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TANZANIA STRATEGIC CITIES PROJECT (TSCP)

ENVIRONMENTAL IMPACT STATEMENT OF THE PROPOSED REHABILITATION/IMPROVEMENT OF SURFACE WATER DRAINAGE SYSTEM IN TEMEKE MUNICIPALITY, DAR ES SALAAM REGION

TENDER N.° ME/022/2011/2012/C/12

12 November 2014

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DECLARATION

We hereby certify that the particulars given to this report are correct and true to the best of our knowledge.

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ACKNOWLEDGEMENT

The Prime Minister's Office - Regional Administration and Local Government (PMO-RALG), the Project Proponent, would like to extent sincere gratitude to all individuals and institutions who contributed to the completion of the following tasks under the proposed Tanzania Strategic Cities Project: Provision of Consultancy Services for Improvement of Surface Water Drainage Systems in Dar es Salaam Metropolitan area, including Preparation of Preliminary and Detailed Engineering Designs, Cost Estimates and Bidding Documents, and Environmental and Social Impact Assessments for the Investment Sub-Projects. Special thanks are due to the management and staff of Temeke Municipal Council, Wami/Ruvu River Basin Office, Water and Sewerage Authority (DAWASA), ward Executive Officers and Village Leaders for providing valuable information and support.

Several other persons, such as Professor Raphael Mwalyosi, were involved in one way or another, in the preparation of and successful execution of this study. To all those, the proponent extends many thanks.

ABBREVIATIONS

ARMCBP	Air Quality Monitoring Capacity Building Project
ACGIH	American Conference of Governmental Industrial Hygienists
BP	Bank Procedures
CBD	Central Business District
CBO	Community-Based Organisations
DAWASCO	Dar es Salaam Water and Sewerage Corporation
DAWASA	Water and Sewerage Authority
DCC	Dar es Salaam City Council
DLA	Dar es Salaam Local Authorities
DMDP	Dar es Salaam Metropolitan Development Project (DMDP)
EIA	Environmental Impact Assessment
EMA	Environmental Management Act
EMP	Environmental Management Plan
EIA	Environmental Impact Assessment
HIV/AIDS	Human Immunodeficiency Virus/Acquired Immune Deficiency Syndrome
IAP	Interested and Affected Parties
IFC	International Finance Corporation
LGA	Local Government Authorities
NEMC	National Environment Management Council
NEP	National Environmental Policy
NGO	Non-Governmental Organisations
OP	Operational Policy
PAP	Project Affected Persons
PMO-RALG	Prime Minister's Office – Regional Administration and Local Government
RAP	Resettlement Action Plan
RCH	Reproductive and Child Health
TANESCO	Tanzania National Electric Supply Company
TANROADS	Tanzania Road Agency
TMC	Temeke Municipal Council
ToR	Terms of Reference
TSCP	Tanzania Strategic Cities Project
WB	World Bank
WEO	Ward Executive Officer

EXECUTIVE SUMMARY

Environmental Impact Statement for the Proposed Rehabilitation/Improvement of Surface Water Drainage in Temeke Municipality, Dar es Salaam Region

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1. A brief description of the project environment

The main objectives of the proposed interventions for Temeke Municipality are to:

- Avoid the accumulation of storm water in existing lower areas with no natural way out or with drainage infrastructures without sufficient capacity of transport;
- Service some areas with drainage infrastructure, avoiding the storm water to run along the roads/paths hampering the access of people and vehicles.

Project Components

The Surface Water Drainage System Sub-projects in Temeke Municipality will have many proposed interventions as summarized below:

- To replace the existing pipe (Temeke drain) that crosses two primary schools for a new. This deviation can be carried out by existing roads on North or on South of the referred schools;

- To improve the impounded area immediately upstream the Nelson Mandela Road to function as an adequate detention pond to reduce the peak flows and to fix the design flow for downstream.
- To replace the existing sections of underground pipes (Serengeti drain/ Gerenzani Creek);
- Enlargement of existing channels/streams (Serengeti and Keko drains);
- Enlargement of existing culverts under Bandari Street and railway station.

Materials

All materials will be sourced locally. For the sections of proposed open channels after enlargement/rising, were assumed a construction detail using vertical walls and concrete for banks and bed. The relatively significant size of these infrastructures and the overall lack of free space to deploy them make the concrete the best solution to consider.

The rehabilitation of the Storm Water System in Temeke Municipality will require the following construction materials: Concrete; Shotcrete; Reno mattress; Precast concrete slabs; Stone masonry; Iron; Soil earth materials, block and sand; Water; and Oil.

Biophysical Characteristics

Geology: The study area has two major geological units: (i) the underlying substratum of (semi-consolidated formations and outcropping rocks that consist of Neogene clay-bound sands to hard sandstone; and (ii) the superficial mainly loose sediments of the Quaternary System which are more extensive in the central and southern parts of Dar es Salaam region and consisting of less consolidated terrace sands and sandstones and recent alluvium.

Soils: The soil is a finite, limited and non-renewable resource. The degradation processes associated with loss of ability to perform its functions are reflected in its inability to maintain or sustain vegetation.

Hydrology and water resources: Gerenzani Creek River has a length of approximately 2 km and a basin area of 13.1 km^2. Kizinga River has a length of approximately 80 km and a basin area of 211.5 km^2 and Yombo River has a basin area of 24.9 km^2. Like the rest of Dar es Salaam city, rainfall catchment at these basins occurs in two seasons: March – June and October – December, and the annual rainfall ranges between 1,000 and 1,200 mm.

Ecological and Environmental Characteristics

Flora: Temeke Municipality has a total of 2,041 ha of natural forest reserve area including the coastal mangrove along the creeks and estuaries and on coastal shores occupying an area of about 27,03 ha. These forests contain unique indigenous wood species such as teak and ebony. Specifically, in the project area, the existing vegetation is scarce and located close to the open drain, mainly bush thickets mixed with annual herbs, grasses and some trees, mainly palms, Acacias and banana and papaya trees.

Fauna: Temeke Municipality contains a significant amount of domestic and non-domestic fauna species including livestock, poultry, wild birds, snakes and other reptiles on the fringes of peri-urban areas e.g. Kigamboni and Mbagala areas. The main fauna found in close to the Sub-projects in Temeke Municipality include domestic animals and some wildlife, predominantly generalist and tolerant to human presence like house rat (*Rattus rattus*), bufo (*Amietophrynus gutturalis*), crows and sparrows. In summary, it can be said that the Sub-projects area has no remarkable wildlife resources.

