UNITED REPUBLIC OF TANZANIA
MINISTRY OF WATER

Updated Environmental and Social Impact Assessment (ESIA) Report for the Proposed Construction of Farkwa Dam, Water Treatment Plant and Water Conveyance System to Chemba District Council and Dodoma City, Dodoma Region, Tanzania

EXECUTIVE SUMMARY

Ministry of Water
Kolon Building adjacent to DUWASA Head Office,
Chimwaga Road, P.O Box 456,
40473 Dodoma, Tanzania,
Tel: +255 26 2322602/+255 26 2322602
Email: ps@maji.go.tz

Submitted to:

The National Environment Management Council
35 Regent Street, P.O. Box 63154,
11404 Dar es Salaam, Tanzania.
Tel: +255 (022)2774852/89; Fax: +255 (022) 2774901
E-mail: nemc@nemctan.org

Prepared by:

TRES CONSULT (T) LIMITED
Tanzania Rapid Environmental Solution Consultants Limited
TRES House, Plot No. 236/1 TRA Road, Mwenge Area
P.O Box 31155 Dar es Salaam
Phone (+255) 0713 425442/ 0782 425442
Fax: +255 22 2461054,
E-mail: tresconsultants@gmail.com
Website: www.tresconsult-tz.com

August, 2021

BASIC INFORMATION ABOUT THE PROJECT

Executive Summary

Project title:	Environmental and Social Impact Assessment (ESIA) Report Proposed Construction of Farkwa Dam, Water Treatment Plant and Water Conveyance System to Chemba and Dodoma City and Chemba District Council, Dodoma Region, Tanzania
Location:	Chemba District Council and Dodoma City, Dodoma Region, Tanzania
Proponent Contacts:	Permanent Secretary, Ministry of Water; Kolon Building adjacent to DUWASA Head Office, Chimwaga Road, P.O Box 456, 40473 Dodoma, Tanzania, Tel: +255 26 2322602/+255 26 2322602 Email: ps@maji.go.tz
Sponsor of the project:	Government of the United Republic of Tanzania
EIA Consultants:	TRES-Consult Tanzania Limited, TRES House, Plot No. 236/1, TRA Road, Mwenge Area, P.O Box 31155 Dar es Salaam, Tanzania Phone (+255) 0713425442/ 0782663447; Fax: +255 22 2461054; E-mail: tresconsultants@gmail.com; Contact Person: Bashiru Abdul / Abel Sikaona
ESIA Preparation Period:	September 2014/2015
Revised ESIA version:	July/August 2021

TABLE OF CONTENTS

LIST OF TABLES

ABBREVIATIONS AND ACRONYMS

AFDB	African Development Bank
CDA	Capital Development Authority
CE	Consulting Engineer
CFRD	Concrete Face Rockfill Dam
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CO^2	carbon dioxide
CoI	Corridors of Impact
DUWASA	Dodoma Urban Water Supply and Sanitation Authority
EFO	Environmental Field Officer
EHS	Environment Health and Safety
EIA	Environmental Impact Assessment
EMP	Environmental and social monitoring plan
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
HEM	Hydro-Electrical and Mechanical
HIV/ AIDS	Human Immuno Deficiency Virus/ Acquired Immune Deficiency Syndrome
HSE	Health, Safety and Environment
HSO	Health and Safety Officer
IDWB	Internal Drainage Water Basin
IFC	International Finance Cooperation
IUCN	International Union for Conservation of Nature
LGAs	Local Government Authorities
MoW	Ministry of water
NEMC	National Environment Management Council
NOx	Nitrogen oxides
OSHA	Occupation Safety and Health Authority
PO-RALG,	President Office, Regional Administration and Local Government
RAS	Regional Administrative Secretary
RCC	Roller Compacted Concrete
RSs	Regional Secretariats
RUWASA	Rural Water Supply and Sanitation Agency
SEMO	Site Environmental Management Officer
TANESCO	Tanzania Electric Supply Company Limited
TANROAD	Tanzania National Roads Agency
TBS	Tanzania Standards
TOR	Terms of Reference
ULV	utra-low volume
VPO	Vice President's Office
WHO	World Health Organisation
WSDP	Water Sector Development Programme
WTP	Water Treatment Plant

1 EXECUTIVE SUMMARY

1.1 OVERVIEW OF THE PROJECT

The Government of United Republic of Tanzania through the Ministry of Water is implementing the Water Sector Development Programme (WSDP) with the aims of improving access to water supply and sanitation services in rural and urban areas. The target of WSDP is to meet the Tanzania's Development Vision, which aims at achieving an absence of abject poverty by 2025, where several achievements are called for including increased access to safe water to be raised to 90% by 2025 in the rural areas and 100% in urban. Therefore, the Ministry of water (MoW) is coordinating the implementation of Farkwa Dam Construction Project comprising (i) Main and Saddle dam construction (ii) Water Treatment Plant (WTP) and (iii) Conveyance system to Dodoma City and Chemba District Council. Also, under this project there will be a component of catchment protection and conservation, in order to conserve the upstream catchment of the dam site.

The overall objectives of the project are to improve water supply services to beneficiaries living within Dodoma City, Chemba District, Bahi District and Chamwino District, the communities along the conveyance system by increasing the quantity of water available in the water distribution system and improving its quality to remain in compliance with Tanzanian and International standards. Increased clean and safe water availability to Dodoma City and the Chemba, Bahi and Chamwino District Councils will contribute to poverty reduction and general social well-being of the people. The present main source of water is the Makutupora well field with an upgraded supply capacity of 61,000 gross m^3/day. This present source is considered not to be reliable enough for the supply of a growing population. The Ministry of Water carried out pre-feasibility studies, which identified Farkwa area as potential site for development of a Dam "Farkwa Dam" that would provide a reliable source of water supply to the Dodoma City. The Farkwa Dam is proposed to be constructed immediate downstream the confluence of Bubu and Mkinki rivers located in Mombose and Bubutole Villages of Farkwa Ward, Chemba District, Dodoma Region. The site is approximately 130 kilometres North of Dodoma on the road to Kondoa District.

The Dam consists of 25m high composite RCC and earthfill Main Dam with intake, outlet works and spillway – FSL 1,110m, 10 m high earthfill Saddle Dam and the site access roads. Other component includes the main Conveyance System consisting of 115 km long conveyance pipeline with an end connection to the Kilimani Tank N°2 in Dodoma; Conveyance System consisting of 51 km long conveyance pipeline to Chemba, water treatment plant, pump station, pumps and associated Hydro-Electrical and Mechanical (HEM) equipment located downstream of the dam on the left river bank; associated civil works and HEM equipment and the Interim tank to be located approximately 14 km from the dam site.

1.2 BACKGROUND OF THE ENVIRONMENTAL IMPACT ASSESSMENT

The Environmental Management Act, Cap 191and the Environmental Management (EIA and Audit) (Amendment) Regulations, 2018, Regulations require that all projects, undertakings and activities that may have potential adverse impacts to the environment to be subjected to the EIA study before their commencement. First schedule of the Regulations categorized canalization of water courses; abstraction and/or utilization of ground and surface water for bulk supply and water treatment plants as category ''A" project which requires the project proponent to undertake a full-fledged Environmental Impact Assessment (EIA) study before its commencement. The EIA certification is part of the project authorization

process. The Environmental and Social Impact Assessment (ESIA) for the proposed Farkwa dam was conducted according to the Environmental Management (EIA and Audit) (Amendment) Regulations, 2018 and submitted to the National Environment Management Council (NEMC) for certifiфcation. Based on the ESIA submitted to the NEMC, MoW was issued an Environmental Impact Assessment (EIA) Certificate in accordance with Section 92(1) of the Environmental Management Act, Cap 191. The EIA Certificate was signed by the Minister 0n 09th March 2016.

Cognizant of the elapsed period from when the ESIA was prepared in 2015 and cleared by NEMC in 2016, TRES Consult (T) Limited was commissioned by the Ministry of Water to update the Environmental and Social Impact Assessment (ESIA) report to document significant modifications in the prevailing biophysical and socioeconomic baseline conditions, incorporating the environmental and social risks and impacts associated to the added project components, identify and assess potentially negative and positive environmental and social impacts of the modified Project scope. The updated ESIA also is intended to reflect improvements and modifications to the Project design, fill in gaps identified in the previous ESIA work and align the assessment with international standards including the International Finance Cooperation (IFC) environmental and social performance standards, World Bank Group EHS Guidelines, African Development Bank (AFDB) Operational Safeguards and the Equator Principles, (June 2006).

The update builds on final ESIA study undertaken in 2014/2015 as the study was reviewed and found to be both comprehensive and broadly accurate. The updated ESIA Report, supporting documentation, and management plans have been prepared in accordance with the Environmental Management Act, cap 191 and Environmental Management (EIA and Audit) (Amendment) Regulations, 2018, and took into account the other relevant government policies, laws and regulations relevant to project and the environment. The ESIA update identifies the likely types of environmental and social impacts associated with the construction and operation of the proposed project. It assesses the magnitude and likelihood of these impacts based on previous work commissioned the Ministry of Water and currently available project information.

1.3 BRIEF DESCRIPTION OF THE PROJECT SITE

Administratively the proposed project site will be located in Mombose and Bubutole villages, Farkwa Ward, Chemba District, Dodoma Region. Water from the dam area will be conveyed to Chemba District and Dodoma City through a pipeline. Villages/Mtaa along the conveyance system to Chemba are Donsee, Tumbakose, Rofati, Gwandi, and for Dodoma City are Farkwa, Donsee, Makorongo, Khubunko, Babayu (chemba), Babayu (Bahi), Asanje, Mayamaya and Zanka will also be supplied with the water. Other Mtaa where the conveyer system will pass are within the Dodoma City.

The land uses in the project area varies from settlement areas at Mombose and Bubutole village centres and mainly agriculture fields and pasture areas for livestock. Comperatively undisturbed habitats are found along the Bubu River bed from and right downstream of the proposed Farkwa Dam. The main dam will be located across the valley downstream of the confluence of the Bubu and Mkinki rivers, allowing to take advantage of the additional hydrological inflow from the Mkinki river. A saddle dam will be constructed across the suspected old river bed of the Mkinki river, which forms a low topographical point approximately two kilometres North of the main dam site.

At the Dam site, the Bubu valley is intersected by a shallow granitic hill which forces the Bubu and Mkinki rivers to pass along its Southern foot forming the main section of the valley. On the northern side of the hill the connection to the steep slopes of the Bubu Fault is formed by a flat saddle. In the main section the

Bubu River flows from NE to SW. The river bed is divided in two narrow branches (Bubu and Mkinki rivers) separated by a small granitic island and has at the dam axis an elevation of 1,086.0m (a.s.l) and a total width of about 60m. The main section appears asymmetric. The right side has a relatively constant slope of about 40m/km and is almost entirely covered of Quaternary deposits of silty sands with some gravel. The left side is much steeper with an average slope of about 75m/Km and shows strong variations of slope.

The Quaternary overburden is discontinuous whereas the granite outcrops frequently. The thickness of the Quaternary overburden can be about 3.5m at the foot of the slopes, but it is usually 2.5m on the right side and 1.5m on the left. These deposits cover a huge granite massive which extends over the whole surrounding area and forms the bedrock which is heavily faulted and jointed. The riverbed deposits of well graded fine sands are thin (about 1.5m) and of small extent. Because of the steep slope of the rapids the Bubu River flows partly in a rocky bed of granite. The overburden of the saddle section is 4 to 6m thick and consists of soils with the same characteristics as in the main section. On the left side the abutment granite outcrops in huge blocks. On the right slope no outcrops of bedrock could be found.

The vegetation of the area is characterized with miombo woodland, wooded acacia, bush land and thicket as well as riverine vegetation along the river course. The vegetation of the area harbors or are being visited by different kind of species of avifauna, medium sized mammals, reptiles, small mammals, large mammals, and arthropods. Out of these the specialized flora and fauna study shows that there are significant presences of birds in the area compared to other higher levels animals. The study further indicates that none of the fauna species that are regarded as endemic or rare to Farkwa was recorded. However, fauna species that are under CITES Category or IUCN-listed species (threatened or vulnerable) was recorded.

Within the proposed area of inundation there are a number of man-made features apart from natural features. There are public and individual/household structures to mentioned notable ones there are two primary schools of Mombose and Bubutole in the respective villages, two mosques, three churches, two boreholes with the water tanks and their associated pumping stations. Along the conveyance system there are also a number of structures that will be encountered by the pipeline such as, residential properties, farmlands, and roads.

