of sensitive species:	
Critically Endangered species:	**Endangered species:**
Vulnerable species	**Migratory species:**
Protected species in Zambia:	**Endemic/rare/globally important species:**
Based on the results of the field observation, data collected and the OP 4.04 definitions	This project has natural habitat YES / NO The project area has critical habitats YES /NO
Based on the project area and the risk and potential impacts, you have identified for biodiversity –	

1-Please indicate the recommend measures to protect these species and Prepare in a separate document a Biodiversity Action Plan (BAP) **2.In the area contains critical habitat and there is ecological flow needs please request to Prepare in a separate document as a Biodiversity and Ecological Management Plan (BEMP)**	
10-Final recommendation	
Name	**Date:**
Signature	
Comments for the preparation of the ESMP and BAP incl. Ecological flow measures.	
Field visits registration	
Photo ‘	Photo ‘
Photo	Photo
Photo	Photo

Annex 3 -Check list for final verification of works and compliance with ESMP, ESA and the WB safeguards policies.

Government of Zambia

Zambia Irrigation Development and Support Project Additional Financing

(P102459 & AF-P172140)

Checklist 3- For the final verification of works and delivery of final works in the dams to communities. verification of compliance with the World Bank Safeguard Policies and ESMP approved.

Name of the DAM			
Date:	Day:	Month:	Year:
Environmental Specialist filling this form:			
Location of dam:			
REGION:	District		
WARD	Village		
CHARACTERISTICS of the WORKS			
Name of the main contractor			
Telephone and email/ website			
List the main works that the contractor was compromised to execute			
Are these works completed **YES NO**	Explain		
Name of the Engineer responsible for supervision:			
Is the Engineer participating in this verification visit? **YES NO**	**Telephone numbers**		
How many workers worked in this contract?			
What was the source of drinking water for the workers?			
ENVIRONMENTAL MANAGEMENT	**NOTES**		
Has the contractor comply with the ESMP: YES NO	Explain		
What is pending to restore and clean at the dam site	Explain		

Is the construction area clean of construction debris, demolition, waste?	Yes NO	Explain
Are new native trees planted around the dam as requested to the contractor	Yes NO	Explain
Are construction debris in the ground	Yes NO	Explain
Are diesel, batteries, kerosene, paints, in the ground	Yes NO	Explain
Are excavations pits open left by the contractor	Yes NO	Explain
Where the impacts to biodiversity mitigated, how?	Yes NO	Explain
What does the ecological flow improve?	Yes NO	Explain
Have the borrow pits and quarries been restored?	Yes NO	Explain
Is there anything unfinished that the contractor needs to fix before accepting the remediation works on the dam	Yes NO	Explain
Is there any issue pending, or any claim by the community members	Yes NO	Explain
PERMITS AND DOCUMENTATION		
If there any pending issue with permits or any requirements or Certificate from ZEMA	Yes No Explain:	
LABOUR, HEALTH AND SAFETY		
Total number of accidents occurred in the construction		Is there a First Aid kit in the construction dam site Yes NO Explain
Name the type of injuries:		
Number of workers that had fatal accidents		Were families compensated?

Have all workers been fully paid and received all other entitlements?	Yes ☐ No ☐	If no, why not and what is the plan to do so?
Have all worker grievances been resolved?	Yes ☐ No ☐	If no, what is the plan for resolving these grievances? (actions, timelines and monitoring)
Have all/ any cases that were sent to the labour courts been resolved?	Yes ☐ No ☐	If no, what is the plan for resolving these grievances?
COMMUNITY HEALTH AND SAFETY		
Have all sites been restored to remove hazards to community health and safety? This could include removal of all waste/ leftover construction materials; instability of slopes in borrow pits or quarries	Yes ☐ No ☐	What hazards remain? What is the plan for addressing these hazards?
Have the walking paths, unfinished bridges, and other legacies resolved, please consult to the community	Yes ☐ No ☐	Explain
Number of incidents reported affecting community health and safety	Number	Notes:
Number of local people that suffer accidents because of the works	Number	Are any compensation or claim pending?
Are all incidents resolved?	Yes ☐ No ☐	If no, what is the action plan for resolving remaining incidents?
Are all cases of conflict resolved?	Yes ☐ No ☐	If no, what is the action plan for resolving remaining cases?
Dam safety		
What a dam safety plan prepared	Yes ☐ No ☐	
Was the community trained to manage the dam?	Yes ☐ No ☐	
Was an operational manual prepared and explain to the community dams committee?	Yes ☐ No ☐	
Are any issue remaining with the dams?	Yes ☐ No ☐	
GRIEVANCE MECHANISM		
Number of Complaints Received:		

Number of Complaints Resolved:		
Are all grievances resolved now?	Yes ☐ No ☐	If no, how many are not resolved:
Grievances pending		
Name of the local leader consulted		
Signature/sign of the leader		
Photographs	(insert photos of the construction site/ Issues identified)	

Final decision:

1- **The dam is ready to be accepted and there is not issue reported in this checklist.** ☐
2- **The dam is not ready to be accepted because there are issues pending to resolve by the contractor.** ☐

Please indicate all the issues the contractors need to resolve before receiving the site and dam:

Indicate who will supervise these works and the date that was agreed with the contractor to be resolved:

Pending problems, the contractor needs to fix before accepting the school	**Responsible to monitor**	**TIME TO BE RESOLVED (in hours and days)**
1-		
2-		

3-		
4-		
Name and signature of the PIU representative		
Name and SIGNATURE OF CONTRACTOR		
Name and SIGNATURE OF THE DISTRICT OFFICER (Engineer, Environmental or Community Officers)		
Name and Signature of UNOPS Environmental and	**Dam Specialist**	
DATE OF VISIT AND NOTIFICATION GIVEN:		
Reviewed and stored this checklist in the PIU project monitoring system		
Folder name:		
Date to send copy to the World Bank:		

Annex 4. Consultations report prepared by the PIU of ISDP project for the AF.

GOVERNMENT OF THE REPUBLIC OF ZAMBIA

MINISTRY OF AGRICULTURE

IRRIGATION DEVELOPMENT SUPPORT PROJECT

2020

REPORT ON THE ENVIRONMENTAL AND SOCIAL AUDIT STAKEHOLDER CONSULTATIONS HELD FOR THE ZAMBIA WATER RESOURCES DEVELOPMENT PROJECT SITES

Mercy Simaubi and
Moono I. Munkombwe
IDSP
3/31/2020

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1.0 INTRODUCTION

The ZWRDP consist of ten (10) sites where either new dams were constructed or old dams rehabilitated. However, the stakeholder consultations focused on four (04) sites as opposed to the entire ten (10). At the four sites visited, the IDSP Team met with representatives from the community, District and Provincial Offices. The selection of a representative sample in terms of the ZWRDP sites, community members, district officials, and provincial officers was in light of the prevailing circumstances during the stakeholder consultation exercise. The two main issues of concern which constrained IDSP and necessitated the need to sample the sites and work with stakeholder representatives were twofold:

- Worldwide outbreak and spread of the Covid 19 virus: The need to conduct the stakeholder consultation exercise arose amidst the world wide health concerns related to the Covid 19 virus. This situation is still ongoing and as such, the team conducting the consultations had to do so under the strictest conditions possible as prescribed through the Government directive issued under Cabinet office and other documentation relevant to ensuring the safety of the stakeholders and the team. Kindly refer to annex I of this report for the government guidance provided.
- Recent security unrest within Zambia: The first quarter of 2020 was also characterised by insecurity due to unrest in some quarters. Subsequently, in both rural and urban areas, it was life threatening to hold public meetings as mobs would sometimes be agitated.

In view of the foregoing, IDSP put together a team comprising the Dam specialist and the Environmental & Social Safeguards Specialist to undertake the assignment and finalise the ESA requirement for the extension of the project. The sites visited included the Zimba (Ngolongozya dam site, Zimba District Office, Southern Provincial office); Namwala (Makaba dam site); Lufwanyama (Katembula dam site and the Lufwanyama District Council) and Mansa (Chibalashi dam site; District office; and the provincial office). The exercise was carried out from 23rd to 28th March 2020.