2. Stakeholders Identification and Methods of Participation

Consultations were conducted aimed at providing issues that are likely to be of interest to the communities, client, concerned stakeholders and developer. Several stakeholders were consulted from February 2013 to April 2014, not only to obtain the literature, references, maps and other documents necessary for the project development but also to introduce the Project and obtain their views regarding it. The comprehensive list of stakeholders consulted in provided in chapter five and appendix 14.3 of this report.

Some of the major issues raised during the consultations were as follow:

- Vandalisms, theft and sabotage
- Costs of Moving /Relocated Infrastructure Facilities
- Limited Capacity of Power Supply
- Alternative Material Usage
- Water leaks from main water supply pipes
- Increasing water demand
- Corporation with other Utility Agencies
- Billing and service follow-up
- Few/limited infrastructure facilities
- Sewerage blockade

- Sewerage overflow and bad odour

TABLE A

List of stakeholders consulted

Name	Institution	Jurisdiction Area	Position
Eng. Ignace A. J. Mchallo	National Environmental Management Council	Nationwide	Director of Environmental Impact Assessment Department Eng.
Eng. Linus Shao	Ministry of Lands, Housing and Human Settings Development	Physical Planning Division Settlement Regularization Section	
Mathias Mlagambwa	DAWASA – Dar e Salaam Water and Sewage Authority	Dar es Salaam Region	Engineer responsibly for the sewage
Lameck Victor	DAWASCO	Temeke	Acting Manager
Dickson P. Lema	Municipal Council	Temeke	Municipal Engineer
Ward Executive Officers	Local Government	Temeke	WEO
Local People	Communities	Temeke Municipality	Community Members
Victor Ndonde	Temeke Municipality	Temeke	Municipal Valuer

3. Description of Major Significant Impacts

The major environmental and social impacts identified include the following:

i) Improved quality of public health

The implementation of the project will lead to positive impacts through the reduction of flooding during the rainy season and reduction of soil erosion by the improvement of drainage infrastructures. The rehabilitation of the storm water drains may also contribute to the improvement of the visual appearance and aesthetics of the urban landscape of the city of Dar es Salaam, due to waste removal.

Implementation of the project will contribute to the improvement of the quality of life of the population, with sustainable and efficient system of infrastructures development.

This improvement will in some way, contribute to the fulfilment of DMDP objectives, with regard to the health of the population.

ii) Improvement of landscape visual quality

There will be a positive impact caused by a permanent change in the visual setting of the landscape due to the presence of a better and improved infrastructure system in the Core Direct Area and Immediate Impact Area.

iii) Disruption of natural drainage network

Construction activities may disrupt the natural drainage network and cause flood events in the Core Direct Area and Immediate Impact Area, leading to negative impacts.

iv) Land take

The most significant negative environmental and social impact associated with storm water drainage project relating to the construction phase is land take for improvement/rehabilitation of surface water drains in Temeke Municipality and the detention pond. The Project was designed to minimize the number of households to be affected as much as possible and this will be provided in the final EIA report.

The land take will lead to loss of agricultural land and access to natural resources caused by the construction of the detention pond and involuntary resettlement.

v) Risk of drowning for the population during heavy rains

There will be a negative impact associated with the risk of drowning for the population during heavy rains on the detention pond, especially sensitive groups such as children and elderly.

4. Recommendation and Plan for Impact Mitigation/Enhancement Measures

Mitigation measures proposed include strategies or engineering construction best practices to prevent, avoid, minimize, restore or compensate impacts. The proposed mitigation measures for the negative impacts of major significance mentioned above include;

i) Disruption of natural drainage network

- Natural flow regimes must be maintained meaning, whenever necessary, alternative and temporary drainage must be implemented
- The sedimentation of rivers and streams for construction materials should be minimized

ii) Land take

- All grievances must be reported to the authorities for conflict resolution
- All PAPs should be paid compensation according to laws of the country
- Establish dispute resolution committees
- Educate the affected people about legal resolution mechanism

iii) Risk of drowning for the population during heavy rains

- Attach of warning signs, barriers, and other precautions on all potential high risk areas
- Implement community sensitization programs on safety measures to be taken

5. Project Alternatives

To achieve a technical, environmental and social sustainable drainage design for the improvement of the drainage system in Temeke Municipality it were conducted several study analyses included:

"Part 3 - Gerenzani Creek basin interventions (Temeke/Serengeti/Keko drains)" (September 2013)

In this report two alternatives were considered:

- Alternative 1: considered the enlargement/extension/alteration of the existing drainage infrastructures maintaining the current location/layout (except for the Temeke drain). This solution considered the maintenance of the natural river track (although significantly artificialized) and as it was strongly constrained along some sections. The intervention required the demolition of some existing buildings and the resettlement of the concerning dwellers along both the Keko and the Serengeti drains;

- Alternative 2: Flood protection works were designed to prevent or mitigate flooding on built areas where lives would be at risk or/ and damage to properties would be serious.

"Part 3 – Gerenzani Creek Basin Interventions - Temeke/ Serengeti/ Keko Drains - 3.0 - Definition and Comparison of Solutions to Adopt" (November 2013)

In this report, a comparative assessment between four alternatives was performed:

- Alternative 1: Inclusion of a detention pond on the upstream section of the Serengeti Drain as well as a relief drain on Keko area together with several selected interventions along the watercourse to widen and/or improve the river to meet the necessary hydraulic requirements;
- Alternative 2: No inclusion of the detention pond on the upstream section of the Serengeti Drain but including the relief drain on Keko area and several selected interventions along the watercourse to widen and/or improve the river to meet the necessary hydraulic requirements;
- Alternative 3: Inclusion of a detention pond on the upstream section of the Serengeti Drain and no inclusion of the relief drain on Keko area, but to construct several selected interventions along the watercourse to widen and/or improve the river to meet the necessary hydraulic requirements;
- Alternative 4: No inclusion of a detention pond on the upstream section of the Serengeti Drain neither the relief drain on Keko area, but to construct selected interventions along the watercourse to widen and/or improve the river to meet the necessary hydraulic requirements.

"Part 4 – Yombo River Basin Interventions - Kigilagila/ Minazi Mirefu/ Kiwalani areas and Mpogo River - 4.0 - Definition and Comparison of Solutions to Adopt (November 2013)

The comparative assessment was undertaken in this report between following two alternatives:

- Alternative 1: Inclusion of a detention pond on the upstream section of the Mpogo River and implementation of selected interventions along the watercourse to widen and/or improve the river to meet the necessary hydraulic requirements.
- Alternative 2: No inclusion of a detention pond on the upstream section of the Mpogo River but to implement selected interventions along the watercourse to widen and/or improve the river to meet the necessary hydraulic requirements.