1.4 INSTITUTIONAL AND LEGAL FRAMEWORK FOR IMPLEMENTATION OF THE PROJECT

1.4.1 Institutional arrangements for the project

The construction of the proposed Farkwa Dam and Water Conveyance to Chemba and Dodoma City will require an effective institutional and management arrangement in order to ensure achievement of the intended benefits. Also the successful implementation of the ESIA recommendations depends on the commitment and capacity of various institutions and stakeholders to implement the recommendations effectively. Thus, the arrangement as well as the roles and responsibilities of the institutions and persons that will be involved in the implementation monitoring and review of the ESIA recommendations are discussed below.

Ministry of Water: the Ministry of Water is the overall overseer of all water projects in the country and is responsible for enacting various policies, laws, strategies, regulations and guidelines on the implementation of water projects and the provision of water and sanitation services in the country. The

Ministry has an overarching responsibility to ensure that the proposed project is carried out to the highest environmental standards strictly in accordance with the ESIA and the mitigation measures set out therein. The Ministry of Water will be supporting the ESIA and Environmental and Social Management Plan (ESMP) process. Will take over use, management and maintenance after the contract has been completed.

Dodoma Urban Water Supply and Sanitation Authority (DUWASA): DUWASA is an autonomous water utility in charge of the water supply and sewerage disposal services to urban residents of Dodoma City. Being classified as a category "A" urban water Authority in Tanzania, DUWASA is required to cover at full cost its operations and maintenance including part of its investment costs. As the foreseen asset owner and operator, DUWASA will among others things implement all recommendation or conditions attached to the environmental certificate of the project; carry out statutory environmental monitoring pertaining to the performance of the specific mitigations measures contained in the project and report the environmental monitoring results to NEMC.

Consulting Engineer (CE): the MOW will engage a Consulting Engineer (CE) to supervise the project construction and ensure that all environmental requirements are met on behalf of the proponents. The Consulting Engineer will ensure that all environmental mitigation is properly implemented and will carry out routine inspections and audits of the Contractors activities. The CE will act as the interface between the Contractors and MOW in relation to contract implementation and implementation of the mitigation under the ESMP. The CE will also review the detailed site specific contractor ESMPs together with MOW.

The National Environmental Management Council (NEMC): NEMC will play a key role in monitoring the project during the construction and operational phases to ensure that the mitigation measures set out in this report are fully implemented. Specifically, NEMC is responsible for enforcement, compliance, review and monitoring of the EIA during the construction and operational phases.

Contractors: the project will be implemented by Contractors (CC) under and Engineer, Procure Supply and Construct Contract. The Contractors will be responsible for constructing the Project in accordance with the Technical Specifications required. Based on their proposed construction method they will draw up detailed site-specific contractor ESMPs as required. These will be issued to the CE for approval and must be approved before any construction commences. The Contractors will implement the project fully in accordance with the ESIA Mitigation measures, "this ESMP" and the detailed site-specific contractor ESMP approved by the Consulting Engineer (CE). Each Contractor will nominate a Site Environmental Management Officer (SEMO) who will be the Contractor's focal point for all environmental matters. The SEMO will be routinely on-site for the duration of the construction works.

CHEMBA - Rural Water Supply and Sanitation Agency (RUWASA): the Water Supply and Sanitation Act No.5 of 2019, among other things, established the Rural Water Supply and Sanitation Agency (RUWASA) which took over mandates that were previously vested to PO-RALG, Regional Secretariats (RSs) and Local Government Authorities (LGAs). The RUWASA has offices at Headquarters, Regional and District levels as opposed to previous structure which compose of office at LGAâ ™s level and RSs. The RUWASA Chemba District Offices under the District Manager will be the key implementer of the proposed project in Chemba District.

Local Government District Authorities: the layout of the proposed project cuts across the area of jurisdiction of three LGA authorities namely Chemba district Council and Bahi district Council and the Dodoma City Council. These entities have mandates and interest on the welfare of the people of their

respective areas and provide the overall oversight for implementation and monitoring of development programmes in their respective areas. The Water Supply and Sanitation Act, 2019 empowers the District Councils to regulate the activities of COWSOs.

Villages likely to be affected by the proposed project: Various rural villages will be affected by the project. these include villages located within the dam reservoir, which will have to resettle in another area; villages within the vicinity of the Bahi Swamp, which are relying on the river flow for economic activities; villages located along the conveyance pipelines, which establishment will be impacted on during the construction phase and potentially the post-construction phase. Villagers in these areas need to share and participate in implementing the proposed environmental mitigation measures to address the downstream effects.

1.4.2 Legal and regulatory framework for implementation of the project

A legal and regulatory framework is essential for providing mandate, allocating specific responsibility and accountability to key factors and stakeholders, and also prescribes and enforces specific operating environmental procedures and standards. An institutional framework is required to develop policies, guidelines and plans; to ensure compliance with laws and regulations; and to monitor, review and adapt policies, plans and regulations in the light of experience. Examples of some of the most relevant national policies and strategies include: the National Environmental Policy (2004); the Land Policy (1995); the National Water Policy (2002); the National Energy Policy (2015); the National Fisheries Sector Policy and Strategy Statement (1997); the National Forestry Policy (1998); the National Wildlife Policy of Tanzania (2007); the National Mineral Policy (1998); the National Agriculture Policy (2013); the National Human Settlements Development Policy (2000); the National Construction Policy (2003); the National Health Policy (2017); the National Policy on HIV/AIDS (2001); the National Women and Gender Development Policy (2000); the National Employment Policy (2008); the National Transport Policy (URT, 2003); the Tanzania Development Vision 2025; the Third National Five Year Development Plan (FYDP III; 2021/22 – 2025/26); the Rural Sector Development Strategy (2001); the National Water Sector Development Strategy (2006 to 2015) and the National Water Sector Development Programme (WSDP) of 2006-2025

Again the ESIA was conducted in general compliance with the following legislations: the Environmental Management Act, Cap 191; the Water Resource Management Act, 2009 (Act No. 11/2009); the Water Supply and Sanitation Act, 2019 (Act No. 5/2019); the Land Act, [Cap.113 R.E 2019]; the Village Land Act, [Cap.114 R.E 2019]; the Land Acquisition Act, [Cap.1183 R.E 2019]; the Courts (Land Disputes Settlements) Act, 2002; the Fisheries Act, 2003 (Act No. 22/2003); the Mining Act, 2010 (Act No. 14/2010); the Energy and Water Utilities Regulatory Authority Act, [Cap.414 R.E 2019]; the Local Government (District Authorities) Act, [Cap.287 R.E 2019]; the Local Government (Urban Authorities) Act, [Cap.288 R.E 2019]; the Land Use Planning Act, 2007 (Act No. 6/2007); the Urban Planning Act, 2007 (Act No. 8/2007); the Contractors Registration (Amendments) Act, 2008 (Act No. 15/2008); the Engineers Registration (Amendment) Act, 2007 (Act No. 24/2007); the Standards Act, 2009 (Act No. 2/2009); the Occupational Health and Safety Act No. 5 of 2003; the Employment and Labour Relation Act, 2004 (Act No. 6/2004); the Workers Compensation Act, 2008 (Act No. 20/2008); the HIV and AIDS (Prevention and Control) Act, 2008 (Act No. 28/2008); the Industrial and Consumer Chemicals (Management and Control) Act, 2003 (Act No. 3/2003); the Wildlife Conservation Act, 2009 (Act No. 5/2009) and the Road Act, 2007 (Act No. 5/2007)

Relevant regulations are: the Environmental Management (Environmental Impact Assessment and Audit) (Amendment) Regulations, 2018; the Environmental Management (Fee and charges) (amendment)

Regulations, 2019; the Environmental Management (Registration and Practicing of Environmental Experts) Regulations, 2020; the environmental Management (Water Quality Standards G. N. No. 238) Regulation, 2007; he environmental Management (Air Quality Standards G. N. No. 237) Regulation, 2007; the Environmental Management (Quality Standards for Control of Noise and Vibration Pollution) Regulations, 2015; the Land (Assessment of the Value of Land for Compensation) Regulations, 2001; the Water Resources Management (Dam Safety) Regulations, 2013 GN. No. 237 of 2013; the Water Supply Regulations, GN No. 90 of 2013; the Water Resources Management (Water Abstraction, Use & Discharge) GN No.190 2010; the Water Resources Management (Registration of Water User Association) Regulations GN. No. 22 of 2010; the Environmental Management (Hazardous Waste Control and Management) Regulations, 2019; and the Environmental Management (Solid Waste Management) Regulations, 2009.

1.5 MAJOR AND MODERATE POSITIVE AND NEGATIVE IMPACTS

Major significant impacts for the purposes of this report are mainly considered as the impact types which are of moderate and high negative significance over a long period of time, in terms of their duration. Those impacts which are of high negative significance as well as cumulative also fall into this category. The impacts identified as significant for this project are listed as follows:

1.5.1 Terrestrial flora

The implementation of the proposed project inflicts a permanent irreversible loss of impoundment area approximately 48 km^2 which composed mainly of miombo woodland, wooded acacia, bushlands and thicket. Clearance of estimated 130 km x 30 m (Dodoma City) and 30m x 51m (Chemba) of the terrestrial land for way-leave for the pipeline could also cause damage to habitats and contained flora and fauna at several places along the conveyance system. Cumulative impacts from bush fire/burning and cutting down of trees were the main activities recorded during the ESIA study. None of these habitats (miombo woodland, wooded acacia, thicket and bush land) is presently undisturbed or natural in terms of plant composition or maturity. The proposed project activities, will significantly affect their importance in terms of biodiversity. The present bush fire/burning and cutting down of trees (logging) by local people and the proposed action will destroy these plant and animal habitats and entail a significant irreversible, however non-quantifiable impact on the local wildlife populations. The expected further development of the area, including the construction of permanent or temporary structures notably access roads, construction camps, embankment, spillway and the operational and maintenance phase of the project will add to the effects of the ongoing cumulative impacts by local people.

1.5.2 Terrestrial fauna

The area is having a good number of terrestrial fauna. Seven fauna species were recorded as threatened or vulnerable or in CITES categories. It was also noted that water bodies notably Bubu, Mkinki Rivers and Bahi swamp potentially provides habitat for aquatic species particularly fish and amphibians. At the time of study part of the site has been modified by activities of local people including burning, cutting down of trees and honey gathering. The proposed development would have a significant impact in terms of destruction, loss of fauna habitat and blockage of wildlife movement (corridor). All of the miombo woodland, wooded acacia-grassland, thicket and riverine forest within the site will be inundated. It can be noted from the study findings that there are species within or around the site that are classified as threatened, endangered, vulnerable or of significant conservation value. According to the study results, development of the proposed dam and water conveyance system will also affect some fauna species of

conservation concern, important bird nesting or nursery areas. Some bird nesting or nursery areas were observed within the proposed development site.

1.5.3 Aquatic fauna and flora

Generally, the area has low aquatic species diversity some of the notable ones include fish species in the family Clariidae (*Clarius spp.*) and Cichlidae (*Oreochromis spp.*) and amphibian (*Ptychademа mascariensis*). These species were found in shallow pools in the few stretches of Bubu River and dug ponds within Bahi Swamp area during dry season period. Riparian vegetation studied have a linear and narrow form as they are paralleled the stream channel of Bubu River, and are either diffuse or sharp edges attributable to the nature of species interactions across the ecotone and disturbances. The dominant species recorded include *Ficus sycomorus, Ficus thoningii, Ficus lutea, Ficus sur, Kigelia africana, and Acacia spp*. The Bahi swamp was noted to be covered by an extensive area dominated by *Cyperus spp.* During the study, the entire swamp was dry and composed mainly of remnant patches of *Cyperus spp.* Among of these, no any species is regarded as rare or endemic as per IUCN – near threatened list and CITES Appendix II category. Most of the species that were recorded are of low conservation concern; however, they form important part of the riverine vegetation and through river bank protection against erosion.

1.5.4 Environmental Flow

Bubu River is seasonal in the project site and further downstream to Bahi swamp area (recipient of Bubu River). The River originates from Manyara Region and traverses two distinct climatic areas which are wet tropic in higher altitude and semi-arid in central regions of Tanzania. Major contribution (>80%) of this River to the project site and further downstream is mainly from wet tropical areas upstream other than from within the semi-arid areas. The River catchment is 54% of the entire Bahi catchment area and among of the two main inflows to the Bahi Swamp the other being Mponde River, both of which originates from northern highlands i.e. wet tropic areas (M. McCartney, 2007).