2.0 CONSULTATIVE MEETINGS WITH STAKEHOLDERS

12.1 3.1 Southern Province

Stakeholder Consultations in Southern Province were held at three different levels. These levels included the Provincial, District and Community levels as follows:

12.1.1 3.1.1 Southern Provincial Office

A meeting was held with the Officials from Southern Province at the Provincial Office in Choma on 23rd March 2020. Present at the meeting were the Water Development Officer; and the Provincial Sanitation Officer and Engineering Assistant. Details of the meeting participants and pictures of the meeting are reflected in annexes i(a) and i (b) of this report. The focus of the meeting was to discuss the concerns and recommendations related to the environmental and social aspects of the ZWRDP works at the Ngolongozya and Makaba sites. Issues raised by the provincial team were as reflected in Table 1:

Table 3: Concerns and Recommendations from the Southern Province Office

NO.	CONCERN	RECOMMENDATION
1.	Incomplete dam works at both sites.	Complete all outstanding works at both sites.
2.	Incomplete rehabilitation of borrow pits.	Where applicable, do ground levelling, re-vegetation and other ESMP related works to ensure rehabilitation.
3.	Lack of information on water-wise irrigation; agribusiness; dam operation and maintenance.	Conduct training to empower communities with information and hands on experience in water-wise irrigation; agribusiness; dam operation and maintenance along with any relevant raining.

3.1.2 Zimba District Office

The meeting with the Zimba District Office was held at the Zimba District in Zimba 24th March 2020. Present at the meeting were the Acting District Agriculture Officer (DACO); Senior Technical Officer; Technical Officer; Acting District Fisheries and Livestock Officer; Engineering Assistant (from the provincial office); Water Development Officer. Details of the meeting participants and their picture areas reflected in annexes ii (a) and ii(b) of this report. As was the case with the provincial office, the focus of the meeting was to discuss the concerns and recommendations related to the environmental and social aspects of the ZWRDP works at the Ngolongozya and Makaba sites. Issues raised by the provincial team were quite similar to the concerns raised by the provincial office with some additional points as reflected in Table 2:

Table 4: Concerns and Recommendations from the Zimba District Office

NO.	CONCERN	RECOMMENDATION
1.	Incomplete dam works at both sites.	Complete all outstanding works at both sites.
2.	Incomplete canal at Ngolongozya	Complete construction of the canal
3.	Compromise of the reservoir due to e exposure to over 12,000 herds of cattle.	Construct a kraal along with drinking troughs for livestock.
4.	Lack of drifts on the access and exit points at the dam	Construction of the drifts on the access and exit points at the dam
5.	Poor access road to Ngolongozya	Grade the access road
6.	Incomplete rehabilitation of borrow pits.	Where applicable, do ground levelling, re-vegetation and other ESMP related works to ensure rehabilitation.
7.	Lack of information on water-wise irrigation; agribusiness; afforestation and dam operation and maintenance.	Conduct training to empower communities with information and hands on experience in water-wise irrigation; agribusiness; afforestation and dam operation and maintenance

3.1.3 Ngolongozya Dam Community

On 24th March, 2020, the IDSP Team met with the Ngolongozya Community Representatives. Present at the meeting were the Dam Committee Chairperson; Dam Committee Secretary; five (05) Dam Committee Members; Headman Kayumba; An agriculture Extension Officer based in Ngongozya; and the Engineering Assistant from the Provincial Office. Details of the meeting participants and their pictures are as reflected in annexes iii(a) and iii (b) of this report. In collaboration with IDSP, the community had done several urgent works to protect the dam and exhibited a high sense of ownership. The works that were undertaken included pilling of sacks to restore part of the eroded training wall; vegetation control and filling of gullies.

The discussions held on site bordered on four main themes: These themes included benefits accrued; outstanding RAP issues; concerns; and recommendations

3.1.3.1 Benefits of the Reservoir to the Community

The Community representatives submitted the following as the main benefits realised from the presence of the reservoir in their area:

i. All year round presence of water for domestic use;
ii. All year round presence of water for gardening;
iii. Constant availability of water for livestock (over 37,000 herds of cattle (12,000 from Ngolongozya and over 15, 000 for surrounding villages);
iv. Improved nutrition due to constant supply of fish from the dam and vegetables from the gardens which was not eh case before;
v. Ability to pay school fees and generally improved livelihoods from sale of fish and vegetables; and
vi. Lack of mortalities for the livestock due to inadequate/lack of water and heart water disease.

3.1.3.2 Status of Resettlement and Compensation Issues in Ngolongozya

There were no PAPs who will suffer losses as a result of the civil works for the dam. The FSL level has not changed and work on the dam has been limited to the spillway and embankment areas. No ARAP was required and social impact management was limited to specifications.

3.1.3.3 Concerns and Recommendations

The concerns raised by the Community Representatives are as reflected in Table 3.

Table 5: Submissions by the Ngolongozya Community

NO.	CONCERN	RECOMMENDATION
1.	Incomplete works on site	Complete all outstanding works at both sites.
2.	Poor access road	Improve on the access road
3.	Need for knowledge of how much water to release for downstream users through the flow pipes	Conduct training in Operation and Maintenance
4.	Lack of information in irrigated agriculture; crop management; marketing; water management (including sharing with down-stream users); and sustainable management of fisheries in view of the fish stock by the Ministry of Livestock.	Conduct training which will include among others training in agriculture; crop management; marketing; water management (including sharing with down-stream users); and sustainable management of fisheries.

3.1.4 *Makaba Dam*

The meeting with the Makaba Community was held on 24th March 2020. Present at the meeting were the Dam Committee Chairperson; Dam Committee Secretary; five (05) Dam Committee Members; and an agriculture Extension Officer from Namwala District; and the Engineering Assistant from the Provincial Office. Details of the meeting participants and a picture of the meeting are as reflected in annexes iv (a) and iv(b) of this report. An inspection of the dam reviewed that the third drop structure had been undermined and this had caused a near breach of the training wall which has since been repaired with support from IDSP. The seepage was constant from the last report submitted and it was evident that remedial measures need to be done urgently.

Submissions from the Community Representatives were fourfold. This included benefits accrued; outstanding RAP issues; concerns; and recommendations

3.1.4.1 Benefits of the Reservoir to the Makaba Community

The Community representatives submitted the following as the main benefits realised from the presence of the reservoir in their area:

i. All year round presence of water for domestic use;
ii. All year round presence of water for gardening;
iii. Constant availability of water for thousands of herds of livestock within Makaba community;
iv. Supply of water for thousands of herds of livestock from surrounding communities;
v. Improved nutrition due to constant supply of fish from the dam and vegetables from the gardens which was not eh case before.
vi. Ability to pay school fees and generally improved livelihoods from sale of fish and vegetables; and
vii. Lack of mortalities for the livestock due to inadequate/lack of water.

3.1.4.2 Status of Resettlement and Compensation Issues in Makaba

Compensation and resettlement in Makaba was in accordance with the Abbreviated Resettlement Action Plan (ARAP) for the site. Table 4 is a summary of the status of resettlement and compensation in Makaba:

Table 6: Resettlement and Compensation issues in Makaba

No	Aspect	ARAP requirement	Risk	Status
1	Compensation and livelihood restoration	A resettlement action plan to be prepared to ensure compensation for the lost assets and income.	Failure to restore PAPs livelihoods.	All the identified PAPs were compensated for their losses.
2	Land to land compensation for affected PAPs.	Allocation of land to all PAPs whose land was affected by the project.	Incomplete livelihood restoration.	The allocation of plots was done along the canal and the PAPs utilise the land off rainy season for growing vegetable

Further, the community submitted that they had no graves within the reservoir area.

3.1.4.3 Concerns and Recommendations

The concerns raised by the Community Representatives are reflected in Table 4.

Table 7: Submissions by the Makaba Community

NO.	CONCERN	RECOMMENDATION
1	Incomplete works on site	Complete all outstanding works on site.
2	Poor state of the spillway	Repair spillway with an alternative design resilient to the prevailing conditions at the dam
3	While the canals were cleaned and are in use, the pipes have been cracking when exposed.	Replace pipes with a more durable make, preferably galvanised or HDPI.
4	Inadequate canal length as more farmers were venturing into gardening.	Increase the canal length to carter for all affected farmers.
5	Risk behaviour from the community which is practiced by crossing on the spillway even when the dam is easily accessed from the right and left banks downstream the spillway	Sensitise the community on the dangers of the risk being undertaken and encourage safe practices.
6	Incompetence in agribusiness; water management; dam maintenance;	Conduct training in agribusiness; water management and dam maintenance.
7	Incomplete borrow pit rehabilitation	Complete borrow pit rehabilitation.