The analysis conducted in the Report concluded that Alternative 1 offered the best option both in terms of lowest construction cost and through reduced impact on people and property.

Taking into account the conclusions of the previous reports was possible to develop the analysis of the preferred alternatives and proceed with the preliminary design. The analysis of the preferred alternatives, at this stage, considered only the "*Project implementation*" and the alternative "*Do Nothing*" under the development of the three (3) following reports:

- "Part 3 – Gerenzani Creek basin interventions (Temeke/Serengeti/Keko drains) 3.1– Preferred Option Analysis 3.2 – Preliminary Design" (March 2014)
- "Part 5 – Construction of Kwa Shego Valley drain - 5.1– Preferred Option Analysis - 5.2 – Preliminary Design" (March 2014)
- "Part 4 – Yombo River Basin Interventions (Kigilagila/Minazi Mirefu/Kiwalani areas and Mpogo River) - 4.1– Preferred Option Analysis; 4.2 - Preliminary Design" (March 2013)

In all three (3) reports was concluded that the "*Project implementation*" was a better option than the "*Do Nothing*" one. The alternative "*Do Nothing*" considers that the storm water drainage in Temeke Municipality will not be improved at all which is already resulting into environmental health hazards to the local residents, especially the vulnerable poor section of the community living in unplanned settlements. The flooding events will also continue to damage the existing infrastructure and utilities. In general, apart from creating health problems among the local community the flooding events will continue to create damage the individual properties, hence perpetuating poverty in the area.

6. Environmental and Social Management

An Environmental Management Plan is presented as a detailed plan and schedule of measures designed to minimize and mitigate identified environmental and social impacts of the project. These measures/ actions outlined in the EMP will be conducted collaboratively and mainly coordinated by DMDP/PMO-RALG.

The DMDP/PMO-RALG will be responsible for reviewing civil works contracts in accordance with the EIA report; coordinating the implementation of the EMP among the contractors, local authorities (e.g. Regional Secretariat, District Councils and Village Councils); monitoring the implementation of the EMP and the civil works contracts in collaboration with local NEMC staff; and preparing semi-annual and annual environmental monitoring and progress reports. The EMP is presented in chapter eight of this report; and also as a standalone document separately.

7. Proposed Monitoring and Auditing

A monitoring regime was established and presented in the Environmental Management Plan (EMP) (presented as a standalone document). The Monitoring Plan prioritises the elements that must be in place prior to construction to allow a baseline to be established against which changes during construction and operation can be assessed.

Some of the necessary monitoring aspects can be included in the on-going activities of government agencies already active in the project area. Some will be the responsibility of the contractors and some should be carried out by other responsible parties for development and operation of the project or organisations appointed by them.

The monitoring programme also establishes effective feedback mechanisms so that the performance and effectiveness of the various elements of the EMP can be evaluated and, if necessary, corrective actions can be implemented.

It is also recommended that environmental audits should be done to determine the long-term effects of adopted mitigation measures. It is recommended that environmental audits be carried out on the project as part of the on-going maintenance programme. The audits will unveil the actual performance of mitigation measures and will allow effective measures to be included in future projects based on the legislation in force. As per operative EIA documents in Tanzania, environmental audits would be a responsibility of the developer and the National Environment Management Council (NEMC).

8. Cost-Benefit Analysis

The economic efficiency of the sub-project was calculated based on Net Present Value (NPV), Benefit/Costs ratio (B/C), and Interest Rate of Return (IRR). The study concluded that for TE2 Serengeti and TE3 Temeke sub-projects present there was a negative social return in all scenarios. The estimated IRR for TE4 intervention ranges from approximately 9 to 18%. For TE8 Mpogo sub-project, the results yield positive social returns in all scenarios except in the extreme scenario were NPV would only be positive with an interest rate inferior to 10.2%. For the TE9 Keko sub-project a range of positive NPV amounts was computed for the different scenarios, thus even for the worst case scenario there would still be a positive social return on this sub-project.

9. Decommissioning

The Sub-projects in Temeke are expected to be a permanent feature not to be decommissioned but rather to be regularly maintained as the need for surface water drainage is essential to prevent flooding events. The infrastructure will continue to have a passive influence on the environment and will be benign, so will not degrade or pollute the environment. However, in the unlikely event of decommissioning, the facility (drainage system) will be left to deteriorate leading to occasional floodings and associated health risks related to water borne diseases such as diarrheal, dysentery, cholera, Malaria etc. In such a scenario, the structures will be dismantled, debris collected, site cleared and rehabilitated. Mechanisms of identifying, collecting and disposal shall be in place to ensure all wastes have been collected, removed and rightly disposed of. Areas disturbed by removal of structures shall be re-vegetated with grass and appropriate tree species.

CHAPTER 1.0: INTRODUCTION

1.1 PROJECT BACKGROUND AND RATIONALE

Dar es Salaam City represents the largest City and is the major industrial and commercial centre in Tanzania with an estimated population of about 4.36 million people according to the National Population Census of 2012. With an annual population growth rate of 5.6 percent which accounts for 10 percent of the total population of Tanzania Mainland, the area of the City is about 1,590.5 square kilometres and registers a population density of 2,742 persons per square kilometre.

The Dar es Salaam Local Authorities set up comprises the Dar es Salaam City Council (DCC) and the three contiguous Municipalities of Kinondoni, to the North, Ilala at the Centre, and Temeke to the South. Together, the four Local Government Authorities are referred to as the Dar es Salaam Local Authorities (DLAs).

Dar es Salaam is experiencing significant problems with the existing Surface Water Drainage System due to a lack of infrastructure or, where drainage infrastructure is in place, it is being used as an informal receptacle for dumping waste and is severely impairing its performance. Currently, a significant part of the existing drainage network is old, undersized or partially blocked.

The government, under the oversight of the Prime Minister's Office, Regional Administration and Local Government (PMO-RALG) with the support from the International Development Agency (IDA) which is also referred to as the World Bank, is preparing an infrastructure improvement project for the city of Dar es Salaam named as the Dar es Salaam Metropolitan Development Project (DMDP). The overall objective of DMDP is to strengthen the institutional and urban management systems of the DLAs in order to improve service delivery. Under DMDP, there are seven complementary Projects which include the Surface Water Drainage System Project that aims to improve Drainage management in the City.