The paddy irrigation is one of the livelihoods that depend on the river flows. The area under irrigation in Bahi area is more than 10,000 hectares. The total area that is directly depending on Bubu River is 3,658 hectares under seven schemes with 7,316 farmers. Likewise, the livestock keeping is one of the livelihoods that depend on water resources in terms of drinking water as well as fodder. The data obtained from the Bahi District Council office shows that in 2006 Livestock Census there were 64,895 cattle, 12,500 Goats and 2,492 Sheep in the villages along the Bubu River. Downstream of the Dam site water is also being used for domestic purpose e.g. drinking, washing and cooking. However, it is used in small amount, almost negligible as there is no water supply scheme. Residents along the River are individually fetching directly from the River. Reduced flow if is significant might threaten ecosystem which depends on the flowing water downstream which in turn might results into disappearance of some species on these areas. The riverine vegetation and aquatic life may be permanently affected by inadequate water flow. The in-stream flow requirements to sustain the riverine ecosystem demands will fully be covered by the irrigation and livestock mitigation flows as the two are located downstream part of the river just before the Bahi swamp.

1.5.5 Sedimentation

Sediment is a naturally occurring material that is broken down by processes of weathering and erosion, and is subsequently transported by the action of wind, water and/or by the force of gravity acting on the

particle itself. The suspended sediments in the Bubu River is the major problem in lowering the in water resources potentials. The Consultant made use of historical measurements sheets of gauging's and sediment load at Farkwa gauge station, which was found to be the only station providing sufficient records for the analysis. It is to be noted that the catchment of this station represents over 98% of the overall catchment, and therefore geographically represents very well the catchment. The sediment curve was used to derive suspended sediment yield from the daily discharge record at Farkwa gauge station. Annual sediment loads are the deducted and shown to be in the range of 16,000 to 1,316,000 tons. The mean annual load is 287,834 tons. The total load includes suspension load and bed load transport. The bed load transport is taken as 15% of the suspension load. The total volume is deducted from the total load by considering a sediment density equal to 1,300 kg/m3, which is a representative value for the sandy deposits observed in the Bubu River.

The sediment rate was assessed by applying the trap efficiency to the annual sediment yields. As sediment is trapped, the reservoir storage capacity is decreased and in turn, the trap efficiency decreases. For practical purposes, the initial trap efficiency can be used as a constant up to 50 percent storage depletion. Furthermore, construction of the dam at the area will attract some human activities that can lead to soil erosion at and around the Farkwa dam area. The possible human activities within the catchment leading to degradation can be due to agricultural activities (improper farming practices on the slopes within the catchment, increased use of pesticides and fertiliser); deforestation; etc.

1.5.6 Climate change

The possible impacts of climate change on the hydrological characteristics of the Bubu River at Farkwa were assessed. Given that the long-term rainfall record at Dodoma (1930-2010) does not show any significant trend, projections were made based on the climate projections and on the previous studies in Tanzania. Three possible scenarios of future rainfall (-15%, 0%, +15%) and, two possible scenarios of future temperature (+1°C, +3°C) were derived from the observed series. The hydrological modeling was applied on these scenarios to calculate the impacts on runoff. The main observations is that the impacts on runoff are ranging from -62% to 68%. The most severe impact on runoff is observed for the combination of a 15% decrease in rainfall and a 3°C increase in temperature in comparison to the reference. The combination of a 15% increase in rainfall and a 1°C increase in temperature results in a 68% increase in runoff. The impact on runoff is mostly driven by the rainfall. This is consistent with the high runoff variability, which is observed since 1957. A small increase in rainfall produces a high increase in runoff. Conversely a small decrease in rainfall produces a high decrease in runoff. The range of possible impacts on runoff is consistent with the runoff evolution observed in the 20th century for several rivers in Africa (White Nile, Senegal River).

Nevertheless, it should be borne in mind that the feasibility study for this project analysis averages the outputs of a number of GCM, some of which *do* predict an increase in annual runoff in the region. This prediction is also made in other reviews, such as de Wit and Stankiewig, (2006) who projected a rise in perennial drainage to a total of 136% in Central Tanzania. There is also a suggestion in some models of a slight increase in flood flows and risks. In relation to floods, the feasibility study weighted scenario predicts a slight increase in high flow levels in rivers (specifically, the flow which is exceeded 10% of the time will increase by 15 to 20%). The project itself will greatly increase the security of water supply to farmers and improve flood control, thereby mitigating against the potential impacts of climate change.

1.5.7 Human wildlife conflicts

The nearby area is somehow visited by wildlife from the Swagaswaga Game Reserve which normally invades and destroys the crops of the community around. With the proposed damming the wildlife are believed will be attracted to the water body for drinking which in turn might increase the visitation as well as inversion into the community farms. Thus, it is expected that the human wildlife conflict will be exacerbated in the area.

1.5.8 Quality of soils and water

The majority of the rural populations within the catchment area are small-scale farmers and agro-pastoralists. Their semi traditional farming system is characterized by low use of farm inputs. Traditional agricultural production in the area is coming under pressure from market forces; with the result that high-input agriculture is increasingly coming to play a major role in the economies of rural communities. The use of pesticides in the catchment area is common in horticultural crops for controlling common plant and animal diseases. The mixing of more than one type of pesticide in a tank is common with the aim of increasing the killing effects of the pesticides. The mixing process is mostly done in respective farms in drums without safety precautions, and the containers and equipment used were washed and rinsed in the irrigation canals. It is also common to find the empty pesticide containers disposed in the farmers and public areas such as market places. The use of ULV formulations (e.g Durban 24ULV and Fenom C 170 ULV) in water spray was a common practice among farmers. Poorly controlled agricultural activities and application of pesticides upstream can lead to accumulation of the pesticide residues (Organ chlorates and Carbonates), in the dam and cause water contamination and the product of hydrolysis or the action of micro – organisms will result into a more toxic creation than the original products.

1.5.9 Socio-economic

The ESIA study identified both positive and negative socio economic impacts for the entire life cycle of the proposed project which are presented below:

Potential Negative social impacts

- Relocation/resettlement of people, farms, properties and disruption of economic activities
- Increased conflicts over local water resources (communities downstream)
- Increase conflict with people living in the upper catchment
- Damage or loss of project structures due to anthropogenic activities
- Public health hazards due to Water-borne and water-related diseases
- Disruption of existing infrastructure and services (blocked access road, water supply)
- Increased population influx
- Public health hazards/safety due to social Interactions
- Conflicts among workers and the local population in the project area

Potential positive social impacts

- Improved water quality and quantity
- Improved health and sanitation status within the Region
- Increased revenues and stimulation of industries
- Increased income to locals from employment opportunities

- Benefit to local producers and suppliers of construction materials
- Increase of government revenue collections
- Improved living standards
- Skills transfer to locals
- Increased fish production
- New market for agricultural produce from the villages
- Increased market base for local products

1.6 CONSULTATIONS

The stakeholders and public consultation was organized to obtain comments and concerns from all individuals, groups or organizations that might be affected or might affect (positively or negatively) the proposed Construction of Farkwa Dam, Water Treatment Plant and Water Conveyance System to Chemba District Council and Dodoma City, Dodoma Region, Tanzania project in one way or the other. The identification of stakeholders was based on the role and relevance of an organization, group or individual to the proposed project. Some of the stakeholders such as the Ministry of Water, Ministry of Land Housing and Human settlements, Internal Drainage Water Basin (IDWB) Board (IDWB head office in Singida Municipality and IDWB sub-office in Dodoma City), Central Zone Irrigation head office Dodoma, Central Zone Irrigation sub-office at Bahi, Dodoma Urban Water Supply and Sanitation Authority (DUWASA), Tanzania National Roads Agency (TANROAD), Tanzania Electric Supply Company Limited (TANESCO), Dodoma Regional Administrative Secretary (RAS), Capital Development Authority (CDA), Dodoma Municipal Council, Chemba District Council, Bahi District Council, Kondoa Township Water Supply Pump House office, Farkwa Ward Office, Mombose Village Council, Bubutole Village Council etc were pre-determined based on the nature of the project. Others and affected groups at the proposed project site and area of influence unfolded as consultations went along.

The process started with physically contacting some of the preliminary stakeholders identified or project Affected People (PAPs). These consultations began in 18/10/2012 when Ministry of Water and TRES Consult (T) Limited staffs visited the project site at Mombose and Bubutole Villages in Chemba District. Meetings were held with individual stakeholders or representatives of organizations. These consultations included presentation of an introductory letter accompanied by a project brief of the proposed project. Public notices in daily newspapers (in English and Kiswahili) were published describing the proposed project.

1.6.1 Consultation activities

Scoping exercise: The Scoping Report was prepared in November and December 2013. During the preparation of this report, informal meetings were held with relevant authorities at national, district and local levels to obtain background information and to seek views on potential route corridors and on the draft Terms of Reference for the ESIA. Stakeholders consulted their comments were primarily concerned with the impacts of the project on the local community and on gathering background information. Their comments were used in the development of the final Terms of Reference (TOR) and the selection of the alternative routes and sites. Upon completion of the Scoping Report and approval of the same by NEMC, the Consultants issued a public notification of ESIA commencement that included ways interested parties could obtain more information.

Draft ESIA report preparation: A second round of consultations was conducted from 09th March to 20th March 2014. The process was completed based on the findings of the draft ESIA, consisting of further

informal agency meetings, formal public meetings and formal agency meetings. In the meetings, the ESIA Team explained the scope of the project and after the presentation the Consultants solicited views from the audience. Key issues considered during consultations include land use of the project site, involuntary resettlement, any conflicts, envisaged negative environmental impacts, negative social impacts, positive impacts of the project, management aspects of the identified negative impacts, enhancement mechanism of positive impacts and aspects to be considered for sustainable project operations. In all cases Stakeholders' views were sought on their acceptance of the project.

Consultative stakeholders meeting in Dodoma: a one day consultative stakeholders meeting for the Environmental and Social Impact Assessment (ESIA) for the proposed Construction of Farkwa Dam, Water Treatment Plant and Water Conveyance System to Chemba and Dodoma City, Dodoma Region, Tanzania was organized by Ministry of Water at the Dodoma Hotel, Dodoma City, Dodoma Region, Tanzania, on 19th September, 2014. The meeting was attended by 72 people including the Minister - Ministry of Water, Deputy Minister - Ministry of Information, Youth, Culture and Sports; Honorable MPs of all Districts found within the project area; District Commissioners; District Council Chairpersons; District Administrative Secretaries; District Executive Directors; District Water Engineers; Honourable Councilors; Ward Executive Officers; Vice President's Office (Environments) (VPO) representative; Capital Development Authority (CDA) representative; Ministry of Land, Housing and Human Settlements representative; Irrigation Zone Office representative; Ministry of Minerals and Energy representative, Chairperson of Internal Drainage Basin Water Board (IDBWB), Government and Public Agencies representatives, Ministry of Water the IDBWB and DUWASA officials,. The main aim of the meeting was to involve key stakeholders in the ESIA process and to ensure that relevant key environmental and social economic issues are identified before the ESIA is conducted to ensure that ESIA study is focused and covers all important issues.

Updating ESIA Consultation Activities: In recognition of stakeholders' participation in decision making, this stakeholders study was designed as addendum to the stakeholders' consultation done during the preparation of the 2015 ESIA report for the proposed project. As such a number of public consultative meetings were held with PAPs residing at Bubutole, Mombosee, Tumbakose, Rofati and Gwandi villages, RUWASA and LGAs' departments in Chemba District Council from 2nd August to 06th August 2021. The meetings were also attended by relevant stakeholders including Political leaders and Officials from Local Government Authorities as well as other interested and affected parties. The aim was to get views from stakeholders in terms of how they understood the dynamics of the environment and socio-economic aspects in which the proposed project will be located and any possible underlying causes, issues or concerns that could lead to changes over time as a result of implementing the project. Consultations with stakeholders having either experience or expert knowledge on the study area were also conducted to validate existing data as well as get their advice on any additional sources of information that was not readily available.

1.6.2 Project acceptance

Consultation with local stakeholders indicated that they viewed the proposed Farkwa Dam, Water Treatment Plant and Water Conveyance System to Chemba and Dodoma City project as a positive venture that will stimulate social economic development and poverty reduction in terms of productivity and income generation. Most of the villagers in Mombose, Bubutole, Farkwa Ward authorities and all neighboring villagers are aware of the proposed project since the project was approved by the village, ward and municipal councils' meetings. Also some of the villagers were involved in the valuation and compensation exercise. Stakeholders indicated that constructed dam and provision of irrigation water will

provide both permanent and temporal employment to the local people. This means more income for the community in the area resulting into increased economic activities and there are could a lot of food security. Also they provided that the operation of the dam will have an influence on the population size of the area, attract tourism activities in the area and will bring fish farming in the project area.