12.2 3.2 Copperbelt Province

Stakeholder Consultations on the Copperbelt Province were held at District and Community levels:

12.2.1 3.2.1 Lufwanyama District Council

The Lufwanyama District officials were met on 25th March, 2020 in the Lufwanyama District Council Hall. Present at the meeting were the Town Planner; Technical Officer; Environmental Planner and the Chief's Affairs Representative. Details of the meeting participants and a picture of the meeting are as reflected in annexes v(a) v(b) of this report. The meeting focused on concerns and recommendations related to the environmental and social aspects of the ZWRDP works at the Katembula sites. Issues raised by the provincial team were as reflected in Table 5:

Table 8: Concerns and Recommendations from the Lufwanyama District Office

NO.	CONCERN	RECOMMENDATION
1	Incomplete dam works in sites.	Complete all outstanding works on site.
2	Incomplete rehabilitation of borrow pits.	Where applicable, do ground levelling, re-vegetation, and other ESMP related works to ensure complete rehabilitation.
3	Lack of information on dam operation and maintenance.	Conduct training on dam operation and maintenance
4	Need to supply water to the township for utilisation	Engage other stakeholders to finance the construction of a pipeline.

3.2.2 Katembula Dam Community

The consultative meeting with the Katembula Community was held on 25th March 2020. Present at the meeting were the Dam former Dam Committee Chairperson; seven (07) Community Representatives; Agriculture Camp Officer; and the Chieftainess' Representative. Details of the meeting participants and a picture of the meting are as reflected in annexes vi (a) and vi(b) of this report respectively. With support from IDSP, the community had done several urgent works to protect the dam and they demonstrated a high sense of ownership. The works that were undertaken included pilling of sacks to restore part of the eroded training wall.

Submissions from the Community Representatives were fourfold and included benefits accrued; outstanding RAP issues; concerns; and recommendations

3.2.2.1 Benefits of the Reservoir to the Katembula Community

The Community Representatives submitted the following three as the main benefits accruing to the community from the presence of the reservoir included:

i. All year round presence of water for domestic use;
ii. All year round presence of water for gardening; and
iii. Improved nutrition due to constant supply of fish from the dam and vegetables from the gardens which was not eh case before.

3.2.2.2 Status of Resettlement and Compensation Issues in Katembula

Compensation and resettlement in Katembula was handled in accordance with the Abbreviated Resettlement Action Plan (ARAP) for the site. Table 7 is a summary of the status of resettlement and compensation in Katembula:

Table 9: Status of Resettlement and Compensation in the Katembula Community

Aspect	ARAP requirement	Risk	Status
Compensation and livelihood restoration	A resettlement action plan to be prepared to ensure compensation for the lost assets and income.	Failure to restore PAPs livelihoods.	All the 30 identified PAPs were compensated. Compensation payments for lost crops were made by government and verified by WB. No grievances logged in the grievance redress mechanism (GRM).
Land for land compensation	Replacement land to be made available by the traditional leadership.	Failure to restore PAPs livelihoods.	According to Chieftainess Shimukunami, all affected PAPs are provided with permanent land for cultivation thereby negating any further issuance of land. Minutes of the meeting held regarding this matter are as reflected in annex (xi(a) while official communication from HRH is as reflected in annex (xi (b) of this report.

3.2.2.3 Concerns and Recommendations

The concerns raised by the Community Representatives are reflected in Table 6

Submissions from the Makaba Community were threefold: Benefits accrued; concerns and recommendations as follows:

Table 10: SUBMISSIONS BY THE KATEMBULA COMMUNITY

NO.	CONCERN	RECOMMENDATION
1.	Incomplete works on site	Complete all outstanding works at both sites.
2.	Poor access roads on the left and right banks	Improve on the access roads on both the left and right banks.
3.	Lack of information on water management and dam maintenance;	Conduct training on water management and dam maintenance;

12.3 3.3 Luapula Province

Stakeholder Consultations in Luapula Province were conducted at Provincial, District and Community levels as follows:

12.3.1 3.3.1. Luapula *Provincial Office*

The provincial meeting was held in Provincial Agriculture Coordinator (PACO)'s office on 26th March 2020. Present at the meeting were the PACO, Senior Water Engineer; and the Principal Agriculture Officer. Details of the meeting participants are reflected in annex vii(a) while a picture of the meeting is as reflected in annex vii(b) of this report. The focus of the meeting was to discuss the concerns and recommendations related to the environmental and social aspects of the ZWRDP works at the Chibalashi site. Issues raised by the provincial team were as reflected in Table 7:

Table 11: CONCERNS AND RECOMMENDATIONS FROM THE LUAPULA PROVINCIAL OFFICE

NO.	CONCERN	RECOMMENDATION
1.	Incomplete dam works on site with emphasis on the spillway.	Complete all outstanding works on site.
2.	Lack of a crossing point	Provide access by constructing a bridge
3.	Incomplete rehabilitation of borrow pits.	Where applicable, do ground levelling, re-vegetation and other ESMP related works to ensure rehabilitation.
4.	Limited irrigable area on the right bank.	Provide an additional canal by pumping to higher ground.
5.	Lack of information on water-wise irrigation; agribusiness; dam operation and maintenance.	Conduct training to empower communities with information and hands on experience in water-wise irrigation; agribusiness; dam operation and maintenance along with any relevant raining.

3.3.2 Mansa District Office

The Mansa District Officials were met on 26th March 2020. Present at the meeting were the District Agriculture Officer (DACO); District Water Development Officer; Irrigation Engineer; Senior Agriculture Officer; Technical Officer; and two District Water Development Officers. Details of the meeting participants are as reflected in annex viii(a) while a picture of the meeting is as reflected in annex viii(b) of this report. As was the case with the provincial office, the focus of the meeting was to discuss the concerns and recommendations related to the environmental and social aspects of the ZWRDP works at the Chibalashi site. The District team made submission on benefits accruing; issues of concern and recommendations to address issues of concern as follows:

3.3.2.1 Benefits of the Reservoir to the Community

The benefits submitted by the DACO's office in included:

i. Improved gardening from consistent and adequate supply of water from the reservoir;
ii. Food security from fish accessed from the dam and vegetables grown;
iii. Improved livelihoods from fish and vegetables; and
iv. Continuous supply of water to Mansa River down-stream, which in times past would dry up in summer.

3.3.2.2 Concerns and Recommendations

While the District office appreciated the benefits from the reservoir, they had concerns and proposed recommendations to address the raised concerns as reflected in Table 8.

Table 12: Concerns and Recommendations from the Mansa District Office

NO.	CONCERN	RECOMMENDATION
1.	Incomplete Spillway	Complete works on the spill way
2.	Generally incomplete dam works.	Complete all outstanding works on site
3.	Lack of a crossing point	Provide access by constructing a bridge
4.	Incomplete rehabilitation of borrow pits.	Where applicable, do ground levelling, re-vegetation, and other ESMP related works to ensure rehabilitation.
5.	Lack of information on water-wise irrigation; agribusiness; dam operation and maintenance.	Train communities in water-wise irrigation; agribusiness; dam operation and maintenance along with any relevant raining.

12.3.2

12.3.3 3.3.3 District Commissioner's *Office*

The IDSP Team also met with the District Commissioner on 26th March 2020 as recommended by the DACO's office. Present at the meeting were the District Commissioner (DC); Irrigation Engineer; and three (03) District Water Development Officers (DWDO's). Details of the meeting participants are reflected in annex ix(a) while a picture of the meeting is as reflected in annex ix(b) of this report. The focus of the meeting was to discuss the concerns and recommendations related to the environmental and social aspects of the ZWRDP works at the Chibalashi site.

The DC's office appreciated the presence of the reservoir as it has been ensuring constant supply of water to the Mansa River as it passes through Mansa Town. He observed that plans are underway to develop Mansa into a City and Chibalashi Dam was key to ensuring water supply.

Issues raised by the provincial team were as reflected in Table 9:

Table 13: SUBMISSIONS BY THE DISTRICT COMMISSIONER'S OFFICE

NO.	CONCERN	RECOMMENDATION
1.	Incomplete dam works on site	Complete all outstanding works on site.
2.	Lack of a crossing point	Provide access by constructing a bridge
3.	Upstream flooding of the River	DC's office to engage the Office of the Vice President through the Disaster Mitigation and Management Unit (DMMU).
4.	Lack of consistent communication between the DC's office and the Project	The local officers attached to the project from the District office to keep the DC's office update don the project.