The overall objective of the Surface Water Drainage Project is to prepare the investments for a comprehensive Surface Water Drainage System for Dar es Salaam to be ready for implementation under the DMDP.

In the Stage Ia[1] of the Project it was prepared a Drainage Plan for Dar es Salaam city which identified and prioritized a set of 13 interventions with the purpose of mitigating and/or preventing serious consequences arising from regular flooding. The proposed interventions involve both the primary drainage network (main rivers/streams) and the secondary network (artificial network).

This Plan is now followed by a Feasibility Study and Preliminary Engineering Design (Stage Ib) for the interventions considered as priority, under which is being developed the present Environmental Impact Assessment (EIA) Report.

The consultancy service for the Improvement of Surface Water Drainage Systems in Dar es Salaam is being carried out by the consortium M/s PROCESL - Engenharia Hidráulica e Ambiental, S.A. in association with M/s COWI Tanzania Limited.

The consultancy involves carrying out Environmental Impact Assessment and laying-down the Environmental Management Plan (EMP) as well as preparing an accompanying Resettlement Action Plan (RAP) for the proposed Sub-projects.

The project will cover the Municipalities of Kinondoni, Ilala and Temeke where a number of selected Sub-projects will be undertaken.

However, this EIA is for the Sub-projects to be developed in the Temeke Municipality which addresses the following interventions:

- TE2 and TE9 - Maintenance of Serengeti open drain from Serengeti breweries and the adjoining Keko drain;
- TE3 - Maintenance of Temeke underground drain from Miburuhani primary school;
- TE4 – Rehabilitation/Improvement of Kwa Shego - Uzomboko - Kingugi - Mzinga open drain valley;
- TE8 - Rehabilitation/Improvement of Mpogo drain;
- Construction of Serengeti detention pond, at Miburani.

1.2 OBJECTIVES OF AN EIA

The objective of an EIA study is to carry out an assessment of a proposed project to determine whether or not the project and associated activities will have any adverse impacts on the

[1] Improvement of Surface Water Drainage System Sub-project in Temeke Municipality under the Dar es Salaam Metropolitan Development Project (DMDP) is being carried out in the following stages: Stage Ia: Drainage Plan and Pre-Feasibility Study; Stage Ib: Feasibility and Preliminary Engineering Designs; Stage II: Details engineering designs.

environment, taking into account environmental, social, cultural, economic and legal considerations.

Specifically, the main objectives of an EIA are to:

(a) Establish before a decision is taken by any person, authority, corporate body or unincorporated body including the Government and local government authorities intending to undertake or authorise the undertaking of any activity impacts that may likely or to a significant extent affect the environment or have environmental effects on those activities;
(b) Promote the implementation of the Act and laws and decision making process through which the goal and objective in paragraph (a) may be realised;
(c) Encourage the development of procedure for information exchange, notification and consultation between organs and persons when a proposed activity is likely to have significant environmental effects on trans boundary or an environmental bordering regions, districts, municipalities, towns and villages;
(d) To ensure the environmental considerations are explicitly addressed and incorporated into the development decision making process;
(e) To anticipate and avoid, minimize or offset the adverse significant biophysical, social and other relevant effects of development proposal;
(f) To protect the productivity and capacity of natural systems and the ecological processes which maintain their functions; and
(g) To promote development that is sustainable and optimises resources use and management opportunities.

1.3 SCOPE OF THE EIA

The Environmental Management Act (2004) stipulates the need to conduct Environmental Impact Assessment (EIA) for development projects in Tanzania. The Environmental Impact Assessment (EIA) and Audit Regulations (2005) regulate EIA procedures in Tanzania and outline the required EIA processes including the obligation for the project proponent to register the project with the National Environment Management Council (NEMC).

The scope of this EIA study covers:

- Describe the baseline environment of the relevant project area;
- Identify major environmental and social impacts which could impede project implementation and propose corresponding mitigation measures for the project;

- Identify major environmental and social impacts to minimize pollution, environmental disturbance and nuisance during construction and operation phases of the project;
- Identify and analyse alternatives to the proposed project;
- Develop an Environmental Management Plan (EMP) with mechanisms for monitoring and evaluating compliance and environmental performance.

1.4 PROJECT BOUNDARIES

1.4.1 Spatial Boundary

A river basin is an area of land that drains rain water into one location such as a river, stream, lake or wetland. These water bodies supply drinking water, water for agriculture and manufacturing, offer opportunities for recreation and provide habitat to numerous plants and animals.

The definition of the spatial boundary for the Sub-projects has taken into account the type of project and the surrounding characteristics, which is why it was considered for the majority of the environmental and social components a study area corresponding to an overlap of the river basins bounded by the limits of the municipality. This area corresponds to about 6,317 ha.

The definition of this area also took into account the fact that the methodology used in hydraulic modelling for the Dar es Salaam Storm Water Drainage System has been prepared considering the entire river basins by its biophysics and socio-economic importance.

However, when deemed relevant to the objectives of this EIA it proceeded to the enlargement of the spatial boundary for some of the environmental and social components in the analysis according to the criteria defined by experts of the several components of the EIA. It is the case of protected areas and socio-economy (in terms of geographical units of the country, region, district, ward and sub ward).

1.4.2 Temporal boundary

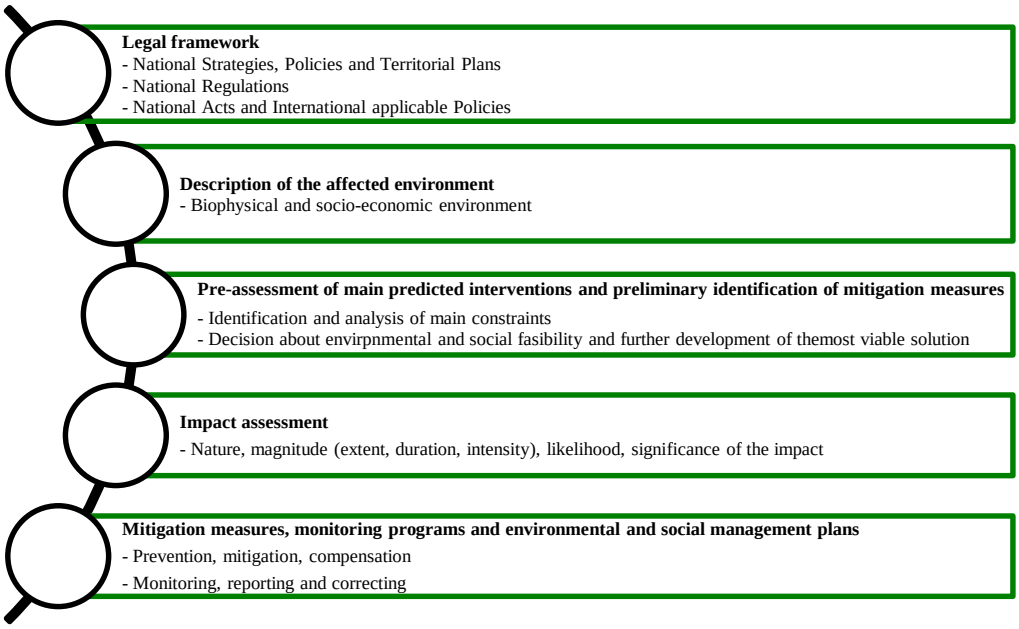
The temporal boundaries of the proposed interventions are referred to the project lifespan and the reversibility of the impacts and include the mobilization, construction and operation phases.