1.6.3 Stakeholders concerns

The ESIA study provided a wide variety of views and opinions on what are considered to be the main concerns and issues of different stakeholders. Issues raised during the stakeholder consultation process were compiled and summarized below and have been elaborated in more detail and considered in proceeding chapters for impact assessment and incorporation in the Environmental Management Plan.

(i) Perceived Negative Impacts

Destruction of natural resource: The stakeholders were concerned that the potential areas for dam inundation are rich in wildlife and plant resources. They were worried about the potential loss of and disturbance to the natural environment from construction activities at the dam area and along the conveyance system, from earthmoving equipment's and machines, noise and vibrations from machinery, etc. If construction work is not properly conducted they may affect those natural resources.

Water quality degradation: Stakeholder pointed out that the water quality of the Bubu River will be affected negatively by the proposed dam construction activities. This is due to the transport and sedimentation of materials re-suspended by backfilling activities. Also stakeholders were of opinion that human activities upstream may cause water contamination due to the use of improper sanitation facilities and poor farming methods (improper use of fertilizers; increased water treatment costs.

Pollution of the Bubu River: During interviews, stakeholders were quick to associate the project with the negative impacts likely to affect the Bubu river. One of the commonest negative impacts mentioned is the pollution of the river from fuels, lubricants and oil spills during construction phase.

Loss of land-based resources and properties: Stakeholder were of concerns that the project activities will affect some of the land-based resources and properties in the project area which people depend on for their livelihoods. These could include loss of farmland and crops, medicinal plants, trees for construction poles, residential houses, grazing area, burial sites, sacred sites etc.

Low compensation: - Concern that Ministry of Water will not pay sufficient compensation if the proposed project activities affect farmland, crops, grazing areas, woodland resources, houses and property which people depend on for their livelihoods, or burial sites and sacred sites of cultural importance. The commented that the compensation rates for the affected crops and houses which are stipulated by Tanzanian law are outdated. Stakeholders are of the opinion that these rates are very minimal and not sufficient for replacement of affected resources and property.

Effects of loss of social contacts in case of resettlement: If residents need to be resettled, the affected person/individual and their family will be moved from their relatives and friends contacts to a new area. Stakeholders suggested that the Ministry of Water should engage in an open dialogue with Farkwa Ward authorities and village governments to ensure the compensation process is implemented fairly in order to avoid conflicts.

Impacts on downstream users: Stakeholder mentioned that one of the most important effects of dam construction and operation is the deprivation of water to downstream users and living organism. However the level of deprivation will depend on amounts of water that will be allowed to flow from the dam back into the river and supplemented with amounts from the catchments.

Restricted access to natural resources: the project areas have natural resources, cultural sites and access roads from one village to another. The inundated area and project infrastructures could restrict access to natural resources and other uses of the area and this may cause nuisance and disturbance to current users.

Increased flooding tendencies: The negative impact mentioned is the probability of the over flooding of the dam thus causing destruction to the environment, the community and their properties downstream.

Increased diseases incidences: Interaction due to increased people after construction of the dam, may increase susceptibility to health problems especially HIV/AIDS and Sexual Transmitted Diseases.

Diminishing of forest commodities and loss of current land: Communities consider the project area as a source of poles for house construction, medicinal plants, grass land for livestock and dry season cattle fodder, firewood, households' settlements, provides outlets to other sub villages and sources for indigenous fruits and juices. Some people had proposed planting trees of different types as a mitigation measure although others could not agree to that, as they thought that the new trees would be exotic and not indigenous leading into fruits and juices becoming exotic.

Road destruction: The roads within the project area are in poor condition and no regular maintenance is scheduled by the Regional/District Authority. As the number and volume of the vehicle load is expected to increase during mobilization and construction phases, the roads may deteriorate further.

Drowning incidences: Communities were worried of human drowning cases due to increased water. It was suggested that by laws should be enacted to protect the dam from those who would have wanted to use it carelessly.

Loss of infrastructure: As a result of the construction of the proposed dam some areas in the vicinity of the site will be cut off from others through submergence of roads and bridges. The proposed project should consider alternative routes to link the different areas that will be affected and construct roads preferably tarmac and associated infrastructure such as bridges.

Small holder farming: Communities who are currently using the area for settlements and agriculture had the opinion that the project will take up their valuable land that has been the source of livelihoods for years. Commenting on the mitigation measures to the impact on these communities, it was suggested that those to be affected should be compensated before their land is taken up. This will enable them to start new homes and agricultural activities elsewhere.

(ii) Perceived Positive Impacts

Increased water supply: Currently Dodoma City is experiencing water rationing due to the fact that water demand is higher than the water supplied. The proposed construction of Farkwa Dam, Water Treatment Plant and Water Conveyance System to Chemba and Dodoma City will improve water supply capacity of the existing infrastructure to a large extent.

Enhanced household food security and improved livelihoods: Food and vegetable production will be enhanced and permanently produced due to availability of water throughout the year. Increased production of food and readily available source of protein i.e. fish, will increase the nutrition status of the villagers. Farmers will be able to produce enough for consumption and sale thereby raising their income which would result into improved livelihoods.

Employment opportunities: It is expected that during dam construction, the project will employ both skilled and unskilled workers. However, a concern was expressed that the project proponent/contractor might probably bring in outside labourers. Where skilled labour is concerned, this will almost certainly be the case. Employment in dam related activities will provide a source of income to a number of people.

Improved village economic status: Communities are anticipating that their village status will be improved as many people will have money, new houses will be constructed, people will buy transport like bicycles, parents will pay school fees for their children and development feeling in general will be enhanced among communities.

Availability of clean and safe water: Currently the villages of Farkwa Ward lack reliable sources of clean and safe water. The problem becomes more acute during the dry season. Local stakeholders are optimistic that the dam will help to combat this chronic water shortage and hence improve the health and sanitation status of the villagers.

Saving productive time: People travel over long distances in search of water, particularly during the dry season. Improved access to water will save the villagers' time in terms of the time spent on fetching water and trekking their livestock to watering points. The saved time will be allocated to other economic/productive activities and contribute to the community well-being.

Health and safety hazards: Village reports on the health status indicate that malaria is apparently the leading disease for all age groups especially during the rain season. The presence of stagnant fresh water might exacerbate the situation and if there will be no adequate security measures e.g. fencing, there are possibilities of accidents, with vulnerable groups being children and livestock falling into the dam.

Induced development: The quantity of water that will be reserved exceeds the villagers' day-to-day requirements. In this situation, water from the dam will as well be used for other development activities such as construction of residential houses which are in a poor state, a cattle dip, a dispensary (they currently have none at Mombose and Bubutole) and expansion of a primary school.

1.7 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

The Environmental and Social Management Plan (ESMP) is presented below in table 1.1 below. This ESMP for the proposed Farkwa dam project aims to address the impacts associated with the proposed project. So, the following proposed environmental management measures are intended to strengthen the current plan.

Based on the assessment undertaken as part of the ESIA, a series of mitigation measures have been identified which aim to reduce and / or eliminate the predicted impacts of the project. It is important that these mitigation measures are appropriately applied to the project mobilization, construction and operation, and this management plan provides a strategic framework for their implementation. The Contractor shall implement components relevant to design, mobilization of materials and machines and

actual construction. The estimated costs for implementing the mitigation measures are just indicative. Additionally, the ESMP include an estimate of the costs of the measures so that the project proponent can budget the necessary funds. Appropriate bills of quantities should clearly give the actual figures. In any case the consultant used informed judgment to come up with these figures.

1.7.1 Purpose of the ESMP

The purpose of the ESMP is to describe the measures that should be implemented by the Contractors and Ministry of Water during the implementation of the project to eliminate or reduce to acceptable levels key potential impacts and social and health impacts related to project activities. The specific measures set out in the ESMP must be fully adhered to by all the project parties. In particular, the project must strive to avoid significant impacts on the bio-physical, socioeconomic, or health aspects during implementation. Avoidance through good detailed design of site specific works and through preparation of the detailed site specific contractor ESMPs will be key to success in this area. Where impacts cannot be avoided they must be mitigated against using appropriate measures. The ESMP has been developed:

- To bring the project to comply with Government of Tanzania applicable national environmental and social legal requirements social policies and procedures;
- To provide guidance on EHS issues as required by the AfDB EHS Guidelines
- To outline the mitigating/enhancing, monitoring, consultative and institutional measures required to prevent, minimise, mitigate or compensate for adverse environmental and social impacts, or to enhance the project beneficial impacts.
- To provide an operational reference and tool for environmental management during project rehabilitation and operation activities.

All contractual and legal obligations relating to the ESMP apply to the main Contractors and any Sub-Contractors appointed by them. It is the responsibility of the Construction Contractors to provide adequate resources to ensure effective implementation and control of the ESMP. The Sub-Contractor is responsible to its respective Contractor for compliance with the measures presented in the ESMP. It is also the responsibility of the Construction Contractors and their Sub-Contractors to ensure that all project staff is trained and procedures are understood and followed.

1.7.2 Key Players in Implementing the ESMP

In order to ensure the sound development and effective implementation of the ESMP, it will be necessary to identify and define the responsibilities and authority of the various persons and organisations that will be involved in the project. The following entities will be involved on the implementation of this ESMP:

- Funding Institutions
- Ministry of Water;
- Consultants;
- Contractor;
- The National Environmental Management Council (NEMC).

(a) Funding Institutions

The Government of the United Republic of Tanzania through the Ministry of Water will received financing from the International Bank for Reconstruction and International Development Association (IDA) toward

the cost of Water Sector Development Program. The MoW intends to apply a portion of the funds to finance construction of the proposed project. The funding organization will have overarching responsibility to ensure that the Project is carried out to the highest environmental standards strictly in accordance with the ESIA and the mitigation measures set out therein. Additionally it is a requirement of the funding Institution that environmental and social impacts are managed in accordance with the AfDB Operational Guidelines.

(b) Ministry of Water

The responsibility for ensuring that mitigation measures specified in this ESMP and the contract documents are implemented will lie with the MoW. The environmental monitoring staff / Environmental Field Officer (EFO) and a Health and Safety Officer (HSO) from MoW and if necessary, representatives from NEMC will undertake monitoring during construction and operation phases of the project.

(c) Environmental Consultant

The appointed Environmental Consultant will be required to oversee the construction programme and construction activities performed by the Contractor, in compliance with the present ESMP. It is recommended that prior to commencement of actual construction; the Environmental Consultant should submit a work site plan that complies with the national environmental guidelines and an updated ESMP for the different phases of the work. The environmental plan should specify in particular the location of sources of materials, disposal area of construction debris and arrangements for traffic management. The plan should take into consideration the mitigation measures proposed in this ESIA Project Report. MoW or Contractor should also appoint an Environmental Field Officer (EFO) and a Health and Safety Officer (HSO) or Consultant who will be responsible for the following tasks:

- Drafting environmental aspects during project implementation;
- Managing environmental and safety aspects at the work sites;
- S/He shall participate in the definition of the no working-areas;
- Recommending solutions for specific environmental problems;
- S/He shall facilitate the creation of liaison group with the stakeholders at the project site and shall monitor the compliance ESMP;
- Organising consultations at key stages of the project with the stakeholders and interested parties;
- S/He will be required to liaise with the MoW Environmental Management Unit or NEMC on the level of compliance with the ESMP achieved by the Contractor on a regular basis for the duration of the contract;
- Controlling and supervising the implementation of the ESMP;
- Preparing environmental progress or "audits" reports on the status of implementation of measures and management of work sites.

(d) The Contractor

The project will be implemented by Contractor and will be responsible for constructing the project in accordance with the Technical Specifications required. The Contractors will implement the project fully in accordance with the ESIA Mitigation measures. The Contractor will nominate an Environmental Site Officer (ESO) who will be the Contractor's focal point for all environmental matters. The ESO will be routinely on-site for the duration of the construction works.

(e) The National Environment Management Council

The National Environmental Management Council of Tanzania will play a key role in monitoring the project during the construction and operational phases to ensure that the mitigation measures set out in chapter 7 above are fully implemented.

1.7.3 Environmental audit procedures

In complying with the requirements of the Environmental Management Act Cap 191 the project will conduct independent audits biannually and submit on annual basis, an environmental monitoring report. The annual report will review the performance of various environmental parameters. The MoW will also ensure compliance with the audit requirements. Environmental auditing will seek to undertake the following, as its minimum requirements:

- Review all monitoring data and, if deemed warranted by the independent third-party auditor, undertaking an independent round of monitoring.
- Review various environmental reports compiled throughout the year.
- Review operations, inspect facilities and observe monitoring activities for purpose of assessing effectiveness of the Company's environmental management procedures, implementation and identifying potential improvements if deemed appropriate.
- Prepare an audit report complete with photographic record and recommendations.