4.1.2 Chibalashi Dam Community

On 26th March 2020, the IDSP Team met with the Chibalashi Community Representatives. Present at the meeting were the Dam Committee Secretary; Treasurer; Vice Secretary; Headman Mulala; fifteen (15) Community Members; the site Agriculture Extension Officer; and representatives from the District office. Details of the meeting participants are as reflected in annex x(a) of this report while a picture of the meeting is as reflected in annex x(b) of this same report. On site, the community had done several urgent works using sand bags to protect the dam. They demonstrated a high sense of ownership. The works that were undertaken included pilling of sacks to restore part of the eroded training wall.

Submissions from the Community Representatives were fourfold and included benefits accrued; outstanding RAP issues; concerns; along with recommendations to address the raised concerns.

4.1.2.1 Benefits of the Reservoir

The Community Representatives submitted the following four as the main benefits accruing to the community from the presence of the reservoir included:

i. All year round presence of water for domestic use;
ii. All year round presence of water for gardening;
iii. Supply of fish from the reservoir;
iv. Improved nutrition due to constant supply of fish from the dam and vegetables from the gardens which was not eh case before;
v. Improved livelihoods from sale of fish and vegetables;
vi. Recreation (Local people go to relax by the reservoir); and
vii. Potential to raise funds for the community from planned minimal fees to be paid by visitors to the reservoir.

4.1.2.2 Status of Resettlement and Compensation Issues at Chibalashi

Compensation and resettlement in Chibalashi was handled in accordance with the Abbreviated Resettlement Action Plan (ARAP) for the site. Table 12 is a summary of the status of resettlement and compensation in Chibalashi:

Table 14: Status of Resettlement and Compensation issues in Chibalashi

No	Aspect	ARAP requirement	Risk	Status
1	Compensation and livelihood restoration	A resettlement action plan to be prepared to ensure compensation for the lost assets and income.	Failure to restore PAPs livelihoods.	The PAPs were paid for crop losses. The additional 30 were not affected by crop losses but lost land. The chief has offered land to the affected (Refer to annex xii-signed minutes of meeting)
2	Land for land compensation	Replacement land	Incomplete livelihood restoration.	• The irrigation system is established and in place. • Permanent Secretary for Luapula Province assisted in requesting for land from HH Chief Kalaba (Annex xii). • HRH Chief Kalaba committed to availing 216 ha of land to compensate the affected HHs (Annex xii(b).

4.1.2.3 Concerns and Recommendations

The concerns raised by the Community Representatives are reflected in Table 10

Table 15: Submissions by the Chibalashi Community

NO.	CONCERN	RECOMMENDATION
1	Incomplete works on site	Complete all outstanding works at both sites.
2	Poor access road	Improve on the access road
3	Lack of a crossing point for the community members	Need to provide a bridge at a point to be determined by experts
4	Lack of information in irrigated agriculture; crop management; marketing; water management (including sharing with down-stream users); and sustainable management of fisheries in view of the fish stock by the Ministry of Livestock.	Conduct training which will include among others training in agriculture; crop management; marketing; water management (including sharing with down-stream users); and sustainable management of fisheries.
5	Flooding upstream due to too much rain	Engage the Office of the Vice President through the DMMU

3.0 CONCLUSION

The Stakeholder consultations were successful in that the stakeholders were met and they made submissions as reflected in the report. The three main categories of their submissions bordered on appreciation to the benefits accrued due to the infrastructure; concerns for incomplete works; and recommendations on how best the stakeholders felt the concerns would be addressed. From all the sites visited, the key benefits highlighted included water supply; improved gardening; fishing; and watering animals. On the other hand, the main challenges bordered on incomplete construction works; need for improving/introducing access points; incomplete rehabilitation on borrow pits; and revegetation. The recommendations for identified challenges were also similar in that they touched on completing construction works; improving access; rehabilitation of borrow pit sites; and revegetation.

Further, the Makaba Community informed the IDSP Team that they did not have any graves within the area of inundation and neither did they have any outstanding compensation issues. The later part of the submission by Makaba Community was also reiterated by the Ngolongozya, Katembula and Chibalashi Communities who submitted that they did not have any outstanding cases for compensation of the Project Affected Persons within their Communities. This, they submitted, was because all cash compensation had been done by the project while land to land compensation had been addressed by their traditional leaders.

While land was offered by HRH Chief Kalaba to compensate affected families, the project will continue to monitor to ensure that the committed land is indeed provided to the affected family. The World Bank will be updated on any developments relate to this matter.

The consultations, therefore, clearly showed that while the communities appreciated the presence of dams in their areas, they also desired for the outstanding works to be completed.

4.0 ANNEXES

Annex i (a): List of participants-Southern Provincial Office

Irrigation Development Support Project

Attendance Register

Chuma - Provincial Admin Date: 23/03/2020

No.	Name	Institution	Position	Email/Contact Number	Signature
1	JACIC NKHOMA	DWRD	PWDO	nkhomaabisa@gmail.com	
2	FRIDAY KANGWA	DWRD	EA	0977 164203	
3	Mercy Simonga	IDSP	D/S	0971978493	
4	Moono Munkombwe	IDSP	S/S	0955 753 320	
5					
6					
7					
8					
9					
10					
11					
12					
13					

Annex i (b): Picture of participants-Southern Provincial Office

Annex ii (a): List of participants-Meeting with the Zimba District

Irrigation Development Support Project

Attendance Register

Zimba District : DACO'S OFFICE

Date: 24/03/2020

No.	Name	Institution	Position	Email/Contact Number	Signature
1	Moses Mumba	Agriculture	Ag/DACO	mozzesmumba@gmail.com/0979337585	[signature]
2	RONALD HAMAMBO	AGRICULTURE	S T O	0979350[illegible] ronaldhamambo@gmail.com	[signature]
3	Chanda Teddy	Agriculture	Technical officer	0975[illegible] chandateddy3@gmail.com	[signature]
4	DR Mukubekwa Nampokolwe	MFL	Ag/DFLC	dvopemba@gmail.com	[signature]
5	FRIDAY KANGWA	DMRD	Ext. ASSISTANT	0977-1[illegible]23 friday.kangwa8@gmail.com	[signature]
6	Mercy Simanbi	IDSP	D/S	mkasimambi@yahoo.com	[signature]
7	LAZAROUS MUBANGA	DWRD DRIVER	DRIVER	lazarousmubanga@yahoo.com	[signature]
8	Mooso Munkombwe	IDSP	S/S	mooso[illegible]@gmail.com	[signature]
9					
10					
11					
12					
13					

Council

Annex ii (b): Picture of participants-meeting held with the Zimba District Council

Annex iii(a): List of participants- Ngolongozya Community Meeting

Irrigation Development Support Project

Attendance Register

Ngolongozya Meeting with the Community Representatives (Dam Committee) Date: 24/03/2020

No.	Name	Institution	Position	Email/Contact Number	Signature
1	Hansen Kasumba		C.member.	0977880779	[illegible]
2	Dinizulu Simaulwinda		C.Member	0972756091	[illegible]
3	BERNARD HAWAILE		Chairperson	0975 99853	[illegible]
4	Kim S. SIANTENDA		Secretary	0975078473/0953253853	[illegible]
5	DALCES SIAMWAMWA		C/member	0777118093	S.D
6	Macksen Mwambo.		C/member	0973258411	[illegible]
7	Patricia Simakuwa		member	0777118088	P. Simakuwa
8	CLEMENT KATUNGWA	AGRICULTURE	AGRICULTURE AS.	0977789877	[illegible]
9	DANIEL KAYUMBA		MEMBER		[illegible]
10	POLINA SIKAATE			0777118718	P. Sikaate
11	Mercy Simanta	IDSP	D/S	0971978993	[illegible]
12	Moses I. Munkombwe	IDSP	S/S	0955 753 320	[illegible]
13	FRIDAY KANGWA	DARD	EA	0977 744 203	[illegible]
14	LAZAROUS MUBANGA	DNDP	DRIVER	0979518179	[illegible]