1.4.3 Institutional boundary

For what concerns the institutional boundaries of the Sub-projects, those include political administrative and institutional boundaries, acts and regulations, and ministerial or departmental mandates mentioned in Chapter 3.0.

1.5 EIA METHODOLOGY

The EIA was prepared by integrating stakeholder concerns and opinion, design considerations and legislative requirements. More specifically, the EIA process is set out in **FIGURE 1** below.



(PROCESL/COWI, 2014)

FIGURE 1
PROCESS OF ENVIRONMENTAL IMPACT ASSESSMENT

The study employed both qualitative and quantitative methodologies as follows:

1.5.1 *Field investigations*

As per the ToR requirements, baseline data information was generated through field investigation. Site visits were conducted in October 2013. Visits were made to the sub-project area to enable geographic positioning of the sub-project and consult the local population who resides along the drainage paths.

Also, during site visits the biophysical and socio-economic and cultural environments along the drainage paths were observed so as to understand the existing conditions including vegetation cover, settlement patterns, land use activities, existing social services, water sources, landscape, and soils.

The environmental and socio-economic baseline conditions considered several components (biophysical, ecological, financial, physical and infrastructural and socio-cultural) and arranged according to its scale of influence. Hence, for each factor a particular boundary was considered, reflecting the scale of analysis, its impacts and constraints.

The characterization of baseline conditions and the environmental and social components that are likely to be significantly affected by the project as well as the interaction between these factors were performed using the available digital and printed information, while planning field methodologies. The level of detail depended on the relevance and sufficiency of the social information collected and disclosed by the detaining authorities.

1.5.2 Consideration of design alternatives

Project alternatives were considered and correspond to selected preferred options to meet anticipated project objectives successfully. Alternatives considered took into account the design, technology, location and construction techniques compared in terms of environmental and social related impacts.

1.5.3 Stakeholders consultations

Input from public consultation provides the authorities and the developer an opportunity to ensure that consideration is given to concerns and comments raised during the consultations. Consultations aimed at providing issues that are likely to be of interest to the communities and stakeholders in the EIA process. Stakeholders' consultations were done at National, Municipal and Sub-ward level, and included decision makers and project affected groups such as local residents in and around the proposed sub-project.

The consultation process started with the identification of major stakeholders of the project who had interest in the Project and who were directly or indirectly involved. Most stakeholders identified were those who used utility services such as water supply, sanitation and electricity. Other stakeholders identified included regulatory authorities, municipal authorities, local leaders and local people of respective wards and jurisdictions. Prior to site visit, the consultant team had been communicating with PMO-RALG for logistics related to project time frame and field work. PMO-RALG prepared a letter of introduction to be presented to each stakeholder prior conducting consultations. The details of methods and types of key stakeholders are addressed in chapter five of this report.

1.5.4 Literature review

Review of additional information was carried out to supplement existing data obtained from different sources. Documents and records were reviewed to obtain existing secondary data and information relevant to the study. A major source of such information included the socio-economic profile of Temeke municipality and the National Bureau of Statistics reports. Other sources of secondary data were the various national policies and legislation, previous reports, World Bank Policies, the NEMC guidelines and international agreements.

Major guiding literature involved the Environmental Impact Assessment and Audit Regulations (2005), Environmental Code of Practice for Road Works (2008), World Bank's Operational Policies on Environmental Assessment (OP 4.01), Natural Habitats (OP 4.04), Forests (OP 4.36), Involuntary Resettlement (OP 4.12), Cultural Property (OP 11.03) and district profile of Temeke area.

1.5.5 Impact identification and assessment

The approach used in the impact identification took also into account the Core Impact Area (CIA), the Immediate Impact Area (IIA) and Area of Influence (AI). The CIA is the identified drainage pathways which will be directly affected by project activities including sources of non-industrial construction material and sources of water. The immediate adjacent areas (or immediate impact areas) are those immediately outside the core impact area and are indirectly likely to be affected by the project activities. These include structure within the drainage corridor likely to be affected by resettlement. The AI is the area beyond the DIA which will be indirectly affected by the construction activities. These include sources of industrial construction materials, and centres of decision-making (e.g. Ward, District and City Council offices).

Impact analysis or evaluation followed a methodology based on the following sequential steps:

- Impact identification – listing all potential positive and negative impacts of a project, including cumulative and residual impacts;
- Impact prediction – determining the magnitude, intensity, extent or size of a particular impact or set of impacts;
- Impact evaluation – determining the significance or importance of a predicted impact i.e. why we should be concerned or worry about this significant impact.

Detailed descriptions of impacts assessment is presented in Chapter 6.

1.6 REPORT FORMAT

The structure of this EIA study involves the following chapters:

Chapter 1.0 – Introduction

This chapter contextualizes the project including its background and justification, objectives of the EIA and describes the general methodology applied in the development of the EIA Report.

Chapter 2.0 – Project Description

The major components of the project, covering aspects such as project location, project components and materials, water and sewerage system, type and sources of energy, waste management and project activities are presented in this chapter.

Chapter 3.0 – Relevant Policy, legal and Institutional Framework

This chapter presents a detailed description of the current policy, regulatory, institutional and administrative framework relevant to the Project.

Chapter 4.0 – Environmental and Socio-Economic Baseline Conditions

Chapter 4.0 describes the characteristics of the affected environment and describes the methodology adopted in each specific environmental component. The chapter also characterizes the project surroundings in a more or less detailed way depending on the information available and considers subsequent identification and evaluation of the environmental and social impacts likely to be generated during construction and operation of the project.