The final audit report, together with monitoring data for the previous year, will be distributed to the Ministry of Water, the NEMC, and the Chemba District Council through the District Environmental Management Officer for review, guidance and comments. The summary of the key issues of the proposed project and their management are shown in Table 1.1 below.

Table 1.1: Environmental and Social Management Plan

Phase	Potential Impacts	Management/Mitigation Measures	Target Level / Standard	Responsible Institution
Preparation/Mobilization phase	Loss of /disturbance of biodiversity (flora, fauna and ecosystem)	Minimize clearing of vegetation shall be as minimal as possible so as to avoid much destruction of this natural, unique and small ecosystem. The Contractor shall clearly mark out the extent of clearing within the approved work-site and instruct all construction workers to restrict clearing to the marked areas and not to work outside defined work areas. The MoW shall help to afforestate the area when the construction work is complete.	Type, number, distribution etc. of species	Contractor/ Environmental Consultants / MoW
	Deterioration/impairment of local air quality	During all mobilization related activities, air quality impacts from combustion sources (equipment emissions) shall be minimized through contracting new equipment or through routine inspection and maintenance of combustion emission sources (such as generators, diesel engines, equipment's). No vehicles or equipment to be used that generates excessive black smoke. Maintenance will ensure that equipment is operating efficiently and is not producing excessive emissions.	SO_2: -average 100 µg/Nm^3 (0.129mg/kg) for 24hour NO_2 : 150 µg/Nm^3 for 24-hours average value CO: 10mg/Nm^3 for 8 hours Black smoke PM_{10} : 40 to 60 µg/Nm^3 refer also table 6.4 above for TBS/WHO standards	Contractor/ Environmental Consultants / MoW
	Nuisance and disturbance on/offsite receptors from noise pollution	The contractor and project proponent shall ensure all plant, machinery and vehicles are fitted with appropriate mufflers, and that all mufflers and acoustic treatments are in good working order. Also shall ensure all plant, machinery and vehicles are regularly maintained and broken parts are replaced immediately.	shall not exceed 75 dB(A)(peak readings), daytime or 55 dB(A) (peak readings) at night, No complaints from the local people	Contractor/ Environmental Consultants / MoW
	Dust pollution	Dust generating activities shall not be carried out during times of strong winds. Water shall be applied whenever dust emissions are visible at the site in consultation with the Project Supervisor. Vehicles delivering soil materials will be covered to reduce spills and windblown dust and vehicle speeds will be limited to minimize the generation of dust on site and haul	$PM_{2.5}$ not to exceed 250 mg/Nm3 (peak readings),	Contractor/ Environmental Consultants / MoW

Phase	Potential Impacts	Management/Mitigation Measures	Target Level / Standard	Responsible Institution
		routes. Any complaints received by the Contractor regarding dusts will be recorded and communicated to Project Supervisor.		
	Depletion /degradation at points of source of construction materials	Construction materials will be from the authorized source only. These authorized dealers should have an EIA certificate and the Mining license from the Ministry of Energy and Minerals. The licensed suppliers who hold the EIA certificate and the Mining License comply with ILO labour conditions.	Materials to be sourced in licensed area, No complaints from the local people.	Contractor/ Environmental Consultants / MoW
	Erosion of the top soil and reservoir sedimentation	The MoW and contractor shall ensure that civil or earth work is done during dry season when there are no run off to reduce the impact severity. Temporarily shall bind exposed soil and redirect flows from heavy runoff areas that threaten to erode or result in substantial surface runoff to adjacent water courses. The contractor shall ensure that backfilling is done adequately, compacted, and the site restored.	No erosion tendencies	Contractor/ Environmental Consultants / MoW
	Disruption of traffic flow during mobilization	The contractor shall employ drivers with authenticated class C licence and with a minimum of 3 years of driving after obtaining the class C licence. Transport routes to and from the project site will be agreed with government agencies prior to commencement of the mobilization program. Traffic control measures (e.g. flagmen, appropriate lighting) will be deployed at the project site and strict speed controls will be implemented for all transport vehicles.	As minimum disruption as possible	Contractor/ Environmental Consultants / MoW
Construction Phase	Disruption of the various users of the highway and road reserve	The pipeline route will be surveyed and clearly marked, and cleared of obstacles before starting trenching in a particular area. MoW/Contractor shall endeavour to obtain as much information as possible about underground services in the area (use maps) including: pipe lines, water mains, sewers, telephones, and power conduits, laid wires poles and guy wires, railways (Dodoma City), highways, bridges or other underground or above ground structures and/or properties crossing or adjacent to the pipeline trench being excavated.	As minimum disruption as possible	Contractor/ Environmental Consultants / MoW

Phase	Potential Impacts	Management/Mitigation Measures	Target Level / Standard	Responsible Institution
	Deteriorated / impairment of local air quality	The proponent is committed to implementing measures that shall reduce air quality impacts associated with construction. All personnel working on the project will be trained prior to starting construction on methods for minimizing air quality impacts during construction. Specific training will be focused on minimizing exhaust gas emissions from heavy construction vehicles. Construction vehicles drivers will be under strict instructions to minimize unnecessary trips, refill petrol fuel tanks in the afternoon, and minimize idling of engines.	SO_2: -average 100 µg/Nm^3 (0.129mg/kg) for 24hour NO_2 : 150 µg/Nm^3 for 24-hours average value CO: 10mg/Nm^3 for 8 hours Black smoke PM_{10} : 40 to 60 µg/Nm^3 refer also table 6.4 above for TBS/WHO standards	Contractor/ Environmental Consultants / MoW
	Noise pollution	Working hours and rules will be established based on the needs to reduce the noise causing nuisance and disturbance, especially by avoiding the cumulative effect of increased noise due to simultaneous operation of different kinds of construction machinery and equipment. Best practice procedures will be implemented in order to reduce construction noise.	shall not exceed 75 dB(A)(peak readings), daytime or 55 dB(A) (peak readings) at night, No complaints from the local people	Contractor/ Environmental Consultants / MoW
	Dust pollution	The batching plant/crushers shall be provided with appropriate dust control measures and be positioned such that the prevailing north-westerly wind does not carry dust fines downwind towards sensitive receptors. Dust emissions from the equipment shall also be controlled by closing all covers and screens and wetting down materials to be crushed.	$PM_{2.5}$ not to exceed 250 mg/Nm3 (peak readings),	Contractor/ Environmental Consultants / MoW
	Increased soil and water pollution downstream	Good house-keeping shall be practiced within material storage compounds or vehicle maintenance yards where the possibility of spillage is great. Vertiver grasses may be used to control areas prone to erosion. Silt fences may be used to reduce suspended solids from surface water runoff. Proper storage of fuels and other chemicals shall be ensured. Machinery will be kept away from surface waters and will have drip trays installed beneath oil tanks / engines / gearboxes / hydraulics which will be checked and emptied regularly.	Maximum 15 ppm for hydro-carbons No leakage /spillage of hydrocarbons	Contractor/ Environmental Consultants / MoW

Phase	Potential Impacts	Management/Mitigation Measures	Target Level / Standard	Responsible Institution
	Contamination/impaired quality of receiving body – land, water from construction wastes	An efficient collection and disposal system based on the principles of reduction; re-use and recycling of materials, shall be instituted at the project site. Instructions to contractor to put on his/her methodologies for handling hazardous waste such as oils, lubricants and non-combustible waste during bidding process.	Adequate solid waste collection bins and sanitation facilities	Contractor/ Environmental Consultants / MoW
	Contamination of soil and ground water quality from the batching plant	Waste water generated from any concrete batching and pre-cast concrete casting plant activities of washing down mixer trucks, drum mixers and similar equipment shall, wherever possible, be recycled – wastewater discharge shall be kept at a minimum. Following silt removal and pH adjustment where necessary (to within pH range of 6-10), the surplus wastewater may be discharged into sewers or being transported by the cesspit trucks.	As minimum as possible	Contractor/ Environmental Consultants / MoW
	Contamination of river waters from accidental spillages/discharges	Properly maintained and convenient toilet and shower facilities and waste disposal services shall be provided and clearly displayed in the project area; including wastewater collection. All toxic, hazardous and harmful materials (such as caustic and acidic substances, fuels, oils, drums, barrels and asphalt materials) will be stored away from any waterway, in banded areas with impervious bases and soak pits to contain accidental spills.	Maximum 15 ppm for hydro-carbons No leakage /spillage of hydrocarbons	Contractor/ Environmental Consultants / MoW
	Soils damage/disturbance to surface and sub-surface organisms	The proponent will ensure proper demarcation of the project area to be affected by the construction works. This will be aimed at ensuring that any disturbance to flora and fauna is restricted to the actual project area and avoid spill over effects on the neighbouring areas.	As minimum as possible	Contractor/ Environmental Consultants / MoW
	Injuries to the general public due to road accidents	Traffic control measures (e.g. flagmen) will be deployed at all intersections of site access routes and main roads and strict speed controls will be implemented for all transport vehicles. The contactor shall install road bumps at regular intervals to limit speed of vehicles through the village and particularly at school crossings.	No injury and sufficient no of road signs	Contractor/ Environmental Consultants / MoW

Phase	Potential Impacts	Management/Mitigation Measures	Target Level / Standard	Responsible Institution
	Public health hazards / safety due to social interactions	The MoW and Contactor will devote time in raising awareness of the dangers of the HIV/AIDS within the project premises. Although basic knowledge of HIV/AIDS is high among Tanzanians, knowledge of self-protection measures and behaviour change will be provided and a preference will be given to those who are vulnerable and to empower women for they compose one of the most vulnerable groups. When the need arises MoW and Contractor will seek for professional assistance from organizations working in the field of public health and control of HIV/AIDS for instituting a health education and disease control programme at the workplace.	Tanzania HIV/AIDS Policy, No HIV/AIDS victims	Contractor/ Environmental Consultants / MoW
	Health hazards associated with construction work	Accidents will be minimized through proper arrangements of construction tools and equipment, protecting or guarding the cutting edges, and awareness of the people including workers on the dangers and make them understand how to protect themselves and others. Further, MoW and contractor shall comply with relevant Tanzania (OSHA, 2003) and IFC's Performance Standards and regulations on health and safety requirements including the provision of PPE, registering the work place, submission of designed drawings of the work place for approval, observing reasonable working hours and good working conditions and facilities.	Tanzania OSHA 2003, Low risk to workers and no exposure	Contractor/ Environmental Consultants / MoW
Operation Phase	Damage to the dam and conveyance system due to effects of natural factors and processes	The engineering design and construction of the dam shall ensure that the dam and conveyance system can withstand normal natural processes. The engineering design and construction shall ensure minimal disturbance to the natural terrain of the area. The hills upstream shall be left to act as natural barriers to contain the water in the project site. This will ensure that some parts of the project area will remain undisturbed to maintain natural scenery. The spillway shall be properly designed to ensure that the dam capacity is not exceeded.	Construction as per design specification	Contractor/ Environmental Consultants / MoW

Phase	Potential Impacts	Management/Mitigation Measures	Target Level / Standard	Responsible Institution
	Sediment loads transported into the dam and degradation of water quality	The natural vegetation in the sides/neighborhoods of the project area shall be conserved whenever possible to minimize soil erosion. Compaction of embarkments shall be done to meet the recommended compaction in the design. Also the project proponent will plant tree around dam boundaries to compensate on tree losses as well as to minimize wind which is one of the factors for excessive evaporation	Turbidity 30 NTU, DO Less than 75% of saturation concentration	Environmental Consultants / MoW
	Impacts on the downstream ecosystem due to delayed and reduced flow	The in-stream flow requirements to sustain the riverine ecosystem demands will fully be covered by the irrigation and livestock mitigation flows as the two are located downstream part of the river just before the Bahi swamp. However, a flow for the ecosystem to the Bahi swamp is considered independently of the later flows, as the irrigation and livestock mitigation flow are to be abstracted / consumed before reaching the Bahi swamp. Based on the study conducted to the Bahi drainage area (Appendix 10) and the discussions among the experts formed ESIA team, it was estimated that 10% of the natural flow of the Bubu River will contribute to the sustenance of the Bahi Swamp ecosystem and its associated ecological services (such as fishing).	Standard dam operational rules, water right user permit, No complains	MoW
	Reduced water quality due to pollution	Identify and promote appropriate latrine technologies within the catchment area. The MoW also may support Local Government Authority within the catchment area to establish and operate basic solid waste management systems. Further a training program shall be developed for farmers on precautionary measures required for the handling, labelling and application of agro-chemicals under field conditions. The training shall be incorporated in a farmer's field school curriculum. Extension workers shall also be able to deliver awareness program on the amounts and conditions for applying fertilizers and pesticides to prevent water pollution.	Nitrate 30 mg/l, Lead 0.05 mg/l, Sulphate 600 mg/l, Turbidity 30 NTU, DO Less than 75% of saturation concentration; Maximum 15 ppm for hydro-carbons; +/- 0.5 from the pH baseline	Environmental Consultants / MoW
	Impacts related with climate change	Climate change was considered in the dam design and no specific mitigation measures are recommended for the Farkwa dam in relation to climate change and hydrology. In times of low flows as a result of drought,	As minimum as possible	Environmental Consultants / MoW