Annex iii(b): Picture of participants-Ngolongozya Community Meeting

Annex iv(a): List of participants-Makaba Community Meeting

Irrigation Development Support Project

Attendance Register

MAKABA DAM, NAMWALA

Date: 24/03/2020

No.	Name	Institution	Position	Email/Contact Number	Signature
1	MWANABUKA SHINGALWE	MOA	A.A	0977242848 / 0969485868 Muzashingalwe24@gmail.com	[illegible]
2	HATWAAMBO SYLVESTER	DAM C.M.	Secretary	0974675377	[illegible]
3	NDHLOVU RODGERS	CAC TREASURER	TREASURER	0977852723	[illegible]
4	Milimo charity	member	member	0762157150	[illegible]
5	Gidion chimbwete	member	member	0974547474	[illegible]
6	Crodness miyanda	member	member		[illegible]
7	CHIYOMBWE Aclason	MEMBER	MEMBER	09477152	[illegible]
8	FRIDAY KANGWA	PWRD	E AE	friday.kangwa8@gmail.com	[illegible]
9	LAZAROUS MUBANGA	PWRD	DRIVER	lazarousmubanga@yahoo.com	[illegible]
10	HAMAKOKO BORNWELL	CHAIR-PERSON	DAM COMMITTEE	0971147254	[illegible]
11	Mercy Simaubi	IDSP	DTS	0971978993	[illegible]
12	Mowa I. Munkombwe	IDSP	S/S	0955753320	[illegible]
13					

Annex iv(b): Picture of Meeting-Makaba Community Meeting

Annex v(a): List of participants-Lufwanyama District Council

Start 15:40
End 16:

Irrigation Development Support Project

Attendance Register

LUFWANYAMA DISTRICT COUNCIL Date: 25/02/2020

No.	Name	Institution	Position	Email/Contact Number	Signature
1	WEBSTER NTAMBO	COUNCIL	TOWN PLANNER	Websterntambo07@gmail.com	
2	PETER AREEBA	AGRICULTURE	TECHNICAL OFFICER	peteraceba70gmail.com	
3	Kafwana Kyembe	Council	Environmental Officer	K.kyembe2@gmail.com	
4	Miningo Milimo	MOCTA	Chiefs Affairs	miningomilimo@gmail.com	
5	Mercy Simamba	IDSP	D/S	mukasimamba@yahoo.com	
6	Moono Munkombwe	IDSP	S/S	moonomk@gmail.com	
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Annex v(b): Picture of participants-Lufwanyama District Council

Irrigation Development Support Project

Attendance Register

KATEMBULA DAM COMMUNITY

Date: 25/03/202

No.	Name	Institution	Position	Email/Contact Number	Signature
1	JERRIES MUSONDA	PLACLE	P.R	0961623167	[illegible]
2	Muteba Morrico	Chitasokame	CHIZOLO	0964601911	[illegible]
3	EVERISTO Kachingwe	Y. Kachingwe	MEMBER	0760032376	[illegible]
4	MICHELO ANDREW	N. MICHELO	MEMBER	0963933223	[illegible]
5	CHINTIMBA	SYDNEY	MEMBER	0966237815	[illegible]
6	Christon Matomba	Matomba	Member	096388797 81	[illegible]
7	Chabala Joyce	Chabala	Member		J. [illegible]
8	Lalabi Monta	Monta	Member		L. monta
9	Mashimango F	Mashimango	Member	0963 932501	F Mashimango
10	Mercy Simwanda	IDSP	KIS	0971978993	[illegible]
11	Moono Munkombwe	IDSP	SIS	0955 753 320	[illegible]
12	Bridget Mwiinga	Agriculture Officer	Camp officer	0969363384	[illegible]
13					

Annex vi(b): Picture of participants-Katembula Community Meeting

Annex vii(a): List of participants-Meeting with the Mansa Provincial Office

Irrigation Development Support Project

Attendance Register

DACO's Meeting (Environmental & Social Audit)

Date: 27/3/2020

No.	Name	Institution	Position	Email/Contact Number	Signature
1	Lukonga Ngalama	Agriculture	Irrigation Engineer ~~Eng ERA~~	ngalamalukonga@gmail.com	[signature]
2	Mayson Sanla	Agriculture	S/WAG Engineer	maysonsagila@yahoo.com	[signature]
3	Hamweeh Albert	MoA - Agriculture	Principal Agri. Off	ahamweeh@yahoo.co.uk 0978277721	[signature]
4	Mercy Simasiki	IDSP	D/S	mikssimanda@yahoo.com	[signature]
5	Moono Munkombwe	IDSP	Safeguards Sp.	moonomk@gmail.com	[signature]
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Annex vii(b): Picture of participants-Mansa Provincial Meeting

Annex viii(a): List of participants-Meeting with the Mansa District Office

Irrigation Development Support Project

Attendance Register

MEETING WITH THE MANSA DISTRICT OFFICE Date: 26/03/2020

No.	Name	Institution	Position	Email/Contact Number	Signature
1	ALICE NAMUKONDA CHIKOSHI	MWDSEP	DISTRICT WATER DEVELOPMENT OFFICER	~~alicenamukonda@gmail.com~~ alicenamukonda319@gmail.com	[illegible]
2	Lukonga Ngalama	Agriculture	Irrigation Engineer	ngalamalukonga@gmail.com	[illegible]
3	ARNOLD ABAU MUIMUI	AGRICULTURE	DACO MANSA	muimuiarnold@yahoo.com	[illegible]
4	Peter Kalima	MOA	SAO-Mansa	PeteKalima@gmail.com	[illegible]
5	BAKAJIKA KAPYA	MOA	T.O-Mansa	Kapyabakaz@gmail.com	[illegible]
6	Mary Simumba	IDSP	D/S	mukasimumba@yahoo.com	[illegible]
7	George Phiri	IDSP-DWDO	DWDO	[illegible]	[illegible]
8	DITTA CHISHIMBA	MWDSEP	DWDO	chishimbachota@gmail.com	[illegible]
9	Moono Mudenda	IDSP	S/S	moonomk@gmail.com	[illegible]
10					
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Annex viii(b): Picture of participants-Mansa District Meeting

Annex ix(a): List of participants-Meeting with the Mansa District Commissioner

Irrigation Development Support Project

Attendance Register

MEETING AT DC'S OFFICE Date: 26/03/2020

No.	Name	Institution	Position	Email/Contact Number	Signature
1	Lukonga Ngalama	Agriculture	Irrigation Engineer	ngalamalukonga@gmail.com	
2	CHITI CHISHIMBA	DIERD	DWDO	[illegible]@gmail.Com	
3	George Phiri	DWDO	DWDO	Phiri-george@yahoo.ru	
4	ALICE NAMUKONDA	DWRD	DWDO	alicenamukonda399@gmail.com	
5	JAMES MWEWE	D C DEP ADM MANSA	D.C MANSA	[illegible]@GMAIL.Com	
6	Mercy Simunda	IDSP	D/S	[illegible]@yahoo.com	
7	Moono Muzyomane	IDSP	S/S	[illegible]@gmail.com	
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Annex ix(b): Picture of participants-Meeting with the Mansa District Commissioner

Annex x(a): List of participants-Chibalashi Community Meeting

Irrigation Development Support Project

Attendance Register

CHIBALASHI DAM COMMUNITY MEETING Date: 26/03/2020

No.	Name	Institution	Position	Email/Contact Number	Signature
1	KAUNDA ELIZABETH	Community	Member	-	KAUNDA
2	Edinah Fenelya	Community	member	0762445502	EDINAH
3	Ireen Nkandu	Community	member	-	I Nkandu
4	Mable Chilufya	Community	member	0964627886	Mchilufya
5	BENSON CHANDO	COMMUNITY	MEMBER	—	
6	Chansa Isaac	Community	Secretary	—	
7	AARON MUYAMBO	community	MEMBER	—	
8	Silas Mulala	Community	Headman	—	Mulala
9	MAYALE LAWRENCE	COMMUNITY	TREASURER	0978327732	L. Mayale
10	MAMBWE EXILDAH	COMMUNITY	V. SECRETARY	0966736923	
11	Mercy Simuuka	IDSP	D/S	0971978592	
12	MOSES MUNKOMBOE	IDSP	S/S	0955753320	
13					