Chapter 5.0 – Stakeholders Identification and Methods of Participation

This chapter presents all the stakeholders identified and consulted, and discusses the main issues and concerns raised by stakeholders during the EIA elaboration.

Chapter 6.0 – Impact Identification and Assessment of Alternatives

This section proceeds to the description of the methodologies used in the identification and assessment of impacts resulting from the project. This chapter also presents an analysis of the considered project alternatives.

Chapter 7.0 – Mitigation and enhancement measures

Identifies mitigation measures to eliminate, minimize or compensate the impacts generated by the project as well as enhancement measures for the identified impacts.

Chapter 8.0 – Environmental Management Plan

This Plan is presented as a standalone document. The Environmental Management Plan (EMP) defines a detailed plan and schedule of measures necessary to minimize and mitigate any potential environmental impacts identified in the Environmental Impact Assessment (EIA) Report.

Chapter 9.0 – Environmental Monitoring Plan

The Environmental Monitoring Plan is a plan which show how the contractor will monitor and mitigate environmental impacts for all established phases.

Chapter 10.0 – Cost benefit Analysis

This chapter presents the project cost benefit analyses.

Chapter 11.0 – Decommissioning

Describes the activities foreseen and the impacts predicted to occur in this stage of the project.

Chapter 12.0 – Summary and Conclusion

This chapter presents a summary and the major findings of the EIA report, outlining recommendations for the project follow up based on the identified impacts and in the mitigation measures envisaged that intended to mitigate the negative impacts and maximize positive ones.

Chapter 13.0 – References

This chapter includes a list of the main bibliographical references consulted during the EIA study.

Chapter 14.0 – Appendices

In the appendix are included:

- Terms of reference;
- Summary of stakeholders views and concerns;
- Signatures of stakeholders consulted;
- Project layout;

- Adopted Solutions;
- Location and Definition of Proposed Interventions - Temeke Council.

CHAPTER 2.0: PROJECT DESCRIPTION

2.1 PROJECT LOCATION

Dar es Salaam is located in the eastern part of the Tanzanian mainland at 6º51'S latitude and 39º18'E longitude. The city is boarded by the Indian Ocean to the East (**FIGURE 2**).

Administratively, the Sub-projects will be developed in Temeke Municipality according to the table below.

TABLE 1

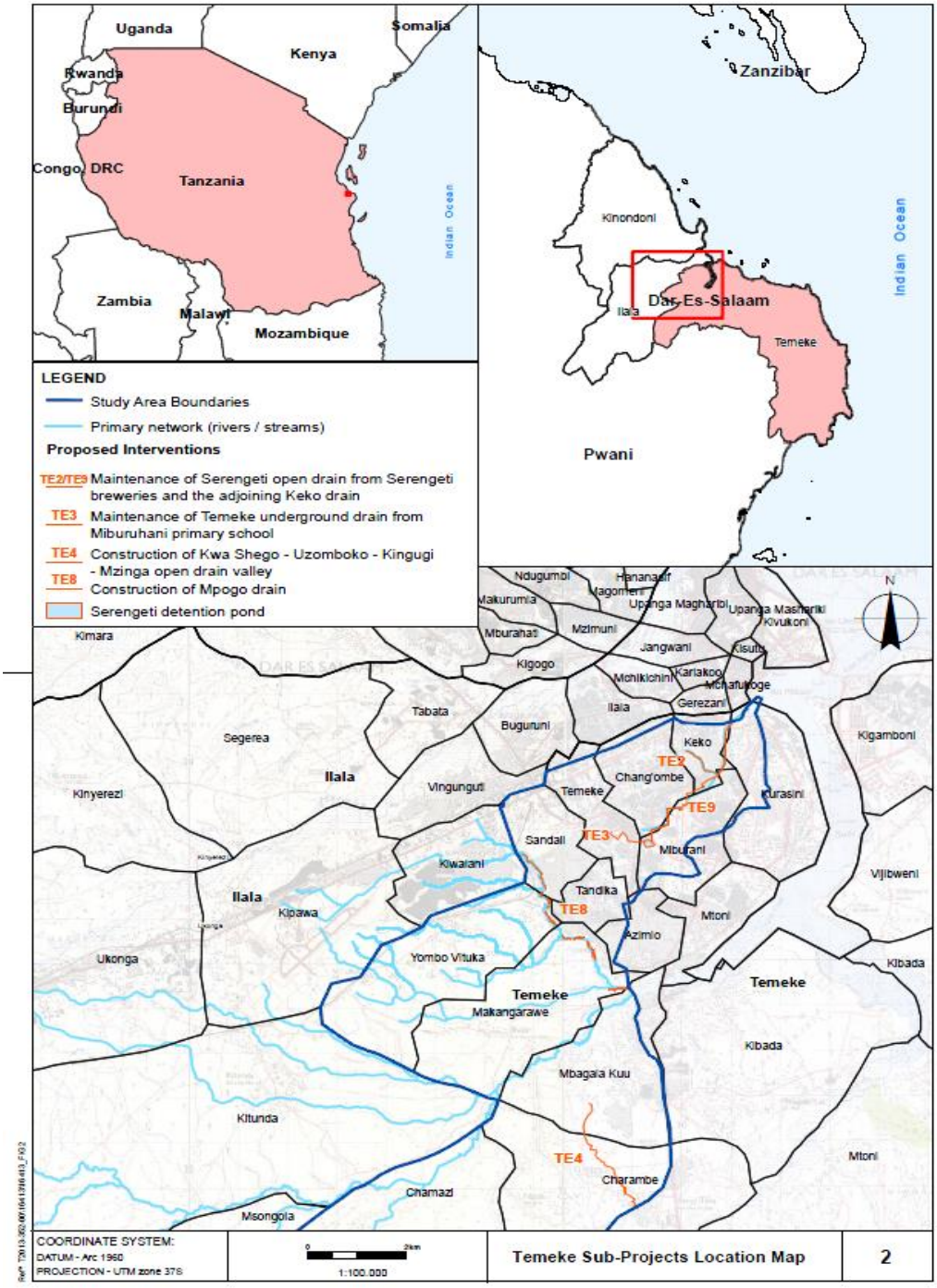
PROJECT LOCATION

Municipality	Sub-projects	Ward
Temeke	TE2	Keko
		Chang'ombe
		Kurasini
		Miburani
	TE3	Chang'ombe
		Miburani
	TE4	Mbagala
		Charambe
	TE8	Sandali
		Yombo Vituka
		Makangarawe
	TE9	Keko
	Serengeti Detention Pond	Miburani

(PROCESL/COWI, 2014)

Temeke Municipality is bordered by the Indian Ocean in the east, Mkuranga and Kisarawe districts to the south and west respectively and Ilala Municipality in the northeast, covering an approximate area of 656 km^2.