Phase	Potential Impacts	Management/Mitigation Measures	Target Level / Standard	Responsible Institution
		the maintenance of the river ecological balance remains paramount and as such restrictions on water usage especially for irrigation downstream will be imposed.		
	Change in local ecosystem /stimulate of vegetation growth/ change in species composition	Proper maintenance procedures especially within the dam shall be undertaken regularly to ensure that occurrence of water weeds is kept to a minimal. A detailed biological inventory of the plants and fauna species composition has to be conducted in area upstream and down-stream of the proposed project site.	Standard dam operational rules, water right user permit	Environmental Consultants / MoW
	Human wildlife conflicts	In order to reduce the impact of wildlife migration to the river and to the dam the project proponent shall collaborate with the Chemba District Wildlife Office, Swagaswaga Game Reserve management, forest division and other relevant government agencies in managing wildlife; create buffer zones, providing separate watering points for wildlife. Information, education and awareness programmes for local residents, especially children, with respect to wildlife and its protection.	Standard dam operational rules, water right user permit, No conflict	Environmental Consultants / MoW
	Flooding hazards	The spillway shall be properly designed to ensure that the dam capacity is not exceeded. The proponent shall provide sluice valve for regulating levels in the dam and install a prior warning system against an increase of water within the dam. Also the engineering design and construction of the dam shall ensure that the dam can withstand normal natural processes.	As minimum as possible	Environmental Consultants / MoW
	Contamination/impaired quality of soils and water from poorly controlled agricultural activities	This impact can be reversible if IPM approaches are undertaken or farmers are trained in techniques of agrochemical applications. A training program shall be developed for farmers on precautionary measures required for the handling, labelling and application of agro-chemicals under field conditions. The training shall be incorporated in a farmer's field school curriculum. Extension workers shall also be able to deliver awareness program on the amounts and conditions for applying fertilizers and pesticides to prevent water pollution.	Dissolved phosphate (as P), *5* mg/l*, max*	

Phase	Potential Impacts	Management/Mitigation Measures	Target Level / Standard	Responsible Institution
	Increased water and soil pollution	During the water treatment process, the flocculation method shall be used for the settling of the fine particles. The incorporated chemical catalyst will be the aluminium sulphate. This chemical product joins the resulting solid sediments, i.e., the sludge that results from the process. This sludge will be disposed of at a storage and dehydration site, with base protected by a plastic membrane. Also the MoW shall consider measures to prevent pollution of ground water while designing the sludge storage site.	Nitrate 30 mg/l, Lead 0.05 mg/l, Sulphate 600 mg/l, Turbidity 30 NTU, DO Less than 75% of saturation concentration; +/- 0.5 from the pH baseline	Environmental Consultants / MoW
	Potential Negative Impacts			
	Relocation/resettlement of people, farms, properties and disruption of economic activities	MoW in collaboration with the local government authorities will work out/calculate the exact size and locations of the required land. Individuals with potential land acquisition issues shall then be subject to a comprehensive sensitization and consultation process. MoW will then initiate a land and property valuation and compensation process guided by relevant Tanzania laws. MoW shall effect compensation before the land is taken over.	As per the provision of Land Act 1999 and O Involuntary Resettlement (OP 4.12)	Environmental Consultants / MoW
	Increased conflicts over local water resources (communities downstream)	This requires the design to ensure that total closure of water is avoided by ensuring that irrigation mitigation flow (27,812,505.6 m3/year), livestock mitigation flow (381,901.5 m^3/year) and 10% of the natural flow of the Bubu River (14.79 MCM/year) is maintained in the river downstream. Further to prevent conflict between irrigation farming and livestock keeping downstream, extension services on improved livestock keeping that is more intensive than extensive shall be promoted.	As minimum conflict as possible, no complaints from the local people	Environmental Consultants / MoW
	Increase conflict with people living in the upper catchment	MoW shall involve communities in managing the upper catchment zone of the water sources. Discussions with relevant village leaders in the catchment zone shall be enhanced and deliberations implemented. Identification of NGOs, CBOs or other cultural groups, which would help in better managing of the catchment, shall be done. Provision of incentives and participation of development programmes in the villages can help to	As minimum conflict as possible, no complaints from the local people	Environmental Consultants / MoW

Phase	Potential Impacts	Management/Mitigation Measures	Target Level / Standard	Responsible Institution
		bring more understanding of the problem and can open up ways for getting better solutions.		
	Damage or loss of project structures due to anthropogenic activities	Marker (warning) tape shall be placed over the pipe but below the soil to warn future workers in the area that a water pipeline lies below to prevent being damaged. Proper documentation of the route detailing coordinates shall be done to ensure that it is possible to locate the route in future. The pipeline directly trenched in the ground shall be placed deep enough to provide adequate protection.	As minimum as possible	Environmental Consultants / MoW
	Public health hazards due to Water-borne and water-related diseases	To mitigate these impacts the proponent shall employ disease vectors disruption techniques such as regulated reservoir operation to curb vectors for malaria and water borne diseases. Also shall encourage natural aquatic life that takes care of mosquito larva as part of the food chain. Whenever possible MoW will support on – going and new community health and safety programmes undertaken by Chemba District Council and Village leaders for community mobilization to control preventable communicable diseases and vectors through awareness and sensitization campaigns.	As minimum as possible	Environmental Consultants / MoW
	Increased population influx	The key to the reduction in immigration of people from other parts of the country that could negatively compete for employment opportunities with the local peoples is to implement a stringent recruitment policy. This will ensure that preference is to be given to existing members of communities, especially those from the local villages such as Farkwa, Gonga, Mombose and Bubutole. A skills audit could be undertaken and a register compiled of persons who have skills that could be used by the project.	As minimum as possible	Environmental Consultants / MoW
	Danger of people drowning either intentionally or accidentally looms within the dam	Awareness raising and education to the communities including posting banners and warning signs at appropriate places shall be provided to advise farmers/villagers on proper use of the dam and by laws shall be enacted to protect the dam from those who would have wanted to use it carelessly.	As minimum as possible	Environmental Consultants / MoW

Phase	Potential Impacts	Management/Mitigation Measures	Target Level / Standard	Responsible Institution
	Conflicts among workers and the local population in the project area	In the dialogues of health and safety the contractor shall explain to workers about the importance of keeping a good relationship with local communities. Amongst the local workers shall be a group of community liaison, responsible for establishing communication between project staff and community, which will be particularly important in cases of complaint. Such elements shall be familiar with the project in general and being able to properly troubleshoot or forward any complaints/claims.	As minimum conflict as possible, no complaints from the local people	Environmental Consultants / MoW
	Exposure to chemicals, hazardous or flammable materials	Chemicals, hazardous and flammables materials shall be secured, and stored accordingly. Procedures for handling hazardous materials must be in place. They must be locked and only authorized personnel can have access to the materials. MSDS must be available and specific PPE shall be provided and users should be trained.	Tanzania OSHA 2003, Low risk to workers and no exposure	Contractor/ Environmental Consultants / MoW
Decommissioning phase	Loss of vegetation cover and plant diversity	Use existing maintenance access roads and the pipeline maintenance access route to dismantle and transport the decommissioned material. If necessary only clear the minimum width of the route for dismantling operation. Experienced ecological advisors must be appointed and be present on each spread during construction activities to chase animals away and collecting and relocating sensitive species from the area, preventing them to be harmed.	Specific to project core area to be cleared	Contractor/ MoW Designated Environment Officer
	Contamination and impaired water quality	The contractor shall prevent any uncontrolled run-off to waters, especially during rainfall events or when spillages occur. Measures shall be taken to minimize the flow of leakages into trenches that may act as short cuts to the river waters. Channels and sand bags shall be provided on site so as to direct storm water to the proper containment/removal facilities. Demolished materials shall be kept within planned boundaries and with a clear separation distance from waters.	Nitrate 30 mg/l, Lead 0.05 mg/l, Sulphate 600 mg/l, Turbidity 30 NTU, DO Less than 75% of saturation concentration; Maximum 15 ppm for hydro-carbons; +/- 0.5 from the pH baseline	Contractor/ MoW Designated Environment Officer
	Loss of employments	The only major impact that will result when the project is decommissioned is loss of jobs. In order to minimize the impacts that may result from this	All employees covered	Contractor/ MoW Designated

Phase	Potential Impacts	Management/Mitigation Measures	Target Level / Standard	Responsible Institution
		eventuality MoW will ensure that all employees are members of the pension fund and will ensure that the contributions are made.		Environment Officer
	Noise pollution	During decommissioning the contractor will coordinate activities that produce the most noise levels and portable barriers will be installed to shield compressors. Use of equipment designed with noise control elements will be adopted where necessary. Use of very noisy equipment will be limited to daytime only. All workers operating in noisy areas or operating noisy equipment will be provided with earpieces to protect against extreme noise.	TBS and WHO standards noise emissions shall not exceed 75 dB(A)(peak readings), daytime or 55 dB(A) (peak readings) at night,	Contractor/ MoW Designated Environment Officer
	Dust and exhaust emissions	A site waste management plan will be prepared by the contractor prior to commencement of demolition works. All personnel working on the project will be trained prior to commencing the demolition exercise on methods for minimizing negative impacts on air quality. The contractor will douse the surface with water to suppress excessive dust and whenever possible, water sprinklers shall be used.	To minimize dust emission. PM 2.5 not to exceed 250 mg/Nm3 (peak readings), No complaints from the local community	Contractor/ MoW Designated Environment Officer
	Occupational health and public safety hazards	All workers will be sensitized before the exercise begins, on how to control accidents related to the demolition exercise. A comprehensive contingency plan will be prepared before demolition begins, on accident response. Adherence to safety procedures will be enforced at all stages of the exercise. All workers, pursuant to labour laws, shall be accordingly insured against accidents.	OSHA 2003, Low risk to workers No exposure	Contractor/ MoW Environment Officer
	Enhancement measures for potential positive impacts			
	Employment/Income generation	From the start of the project the contractor during construction and the proponent shall strive to employ local community in most position. Training shall be provided where necessary to give basic understanding on some of the aspects of dam construction in order to increase the number of locals to be involved with the project. Salaries for the workers shall be over and above the government minimum wage.	As maximum as possible	Contractor/ MoW

Phase	Potential Impacts	Management/Mitigation Measures	Target Level / Standard	Responsible Institution
	Benefit to local producers and suppliers of goods and services	Where ever possible the project will procure materials from local sources. The use of locally available materials and labour for the proposed construction of Farkwa Dam will contribute towards growth of the economy by contributing to the gross domestic product.	As maximum as possible	Contractor/ MoW
	Improvement of health conditions of the population as a result of the consumption of drinking water	The project to upgrade and expand the water supply system will create conditions for improving the lives of the recipient population by providing more efficient access to water supply services. The availability of quality water will help in reducing the incidence of waterborne diseases, increasing the welfare of local people. This will be a positive impact of the project and great motivation for its implementation.	As maximum as possible	MoW
	Planned water supply and reliability of water supply system	The improvement and expansion of water supply system will enable greater responsiveness to the demand, increasing also the reliability of the operating system. The reliability of the system will allow adequate planning for water supplies.	As maximum as possible	MoW
	Rural income improvement	Implementation of the proposed project will induce a commercially sustainable agriculture for improved income level for the household, and thus help in poverty reduction, which is the core socioeconomic problem in the area. Poverty is to be reduced through provision of reliable water, which apart from creating the condition for more production and intensification will also reduce the high risk in agricultural production.	As maximum as possible	MoW
	Opportunities for skills acquisition	This impact is high and of great importance and therefore it will be enhanced by ensuring there is skill transfer through an elaborate programme. Staff will be categorized and each group will be supervised by dedicated skilled personnel to ensure on job training. The proponent will encourage job on training through observation and trial under supervision	As maximum as possible	MoW

1.8 ENVIRONMENTAL MONITORING PLAN

1.8.1 Introduction

The correct and successful implementation of impact mitigation measures in order to reduce adverse impacts on environmental conditions needs to be ensured by a proper monitoring programme. This chapter presents the Environmental and social monitoring plan (EMP) that will be carried out throughout the project implementation to mitigate the impacts and enhance the benefits of the project. The EMP outlines the specific actions that shall be undertaken to ensure that the Project complies with all applicable laws and regulations related to environmental impacts and impact mitigation. The EMP deals with all mitigation required for the physical, biological and socio-economic impacts and focuses on the impacts of higher significance as provided in table 1.1 above.