Irrigation Development Support Project

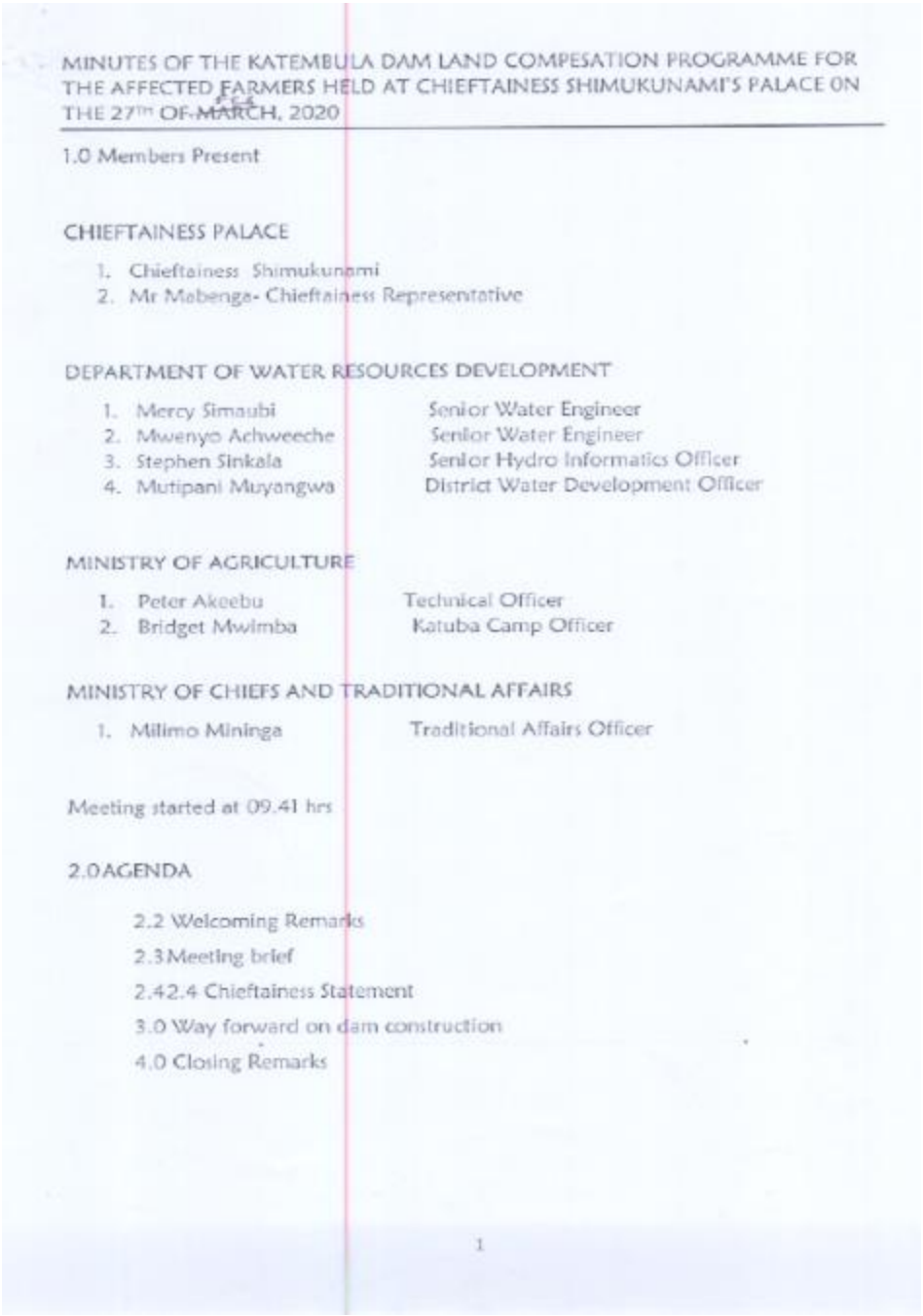
Attendance Register

CHIBALASHI DAM COMMUNITY MEETING Date: 26/03/2020

No.	Name	Institution	Position	Email/Contact Number	Signature
1	RUTH CHIYAYIKA	AGRICULTURE	AGRICULTURE ASSISTANT	ruthchiyayika@gmail.com	Ruth
2	ALICE NAMUKONDA	MWSDSEP	DISTRICT WATER DEV. OFFICER	alicenamukonga@gmail.com	
3	GEORGE PHIRI	MWDSEP	DISTRICT WATER DEV. OFFICER	phiri.george@yahoo.co.uk	
4	LUKANGA NGALAMA	AGRICULTURE	IRRIGATION ENGINEER	ngalamalukanga@gmail.com	
5	MIYAMBO ELIAS	COMMUNITY	MEMBER		Elias
6	Mwaba Derrick	Community	member	0763265414	
7	mwaba Clarence	community	member	0962284209	
8	estella muchini	community	member	0962661261	
9	Malonga Loveness	Community	member		L. Malonga
10	J. Mwaba	Community	member	0968554960	
11	Agness Muyambo	Community	member		
12	Memory Muyambo	Community	member		M. Muyambo
13	CHIPOM MR BENSON	Community	member		B. Chipom

Annex x(b): Picture of participants-Chibalashi Community Meeting

Annex xi (a): Minutes of the meeting with HRH Chieftainess Shimukuni



MINUTES OF THE KATEMBULA DAM LAND COMPESATION PROGRAMME FOR THE AFFECTED FARMERS HELD AT CHIEFTAINESS SHIMUKUNAMI'S PALACE ON THE 27TH OF MARCH, 2020

1.0 Members Present

CHIEFTAINESS PALACE

1. Chieftainess Shimukunami
2. Mr Mabenga- Chieftainess Representative

DEPARTMENT OF WATER RESOURCES DEVELOPMENT

1.	Mercy Simaubi	Senior Water Engineer
2.	Mwenyo Achweeche	Senior Water Engineer
3.	Stephen Sinkala	Senior Hydro Informatics Officer
4.	Mutipani Muyangwa	District Water Development Officer

MINISTRY OF AGRICULTURE

1.	Peter Akeebu	Technical Officer
2.	Bridget Mwimba	Katuba Camp Officer

MINISTRY OF CHIEFS AND TRADITIONAL AFFAIRS

1.	Milimo Mininga	Traditional Affairs Officer

Meeting started at 09.41 hrs

2.0 AGENDA

2.2 Welcoming Remarks
2.3 Meeting brief
2.42.4 Chieftainess Statement
3.0 Way forward on dam construction
4.0 Closing Remarks

1

i) INTRODUCTIONS

Members introduced themselves accordingly.

ii) WELCOMING REMARKS

The opening remarks were given by Ms Mininga Milimo, she welcomed everyone to the meeting and briefed the chieftainess that the agenda of the meeting was a follow up meeting from the one the District Water Development Officer as well as her self-concerning the need to compensate land to the affected farmers who has gardens around the Katembula dam construction site.

III) MEETING BRIEF

Ms Mercy Simaubi gave a briefing firstly by thanking the chieftainess for allowing the Zambian Government -through the Department of Water Resources Development construct Katembula Earth dam in her chiefdom and for being open and always helpful as and when required.

She later explained that the Ministry paid 30 affected farmers a total of K217, 000 as payment for their crops that were affected resulting from the construction in March, 2019. After the payments were concluded, the local people explained that they also wanted alternative land to use for their gardening purposes, due to this, the Department of Water Resources Development sent the District Water Resources Development Officer-Lufwanyama to her royal highness's palace to that effect, the feedback of that meeting was that her Royal Highness BODLY stated that she would not give out any land to the affected farmers because the people were only doing seasonal gardening near the dam area and had permanent fields were they did their cultivation from their homes of residence were not affected. This follow up meeting has been requested for so that her royal highness can validate this in form of writing so that the Ministry of Water Resources Development can get further funding for the remaining civil works as well as close up on the compensation component of construction.

IV) CHIEFTAINESS STATEMENT

Chieftainess Shimukunami stated that there was no need to compensate the affected people with alternative land in addition to the monetary compensation they got from Government, reasons being that;

I. The claimed people are from her chiefdom and their homes of residence were not affected by the dam construction
II. The said gardens that were submerged were seasonal and they have permanent fields were they cultivate crops from all year round
III. The crops in their gardens have already been compensated for in monetary form by the Government.

Furthermore, during the identification process of compensation beneficiaries, the people showed officers who were doing surveys their alternative land they use for

cultivation. "I still stand by my word that I will not give out any land to these people".

Her Royal highness further explained that, there is need for her to have a list of the affected farmers again so she can have a meeting with them and state that she will still not give them land.