About 30% of Dar es Salaam population lives in Temeke. In terms of population, Vijibweni is considered the least while Charambe is the most populated Wards.



(PROCESL/COWI, 2014)

FIGURE 2

TEMEKE SUB-PROJECT LOCATION MAP

Temeke suffers from the growing and increasing number of urban settlements, where large numbers of residents live in precarious houses and without proper sanitation conditions.

The municipality is considered to be the more industrial district of the city, with many manufacturing industries (both heavy and light industries) and the Dar es Salaam Port, which is the largest in the country.

According to Mruma[2] (2005) Mtoni Kijichi, Kibonde Maji, Buza and Vijibweni, Keko and Mikoroshini, verify several unplanned settlements. The unplanned settlement has led to a set of associated environmental problems such as the intensification of solid waste production and disposal in the nearby streets.

Other socio-economic activities in the area include agriculture and informal trade some of which are operating in the areas without proper water supply, sanitation, waste management and other environmental protection systems.

There are nearly 40 major industries registered in the Municipality which include manufacturing and processing located in Chang'ombe, Mbagala, Vijibweni in Kigamboni. Industries in Kurasini Mandela road, and part of Kilwa road are mainly service industries such as garages and warehouses.

It is highly probable that these industrial areas are contaminated from industrial effluents including those located along Nyerere road (affecting Ilala Municipality), Morogoro road (where Karibu Textile Mills is located), Mandela road (crossing Ilala Municipality) and Vingutinguti crude dump.

Nearly 45,000 hectares of land in Temeke is used for agriculture production of cashew nuts, coconuts, maize, rice, vegetables and fruits. Improper agriculture methods, such as excessive use of fertilizers and insecticides are responsible for soil and land degradation.

Sand extraction and quarrying also exacerbate the loss of natural land, deforestation and soil erosion. Tree harvesting is responsible for destroying most of the former existent forests of Chekeni Mwasonga Yaleyalepuna and Chamazi hills. Mangrove forests are also in decay especially in coastal zones and around the river estuaries[3].

[2] Rosemary Oswald Mruma (2005) IMPLEMENTATION OF THE NATIONAL ENVIRONMENT POLICY: A CASE OF THE LOCAL GOVERNMENT AUTHORITIES IN DAR ES SALAAM CITYTANZANIA. Thesis Submitted to the Faculty of Social Sciences, University of Bergen, in Partial fulfillment for the Award of the Degree of Masters of Philosophy in Public Administration. Department of Public Administration and Organisation Theory; Bergen.

[3] Ditto

The following photographs present a few examples of the places where the Storm Water Drainage tends to intervene in Temeke Municipality.

PHOTO 1

SERENGETI OPEN DRAIN

PHOTO 2

TEMEKE UNDERGROUND DRAIN

PHOTO 3

KWA SHEGO OPEN DRAIN

PHOTO 4

MPOGO DRAIN

PHOTO 5

KEKO DRAIN

(Field work, PROCESL/COWI, 2013)

Serengeti open drain (**PHOTO 1**) is covered with waste which contaminates storm water flowing in the drains. There is a high density of unplanned settlements located extremely close to, and sometimes on top of the drains. On the natural water lines there are low lands with unplanned settlements and a low size dense shrub and riparian vegetation. There is a school nearby and a railroad. There is also a Petrol Refinery Industry close to the waterline. The artificial and natural water lines are surrounded by planned areas where services and commercial activities are developed along Gerezani Street.

Temeke underground drain (**PHOTO 2**) is made of a concrete pipe passing through unplanned settlements. The underground pipe is in poor condition with breakages, and is blocked by silt and refuse causing localised flooding. The houses have been constructed over the pipe manholes making it very difficult to clean through standard maintenance operations.

In the banks of artificial water lines the land is occupied by areas of planned settlements with paved roads, commercial services and households which cross two school areas. There are also some low floodable green areas (urban forcing public ones).

On the natural water lines, the adjacent land is occupied by low areas with scarce settlements with low size dry vegetation.

Kwa Shego - Uzomboko - Kingugi - Mzinga open drain (**PHOTO 3**) this is a partially engineered primary watercourse receiving runoff via earth ditches from adjacent unplanned settlements. There are solid waste which blocks the crossing culvert, the main channel and the crossing box culvert which is fully silted. Most of the sections consist of earth drains which show susceptibility to erosion.

Close to the artificial water lines, the land is occupied by high density of unplanned settlements extremely close to the drains. There are scarce dry shrub and arboreal vegetation alongside the drains and waste disposed inside the drains blocking the storm water natural flow.

At Mpogo drain (**PHOTO 4**) there is a mix of earth ditches and concrete lined channels passing through unplanned settlements. The storm water drains and culvert crossings are often blocked by solid waste and silt. The houses are very close to the storm water drains.

On the artificial water lines the adjacent land is occupied by considerable amounts of waste mixed with scarce shrub and riparian vegetation. There are small bridges crossing water lines which are blocked by domestic waste in unplanned settlement areas. Mpogo drain is located near the railway line.

On natural water lines there are low floodable land highly occupied by medium size riparian and shrub vegetation with presence of trees and small to medium size horticultural crops with small ponds showing traces of eutrophizated water. In unplanned areas of high density settlements, there are large amounts of waste disposed through the water lines blocking its natural flow, mixed with medium sized riparian vegetation and some trees.

Close to Keko drain (**PHOTO 5**) the artificial water lines are surrounded by unplanned settlements with occasional chicken and goat domestic grazing/ breeding area. The storm water is contaminated with leachate and is used for irrigation for domestic horticultural production and there are large amounts of waste disposed in the 5 meters margins of the discharge waterline. The drains are located close to an industrial area, cemetery yard and to Julius Nyerere and Mafuta Roads.

Serengeti Detention Pond is located on upstream end of an urban area and a natural depression strategically located within the existing drainage systems for controlling/reducing flows. The inflow will come from Temeke drain, discharging in Serengeti drain (**PHOTO 6**).