1.8.2 Objectives of EMP

The EMP applies to, and will be implemented throughout, all phases of the project: mobilization, operation, and decommissioning. The objective of the EMP is to set out clearly the key components of environmental and socio-economic management for the proposed project and thereby ensure that the following concepts are realized throughout the mobilization, construction, operation, and decommissioning.

- negative impacts on the physical, biological and socio-economic environments are mitigated;
- benefits that will arise from the development of the proposed project are enhanced;
- support smooth implementation of project with minimum losses to environmental and social infrastructure;
- compliance and guided by National, International laws, standards and guidelines e.g. effluents standards, noise level standards, occupational and safety standards etc and best practice is achieved; and
- good will and good relations with communities, and governments at local and national levels are maintained.

1.8.3 Monitoring responsibility

Implementation of the EMP is the solely the responsibility of the project proponent. MoW shall supervise and monitor components of the monitoring plan and keep record of monitoring outcome. MoW has ability to provide the necessary supervisory oversight to ensure the mitigation measures are working and where they are not remedial measures are established. MoW is committed to protect, and will enhance the environment.

Detailed parameters to be monitored have been considered along with responsible institution (s). The MoW will endeavor to ensure that resources are available to implement the EMP throughout all phases of project development and decommissioning. The EMP will be subject to the principle of continuous improvement. The details of environmental issues, environmental impacts, proposed parameter to be monitored and timing agencies responsible for execution of proposed actions during mobilisation, construction, operation and decommissioning stages are presented in Tables 1.2 below.

Table 1.2: Environmental and Social Monitoring Plan

Phase	Potential Impacts	Parameter to be monitored	Monitoring Frequency	Monitoring Area	Measurement Units	Measuring Method	Target Level / Standard	Responsible Institution	Estimated Costs -TZS
Preparation/Mobilization phase	Loss of /disturbance of biodiversity (flora, fauna and ecosystem)	Size of land cleared, number of trees planted, type of planted trees	Weekly inspection	Project area	M_2, Number of affected species	Site inspection, Visual observation	Type, number, distribution etc. of species	Contractor/ MoW	6,000,000
	Deterioration/impairment of local air quality	SO_2	Once a Month	Project site	Mg/l	Detector tubes	average 100 µg/Nm^3 (0.129mg/kg) for 24hour	Contractor/ MoW	5,000,000
		NO_2	Once a Month	Project site	Mg/l	Detector tubes	150 µg/Nm^3 for 24-hours average value		
		CO	Once a Month	Project site	ppm	Mini-Vol Sampler	10mg/Nm^3 for 8 hours		
		Black smoke PM_{10}	Once a Month	Project site	ppm	Mini-Vol Sampler	40 to 60 µg/Nm^3		
	Nuisance and disturbance on/offsite receptors from noise pollution	Noise level	Weekly checks	Project site	dBA	Noise level meter	shall not exceed 75 dB(A)(peak readings), daytime	Contractor/ MoW	4,000,000
	Air pollution due to dust	Dust level	Twice daily	Project site	µg/m^3	Dust level meter/ Mini-Vol Sampler	PM 2.5 not to exceed 250 mg/Nm3 (peak readings)	Contractor/ MoW	5,000,000
	Depletion /degradation at points of source of construction materials	Documentation on resource procurement practices	Weekly checks	Materials sourcing area	Affected resource	Visual observation	No degradation of local resources, no complaints from local people	Contractor/ MoW	5,000,000
	Erosion of the top soil and reservoir sedimentation	Visible erosion	Weekly checks	project site, borrow pits & quarries	visible erosion	Site inspection, visual observation	No erosion tendencies	Contractor/ MoW	5,000,000
	Disruption of traffic flow during mobilization	Traffic control measures in place	Weekly checks	Project area	Number and	Visual inspection	As minimum disruption as possible	Contractor/ MoW	10,000,000

Phase	Potential Impacts	Parameter to be monitored	Monitoring Frequency	Monitoring Area	Measurement Units	Measuring Method	Target Level / Standard	Responsible Institution	Estimated Costs -TZS
					duration of disruption				
Construction Phase	Disruption of the various users of the highway and road reserve	Traffic control measures in place	Weekly checks	Project area	Number and duration of disruption	Visual inspection	As minimum disruption as possible	Contractor/ MoW	5,000,000
	Deteriorated / impairment of local air quality	SO_2	Once a Month	Project area	Mg/l	Detector tubes	average 100 µg/Nm^3 (0.129mg/kg) for 24hour	Contractor/ MoW	5,000,000
		NO_2	Once a Month	Project area	Mg/l	Detector tubes	150 µg/Nm^3 for 24-hours average value		
		CO	Once a Month	Project area	ppm	Mini-Vol Sampler	10mg/Nm^3 for 8 hours		
		Black smoke PM_{10}	Once a Month	Project area	ppm	Mini-Vol Sampler	40 to 60 µg/Nm^3		
	Noise pollution	Noise levels, sound abatement measures in place	Weekly inspections	Project area	dBA	Noise level meter	shall not exceed 75 dB(A) daytime or 55 dB(A) at night,	Contractor/ MoW	6,000,000
	Air pollution due to dust	Dust level	Weekly checks	Project area	µg/m^3	Dust level meter/ Mini-Vol Sampler	PM 2.5 not to exceed 250 mg/Nm3 (peak readings)	Contractor/ MoW	5,000,000
	Increased soil and water pollution downstream	Fuel and hazardous material storage areas, plant, machinery, re-fuelling & delivery areas	Weekly inspections	Project area	mg/l	Sampling and analysis(Spectrophotometer)	Maximum 15 ppm for hydro-carbons No leakage /spillage of hydrocarbons	Contractor/ MoW	6,000,000
	Contamination/impaired quality of receiving body–land, water from construction wastes	BOD, TSS; signs of floating wastes at river; management records	Weekly inspections	Project area	types of waste	Visual inspection	Less complaints from neighboring communities	Contractor/ MoW	5,000,000
	Contamination of soil and ground water	Water turbidity	Once per week	Project area	NTU	Sampling and analysis	< 25 NTU	Contractor/ MoW	5,000,000

Phase	Potential Impacts	Parameter to be monitored	Monitoring Frequency	Monitoring Area	Measurement Units	Measuring Method	Target Level / Standard	Responsible Institution	Estimated Costs -TZS
	quality from the batching plant					(Spectrophotometer)			
		Total Solids	Once per week	Project area	mg/L	Drying and Weighing	Minimum disturbance as possible		
		pH	Once per week	Project area		pH meter	6.5-9.2		
	Contamination of river waters from accidental spillages/ discharges	Fuel and hazardous material storage areas, plant, machinery, re-fuelling & delivery areas	Weekly inspections	Project area	mg/l	Sampling and analysis(Spectrophotometer)	Maximum 15 ppm for hydro-carbons No leakage /spillage of hydrocarbons	Contractor/ MoW	4,000,000
	Soils damage/ disturbance to surface and sub-surface organisms	Impacted habitats / Species	Continuously	Project area	Type/quantity/area of fauna/ flora	Visual inspection	As minimum disturbance as possible	Contractor/ MoW	6,000,000
	Injuries to the general public due to road accidents	Traffic control measures in place	Weekly checks	Transportation route, project site	Number & duration of disruption	Visual inspection	As minimum disruption as possible	Contractor/ MoW	5,000,000
	Public health hazards / safety due to social interactions	Incidence of medical reports of HIV/AIDS or other disease,	Every 3months	Project records	Number of people infected	HIV blood tests and surveys	Tanzania AIDS/HIV Policy, No HIV/AIDS victims	Contractor/ MoW	10,000,000
	Health hazards associated with construction work	Registered worker Injury /illness, Proper use PPE	Continuously	Project area	Number of cases, PPE users	Medical records, and site inspection	OSHA 2003, Low risk to workers, No exposure	Contractor/ MoW	6,000,000
Operation Phase	Damage to the dam and conveyance system due to effects of natural factors and processes	Construction workmanship Certificate of works	Every month	Project area	Presence of cracks	site inspection	Construction as per design specification	MoW	10,000,000
	Sediment loads transported into the	Water turbidity	Once per week	Dam site	NTU	Sampling and analysis	< 25 NTU	MoW	5,000,000

Phase	Potential Impacts	Parameter to be monitored	Monitoring Frequency	Monitoring Area	Measurement Units	Measuring Method	Target Level / Standard	Responsible Institution	Estimated Costs -TZS
	dam and degradation of water quality					(Spectrophotometer)			
		Total Solids	Once per week	Dam site	mg/L	Drying and Weighing	As minimum disturbance as possible		
		pH	Once per week	Dam site		pH meter	6.5-9.2		
	Impacts on the downstream ecosystem due to delayed and reduced flow	Flow rate downstream	Every month	Dam site	m^3/day	V- Notch Weirs, Frequencies of conflicts	Standard dam operational rules, water right user permit, No complains	MoW	5,000,000
	Reduced water quality due to pollution	Nitrate	Once per day	Dam site, water sources at the quarry & access road	mg/l	Sampling and analysis	30	MoW	6,000,000
		Lead	Once per day		mg/l	Sampling and analysis (AAS)	0.05		
		Sulphate	Once per day		mg/l	Sampling and analysis	600		
		Turbidity	Once per day		NTU	Sampling and analysis	< 25 NTU		
		pH	Once per-day		mg/l	pH Meter	+/- 0.5 from the baseline		
		DO	Twice per day		mg/l	DO meter	Less than 75% of saturation concentration		
	Impacts related with climate change	Performance of the dam, Water levels	Every month	Project area	None	Visual and site inspection,	As minimum as possible	MoW	4,000,000

Phase	Potential Impacts	Parameter to be monitored	Monitoring Frequency	Monitoring Area	Measurement Units	Measuring Method	Target Level / Standard	Responsible Institution	Estimated Costs -TZS
	Change in local ecosystem /stimulate of vegetation growth/ change in species composition	Species diversity	Once after one year of commissioning	Project area	m2, number of affected species	Visual observation and area computation	Standard dam operational rules, water right user permit	MoW	5,000,000
	Human wildlife conflicts	Reported conflicts	Every month	Project area	frequencies of conflicts	Reported complains, Visual observation	Conflict kept as minimum as possible	MoW	3,000,000
	Flooding hazards	Performance of the dam, Water levels	Every month	Project area	None	Visual and site inspection,	No crack in the foundation	MoW	4,000,000
	Contamination/impaired quality of soils and water from poorly controlled agricultural activities	Water quality – chemical content (of known chemicals and fertilisers), Soil contamination	Once every six months	Dam site	Mg/l ppm	Sampling and analysis (Spectrophotometer)	TBS standard, Dissolved phosphate (as P), *5* mg/l*, max*	MoW	5,000,000
	Increased water and soil pollution	Water quality – sediments, silt, turbidity	Once every six months	Dam site	NTU	Sampling and analysis	< 25 NTU	MoW	6,000,000
	Potential negative impacts								
	Relocation/resettlement of people, farms, properties and disruption of economic activities	Number of affected people	Once before construction	Project site	Numbers	RAP, Reported complains, Visual observation	As per the provision of Land Act 1999	MoW	5,000,000
	Increased conflicts over local water resources (communities downstream)	Reported conflicts	Every month	Project area	Frequencies of conflicts	Visual inspection and interview with local communities	Conflict kept as minimum as possible / No complaints from the local people	MoW	5,000,000