2.0 WAY FORWARD FOR KATEMBULA DAM

Eng. Simaubi told the house that the dam is not yet completed and still requires civil and remedial works to be done, in that regard, there will be a contractor coming to finish up the civil works at the end of the rainy season, before that, there will be remedial works which are about to start done and the Department is requesting the palace to help with the recruitment of general workers for the said works.

Additionally, there will be a lot of people coming in and out of the chiefdom to quantify the works that are scheduled to begin, this is said in line with the national security issue currently taking place.

Furthermore, this validation meeting will require auditors that will come to see the chief to ensure that the meeting conclusions indeed where done on or before the 16th of March, 2020. In Conclusion, the department is requesting for the letter to be done on the statement on land compensation so that the issue can be concluded.

The chieftainess mentioned that the letter will be done as soon as possible and be given to the ministry, her Royal highness also mentioned that, the palace must be informed in future when there other developments being done in the district and also whenever people come to carry out works at the dam in line with the national security issues.

3.0 CLOSING REMARKS

Ms Millimo Mininga thanked the chieftainess for her time and thanked the delegates that came through and wished them a safe journey back home.

4.0 The meeting was closed at 10.20 hrs.

Secretary name and signature: For

Mutipani Muyangwa

District Water Development officer:

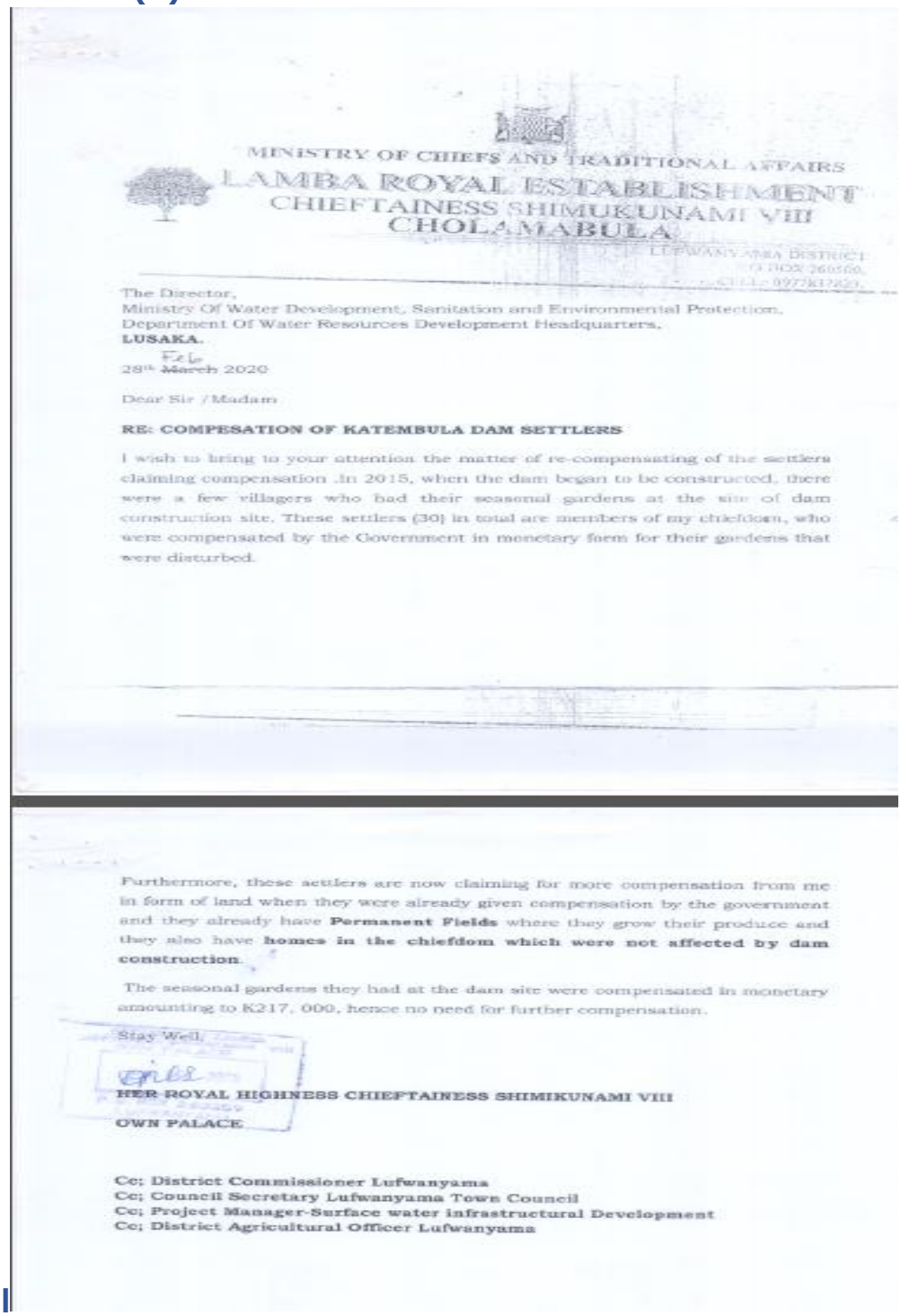
25/02/2020

Her Royal Highness signature:

JOSEPH JHANGA
0977091314

3

Annex xi (b) Communication from HRH Chieftainess Shimukunami



MINISTRY OF CHIEFS AND TRADITIONAL AFFAIRS
LAMBA ROYAL ESTABLISHMENT
CHIEFTAINESS SHIMUKUNAMI VIII
CHOLAMABULA

LUFWANYAMA DISTRICT
P.O BOX 260500,
CELL: 0977817423.

The Director,
Ministry Of Water Development, Sanitation and Environmental Protection,
Department Of Water Resources Development Headquarters,
LUSAKA.

28th ~~March~~ Feb 2020

Dear Sir / Madam

RE: COMPESATION OF KATEMBULA DAM SETTLERS

I wish to bring to your attention the matter of re-compensating of the settlers claiming compensation .In 2015, when the dam began to be constructed, there were a few villagers who had their seasonal gardens at the site of dam construction site. These settlers (30) in total are members of my chiefdom, who were compensated by the Government in monetary form for their gardens that were disturbed.

Furthermore, these settlers are now claiming for more compensation from me in form of land when they were already given compensation by the government and they already have **Permanent Fields** where they grow their produce and they also have **homes in the chiefdom which were not affected by dam construction**.

The seasonal gardens they had at the dam site were compensated in monetary amounting to K217, 000, hence no need for further compensation.

Stay Well,

HER ROYAL HIGHNESS CHIEFTAINESS SHIMIKUNAMI VIII
OWN PALACE

Cc; District Commissioner Lufwanyama
Cc; Council Secretary Lufwanyama Town Council
Cc; Project Manager-Surface water infrastructural Development
Cc; District Agricultural Officer Lufwanyama

Annex xii (a): Letter from PS Luapula Province to HRH Chief Kalaba

Correspondence should be addressed
to the District Commissioner
Tel/Fax: 260 02-821278

In reply Please quote:
OPDC/MANSA/54/24/1

REPUBLIC OF ZAMBIA
OFFICE OF THE PRESIDENT
DISTRICT COMMISSIONER'S OFFICE
MANSA DISTRICT, LUAPULA PROVINCE
P.O. BOX 710065
MANSA

26th February 2019

His Royal Highness Chief Kalaba
His Royal Palace
MANSA DISTRICT

Your Royal Highness

REQUEST FOR LAND ALLOCATION FOR THE SEVENTY-TWO (72) DISPLACED FARMERS IN CHIBALASHI DAM AREA

Reference is made to the above subject.

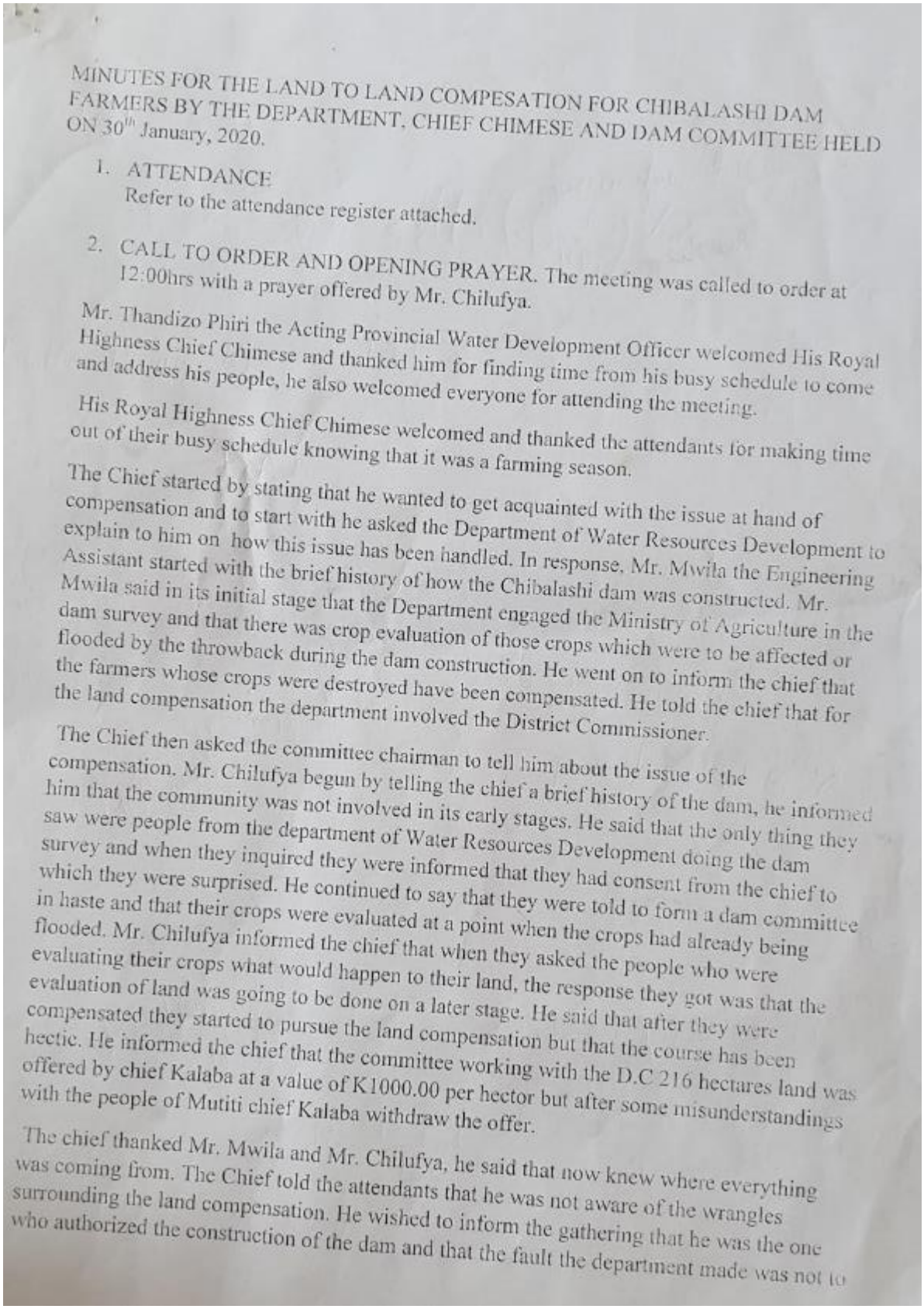
I write to you, your Royal Highness to request for 216 hectares of land to be shared amongst the 72 displaced farmers who were cultivating where Chibalashi Dam has been constructed. Attached are names of the displaced farmers.

Your assistance to the above request will be highly appreciated.

James M. Nyenjele (Mr)
DISTRICT COMMISSIONER
MANSA DISTRICT

Copied to : The Permanent Secretary – LUAPULA PROVINCE
: The Chief and Traditional Affairs –LUAPULA PROVINCE

Annex xii (b): Minutes of the meeting with HRH Chief Kalaba



MINUTES FOR THE LAND TO LAND COMPESATION FOR CHIBALASHI DAM FARMERS BY THE DEPARTMENT, CHIEF CHIMESE AND DAM COMMITTEE HELD ON 30th January, 2020.

1. ATTENDANCE
   Refer to the attendance register attached.

2. CALL TO ORDER AND OPENING PRAYER. The meeting was called to order at 12:00hrs with a prayer offered by Mr. Chilufya.

Mr. Thandizo Phiri the Acting Provincial Water Development Officer welcomed His Royal Highness Chief Chimese and thanked him for finding time from his busy schedule to come and address his people, he also welcomed everyone for attending the meeting.

His Royal Highness Chief Chimese welcomed and thanked the attendants for making time out of their busy schedule knowing that it was a farming season.

The Chief started by stating that he wanted to get acquainted with the issue at hand of compensation and to start with he asked the Department of Water Resources Development to explain to him on how this issue has been handled. In response, Mr. Mwila the Engineering Assistant started with the brief history of how the Chibalashi dam was constructed. Mr. Mwila said in its initial stage that the Department engaged the Ministry of Agriculture in the dam survey and that there was crop evaluation of those crops which were to be affected or flooded by the throwback during the dam construction. He went on to inform the chief that the farmers whose crops were destroyed have been compensated. He told the chief that for the land compensation the department involved the District Commissioner.

The Chief then asked the committee chairman to tell him about the issue of the compensation. Mr. Chilufya begun by telling the chief a brief history of the dam, he informed him that the community was not involved in its early stages. He said that the only thing they saw were people from the department of Water Resources Development doing the dam survey and when they inquired they were informed that they had consent from the chief to which they were surprised. He continued to say that they were told to form a dam committee in haste and that their crops were evaluated at a point when the crops had already being flooded. Mr. Chilufya informed the chief that when they asked the people who were evaluating their crops what would happen to their land, the response they got was that the evaluation of land was going to be done on a later stage. He said that after they were compensated they started to pursue the land compensation but that the course has been hectic. He informed the chief that the committee working with the D.C 216 hectares land was offered by chief Kalaba at a value of K1000.00 per hector but after some misunderstandings with the people of Mutiti chief Kalaba withdraw the offer.

The chief thanked Mr. Mwila and Mr. Chilufya, he said that now knew where everything was coming from. The Chief told the attendants that he was not aware of the wrangles surrounding the land compensation. He wished to inform the gathering that he was the one who authorized the construction of the dam and that the fault the department made was not to

involve his representatives in the dam survey and other processes. He said that yes he understood that some crops were lost but he was learning it there that his people were even compensated without them telling him about it but only informing him of the land compensation and other problems.

The chief went on to tell the gathering that, as it stand it's very difficult to establish the exactly hectares which was lost by each farmer and that the hectares which some were claiming were not true. He went on to caution them that the land was his and that those who were claiming big portions of land to have been lost needed to produce the papers on which he allocated the land to them.

The chief said he can look for land from his chiefdom or he can even engage chief Kalaba if they wished because he like hard worker, so he asked them if they really wanted land, to which the chairman said that they wanted to be compensated in monetary form to which all the affected farmers agreed. The said that he knew that that was what they wanted because he knew that all of them had were they were farming.

Mr. Mwila told the meeting that according to the contract to construct the dam, there was a provision to compensate the farmers who will lose crops in monetary form but for the farmers who lose land they were to be compensated with land and not in monetary form.

Mr. Mwindula wanted to know through the chief if Mr. Mwila was speaking the truth, because according to him, when the Permanent Secretary in the Ministry of Water Development Dr. E. Chomba informed them that the farmers who lost land will be compensated in monetary form also. In response Mr. Mwila, said he that was ignorant about that, but doubted if the P.S said so because the P.S understood the contents of the contract.

The Chief said that he understood the position of the government and that of his subjects and said that it will be difficult to have them compensated in monetary form but he offered that he can look for land for those who are claiming that they lost big potions of land. He offered that he can give them 5 to 10 hectares but that he will grab the land if no farming activities in 2 years were not taking place and he said that those who just wanted some small portions of land to do some gardening he can demarcate for them some land along the canal.

ANY OTHER BUSSNESS

The Chief appealed to the government to support the farmers with some farm mechanization equipment's.

The Chief thanked his subjects for their usual cooperation and thanked the government through the Department of Water Resources Development for choosing his chiefdom for the construction of dam. Mr. Mwila thanked the committee for coming and for the support they usually offer to the department.

The meeting ended about 14:45hrs with a prayer which was offered by his Royal Highness chief Kalaba

Royal Highness Chief Chimese.....

Chairman

Mr. Mutale Mwila.....

Secretary

Last page----------