Phase	Potential Impacts	Parameter to be monitored	Monitoring Frequency	Monitoring Area	Measurement Units	Measuring Method	Target Level / Standard	Responsible Institution	Estimated Costs -TZS
	Increase conflict with people living in the upper catchment	Reported conflicts	Every month	Project area	Frequencies of conflicts	inspection and interview with local communities	Conflict kept as minimum as possible / No complaints from the local people	MoW	4,000,000
	Damage or loss of project structures due to anthropogenic activities	Affected structures	Once after construction	Dam site	None	Visual inspection	As minimum as possible	MoW	4,000,000
	Public health hazards due to Water-borne and water-related diseases	Prevalence of water-borne diseases	Once every year	Health Centre	Number of Patients and types of ailments	Medical reports	No or minimum incidences of water borne and water related diseases	MoW	5,000,000
	Increased population influx	Number of people	Once every six months	Report files	Numbers	Visual observation	As minimum as possible	MoW	4,000,000
	Danger of people drowning either intentionally or accidentally looms within the dam	Number of people drowning, awareness program in place	Continuously	Project area	Number of cases / injuries	Medical records, and site inspection	Low risk to people No exposure	MoW	5,000,000
	Conflicts among workers and the local population in the project area	Reported conflicts	once every six months	Project site	Numbers	Numbers	Conflict to be kept as minimum as possible	MoW	4,000,000
	Exposure to chemicals, hazardous or flammable materials	Water quality – chemical content, Reported exposure	Once every six months	Down stream	Mg/l ppm	TBS standard	Tanzania OSHA 2003, Low risk to workers and no exposure	MoW	6,000,000
Decommissioning	Loss of vegetation cover and plant diversity	Flora diversity	Once before construction	Upstream and down stream	Numbers and names	Site inspection, survey,	IUCN list CITES list	Contractor/ MoW	5,000,000

Phase	Potential Impacts	Parameter to be monitored	Monitoring Frequency	Monitoring Area	Measurement Units	Measuring Method	Target Level / Standard	Responsible Institution	Estimated Costs -TZS
	Contamination and impaired water quality	Nitrate	Once per day	Dam site	mg/l	Sampling and analysis	30	Contractor/ MoW Designated Environment Officer	10,000,000
		Lead	Once per day		mg/l	Sampling and analysis (AAS)	0.05		
		Sulphate	Once per day		mg/l	Sampling and analysis	600		
		Turbidity	Once per day		NTU	Sampling and analysis	< 25 NTU		
		pH	Once per day		mg/l	pH Meter	+/- 0.5 from the baseline		
		DO	Twice per day		mg/l	DO meter	Less than 75% of saturation concentration		
	Loss of employments	Pension fund remittance	Once every year	Project site	Employees registered for pension fund	Workers register book	All workers	Contractor/ MoW	5,000,000
	Noise pollution	Noise level	During decommissioning	Project Site	dBA	Noise level meter	noise emissions shall not exceed 75 dB(A)(peak readings), daytime or 55 dB(A) (peak readings) at night,	Contractor/ MoW Designated Environment Officer	5,000,000
	Dust and exhaust emissions	Suspended solids in air	During decommissioning	Project Site	$\mu g/m^3$	Dust level meter	PM 2.5 not to exceed 250 mg/Nm3 (peak readings), No complaints from the local community	Contractor/ MoW Environment Officer	5,000,000
	Occupational health and public safety hazards	Registered worker Injury / illness, Proper use PPE	Monthly	Work sites	Number of cases/injuri	Medical records, and site inspection	OSHA 2003, Low risk to workers, No exposure	Contractor / MoW	4,000,000

Phase	Potential Impacts	Parameter to be monitored	Monitoring Frequency	Monitoring Area	Measurement Units	Measuring Method	Target Level / Standard	Responsible Institution	Estimated Costs -TZS
					es, workers using PPE			Environment Officer	
	Enhancement measures for potential positive impacts								
	Employment/Income generation	Local people employed and training conducted	Continuously during operation	Project records	Local people employed	Numbers of local people employed	As maximum as possible	Contractor/ MoW	4,000,000
	Benefit to local producers and suppliers of goods and services	Procurement records	Continuously during operation	Project records	Amount	Amount	As maximum as possible	Contractor/ MoW	5,000,000
	Improvement of health conditions of the population as a result of the consumption of drinking water	Health conditions within project area	Monthly	Work sites	Number of cases	Medical records, and site inspection	More improvement of health conditions of the population	MoW	5,000,000
	Planned water supply and reliability of water supply system	Water supply	First year of operation	Project records	Water provided	M^3	As maximum as possible	MoW	5,000,000
	Rural income improvement	Income of local people	Continuously during operation	Project records	Amount	Amount	As maximum as possible	MoW	5,000,000
	Opportunities for skills acquisition	Local people trained	Continuously during operation	Project records	Numbers of local people employed	Numbers of local people trained	As maximum as possible	MoW	4,000,000

1.9 ALTERNATIVES CONSIDERED

The general principle involved in identifying the option(s) of the proposed project is to ensure that the option chosen would result in optimal social, economic and environmental returns. Three dam type options were studied for Farkwa Dam i.e. alternative 1- Earth-fill, alternative 2 - Composite RCC and Earth-fill and alternative 3 - Concrete Face Rockfill Dam (CFRD). The technico-economic comparison shows that the composite RCC and Earthfill Dam option (Option 2) presents non negligible technical and economic advantages. The main advantage is brought by the incorporation of the spillway and intake in the dam body, which reduce as well as facilitate the construction works. From an environmental point of view, Option 2 also appears to be friendlier due to a smaller amount of construction materials, excavations and footprint than the other two options. Regarding the FSL of the dam, a FSL at El. 1110 m is recommended:

- The reservoir simulations show that the total water demand (including the additional rural demand provided by the MOW) is satisfied;
- An increase of 1 metre of the FSL leads to evaporation losses greater than the gain in water supply;
- A higher FSL may have impacts on the Swagaswaga Game Reserve;

An increase of 1 metre of the FSL has a cost to be taken into account. It is estimated that the cost increase by approximately 7% every meter. On this basis it is recommended to select the composite RCC and Earthfill Dam Option with a FSL at El.1110m for the Farkwa Dam project.

If the drinking water demand in the Chemba District and Dodoma City beyond 2015 shall be met another feasible alternative to the project including the No-Project option does not exist. The conclusion is that the recommended alternatives in this ESIA report recognizes the viability and need for the proposed development and are designed to address environmental issues and concerns, meets all local regulatory requirements.

1.10 COST BENEFIT ANALYSIS

The cost benefit analysis for the establishing Farkwa Dam and the conveyance system was conducted during feasibility study to evaluate whether establishing the Dam will yield economic and social benefit to the project proponent and communities in Dodoma Region. The aim of the analysis is to calculate the Net Present Value (NPV) and the Internal Rate of Return (IRR) in order to evaluate the profitability of the project.

- The Net Present Value is estimated as the difference between total benefit and project's total cost discounted at the same date. It is derived as summed discounted benefits less sum discounted costs.
- The Internal Rate of Return can be defined as the rate at which the Net Present Value of the net benefit stream in financial terms becomes zero. Thus, it is the rate that equates project's discount financial benefits to discounted financial costs.

The normal cost of capital in the water sector in Tanzania is known to range from 8 to 15%. This parameter was used as reference for the analysis, which was carried out as follows:

- Firstly the Net Present Value was calculated for both discount rates 8% and 15%;

- Secondly the price of water was computed on the basis of a fixed IRR. The computation was made for two IRR values: 8 and 15%, to cover the normal range.

A cost estimate was prepared during the feasibility study for the project infrastructures (dam, conveyance system and others). Cost estimates for the social and environmental impacts mitigation, land valuation and others are also presented here. The dam cost is estimated at 38.6 MUSD for the recommended option (composite RCC and earthfill Main Dam, FLS 1,110m), including the cost for operations and maintenance estimated at 2.6 MUSD. The dam cost without the operations and maintenance cost is therefore estimated at 31.6 MUSD.

The conveyance system cost is estimated at 175 MUSD, including the cost for operations and maintenance estimated at 15 MUSD. The conveyance system cost without the operations and maintenance cost is therefore estimated at 160 MUSD. A provision of 16 MUSD is providing in order to anticipate the increase of the conveyance system cost due to the addition of 3 districts (increase in water demand). The treatment plant cost is estimated at 33 MUSD, including the cost for operations and maintenance estimated at 3 MUSD. These later costs include costs related to access roads but not the cost related to the power supply to the dam site. The total infrastructures cost is therefore estimated at 222 MUSD without the operation and maintenance costs, which are estimated at 20.5 MUS.

The environmental and social mitigation costs were estimated to 12.7 MUSD. The costs of all the pollution control equipment, operation and maintenance of that equipment's and the procurement of the monitoring equipment are included in the project cost. Other cost to be incurred by the project proponent are as detailed under the environmental management and monitoring plans. It was concluded that the potential benefits of the project, in terms of financial and social benefit are substantial. Similarly, the environmental impacts can be reasonably mitigated and the financial resources needed to mitigate negative impacts, when compared to the required investment, are relatively small.

1.11 DECOMMISSIONING PLAN

After completion of mobilization and construction activities, all construction equipment, vehicles and vessels will be removed from site along with any temporary facilities. All equipment, tools and surplus materials (materials are defined in this instance as – items that have been brought to site by the contractor or any other materials taken from the site) will be placed in containers and returned to contractor yard or to another project. Materials and equipment shall be removed from the site as soon as they are no longer necessary to minimize the demobilization work after completion of the project.

Before the final inspection, the site shall be cleared of equipment, unused materials and rubbish so as to present a satisfactory clean and neat appearance. All the camp sites will be built as temporary structures and these will also include the use of movable structures such as movable containers. All the temporary structures that can be beneficial to the community shall be provided freely to the local government for other uses in the area.

1.12 GRIEVANCE REDRESS MECHANISM

The proposed project is anticipated to impact both directly and indirectly, positively and negatively on communities in the project area. These impacts can potentially affect the lives of people living and working in these communities, thus giving rise to grievances. These potential grievances may relate to any aspect of the project. They might be felt and expressed by a variety of parties including individuals, groups,

communities, entities, or other parties affected or likely to be affected by the social or environmental impacts of the project. To address the environmental and social impacts related to the project, was carried out. Despite that the ESIA document was developed for the project, large-scale development projects such as the construction of Farkwa Dam and Water Conveyance System to Chemba and Dodoma City represent dramatic change for communities. While change may lead to opportunity for some, it may put others at risk, despite project efforts to be socially and environmentally responsible, and despite genuine attempts to engage communities and create project safeguards. Risk and change work hand in hand to create conditions where community conflicts arise. To manage the potential grievances related to any aspect of the project, to enable community members to raise concerns about possible negative impacts and to give MOW the opportunity to address those concerns, MOW develop the Grievance Mechanism.

These mechanisms outline the requirements for designing and implementing an appropriately tailored site Grievance Management and Resolution Procedure, or "Grievance Mechanism" for short. It also outlines the Ministry of Water approach to accepting, assessing, resolving and monitoring grievances from those affected by proposed project. The purpose of a Grievance Mechanism document is to manage complaints and grievances from communities and other local stakeholders in a systematic, fair, timely and transparent manner in order to promote mutual confidence and trust. A Grievance Mechanism also provide the site with information about stakeholder issues and concerns and serves as an early warning mechanism that addresses issues before they become more difficult and more costly- to resolve. Timely redress or resolution of such grievances is vital to ensure successful implementation of the project

Grievances can encompass minor concerns as well as serious or long-term issues. They might be felt and expressed by a variety of parties including individuals, groups, communities, entities, or other parties affected or likely to be affected by the social or environmental impacts of the project. It is essential to have a robust and credible mechanism to systematically handle and resolve any complaints that might arise in order that they do not escalate and present a risk to operations or the reputation of the MOW (nationally or internationally). If well-handled, an effective grievance mechanism can help foster positive relationships and build trust with stakeholders.

This Grievance Mechanism has been considered in parallel to the Stakeholder Engagement Plan (SEP) due to the inter-relationship between these two planning mechanisms. It has been designed to meet the legal requirements of Tanzania laws and regulations and the requirements of the International Finance Corporation (IFC) in relation to grievance management. The mechanism for addressing employee grievances is not addressed through this mechanism which is solely to manage the interface with external stakeholders.

11.13 CONCLUSION AND RECOMMENDATIONS

It can be stated that the Project can be implemented and operated without having significant impacts on the bio-physical environment if the proposed mitigation measures are implemented. The project is viable from a social point of view and the implementation of the identified mitigation measures will minimize the negative socioeconomic implications of the project to a minimum.

In order to compensate the loss of assets of affected people and to manage physical relocation properly a Resettlement Action Plan to the Project has been prepared. The implementation of the resettlement plan especially the compensation payment shall be carefully monitored. For construction works it is recommended to hire local workers wherever possible. This will raise the acceptance of the population to the project. Regarding Health and Safety aspects, the Project can be implemented without any

remaining significant risks and impacts, provided that the Health and Safety requirements stated are put in place.

Given the nature and location of the development, the conclusion is that the potential impacts associated with the proposed project are of a nature and extent that can be reduced, limited and eliminated by the application of appropriate mitigation measures. The proposed environmental management plan and environmental monitoring plan if implemented will safeguard the tranquility of the environment.