(Field work, PROCESL/COWI, 2013)

PHOTO 6

SERENGETI DETENTION POND LOCATION

2.2 PROJECT COMPONENTS AND MATERIALS

2.2.1 Existing conditions

The existing drainage infrastructure is constituted by underground pipes (Temeke drain and partially Serengeti drains) as well a set of open channels partly earthy and partly lined in concrete which have generally undersized cross sections. In the intermediate section Serengeti drain passes through very narrow spaces between houses very close to or even in the river bed or and in the flooding marginal areas. The last section of this drain lays along a flat area not so constrained and partially between industrial areas. The Bandari Road culvert is significantly undersized and the flooding of this road is recurrent. Keko drain crosses unplanned settlements with very precarious drains. Some of the existing culverts (crossing roads) are also undersized.

The existing drainage infrastructures are constituted by the significantly artificialized Gerenzani Creek with channelized sections and some underground pipes with the following main problems/ bottlenecks:

- An underground pipe (300 mm diameter) that crosses two existent primary schools with insufficient hydraulic capacity causing regular flooding in the vicinity (Temeke Ward);

- An existing impounding area upstream the Nelson Mandela Road near the Temeke Police Station where the storm water (transported by Temeke and Evareth drains) accumulates after an intense rain event without any control and causing flooding on the police station zone. The referred area will be prepared to function as an adequate detention pond for attenuating the storm water peak flow and for fixing the flow to be drained to the downstream area as mentioned;

- Two underground pipe sections with strong lay-out problems, located under existing private areas and houses or protruding the path where deployed, with strong constraints to be replaced or reinforced, forcing the relocation of some dwellers;

- Some natural streams between houses, poorly built, impeaching any significant construction works of enlarging/ deepening the existing “channel” and forcing the demolition of some houses and the resettlement of some dozen of dwellers. This situation applies to both Serengeti and Keko drains as previously referred;

One less constrained section along a more flat valley where the existing stream runs along some properties/ industries with some access roads crossings and one passage under a building. The last

section of the Gerenzani Creek (also known by the name of Serengeti drain) crosses under Bandari Road that is regularly invaded by flooding.

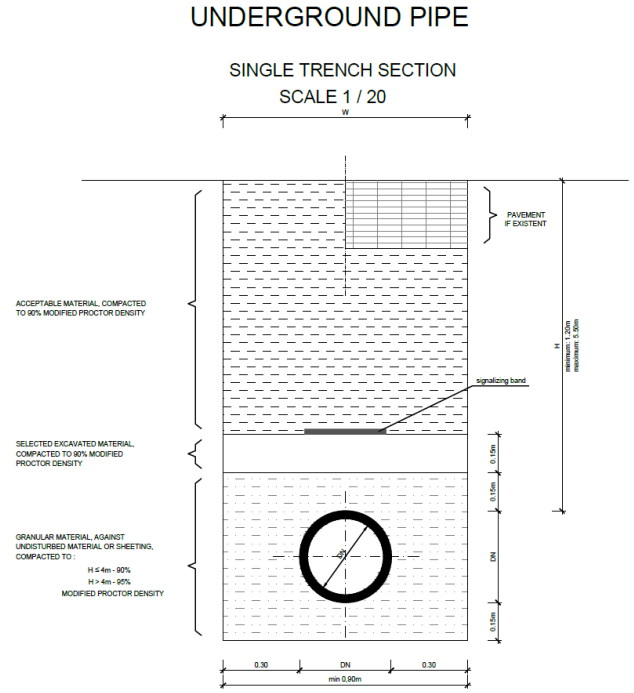
In Kwa Shego drain, the existing drainage infrastructure is constituted by a partly channelled stream which is an open drainage with a general undersized cross section, with bottom and banks with significant erosion problems and with remaining areas without a well-defined water course. Some houses are too close to the stream bed or in the flooding marginal areas. Some of the existing culverts (crossing roads) are significantly undersized. The final section of Kwa Shego stream is a more open valley with conditions to be maintained as per existent.

2.2.2 Project components

The Surface Water Drainage System Sub-projects in Temeke Municipality will have many proposed interventions as follows:

1. **Temeke Drain**

Temeke drain is currently a 300 mm pipe in a very poor condition clearly undersized which crosses two adjacent schools in the area that is usually flooded during rainy seasons. The proposed intervention has two objectives: to enlarge the system for conveying the design flow without causing flooding and simultaneously to select a better path for it avoiding the referred schools crossing. The new pipe, DN 1,200 mm, with a length of around 900 m will follow Jaribu Street on north of mentioned schools, and will discharge into the proposed detention pond.



(PROCESL/COWI, 2014)

FIGURE 3

TEMEKE UNDERGROUND PIPE DETAIL

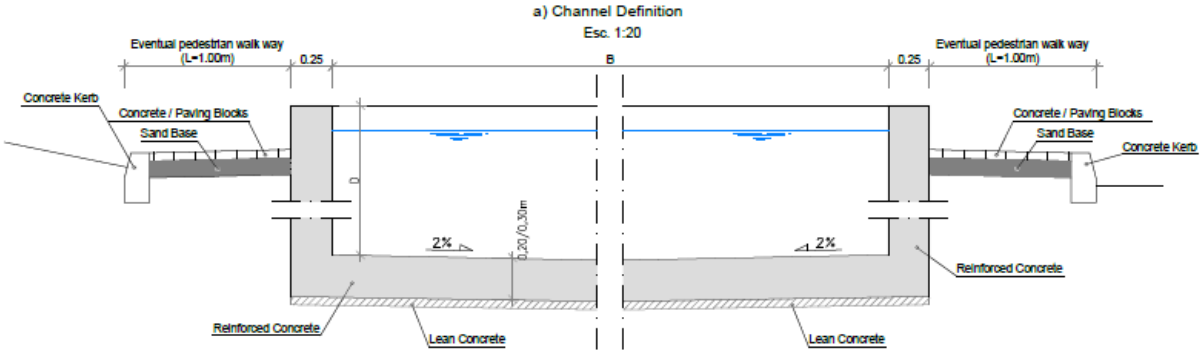
2. Serengeti drain

The proposed intervention for Serengeti drain is mainly the construction of a new relief "channel". The earthy open channel downstream of the detention pond is to be replaced for a wider concrete rectangular one and the set of two 600 mm underground pipes which crosses private properties (next to Zimbabwe road) will be put out of service. The new relief channel continues downstream along approximately 1 km and follows Zimbabwe Street, Mganda road, Chang'ombe road and Maendeleo Street crossing Keko prison land to reach the Serengeti drain in a lesser constrained area. The last section of the Serengeti drain will be an open channel which receives the Keko drain contribution with larger culverts for crossing access roads to existing industrial areas. The last 150 m, immediately upstream of Bandari Road, are to be improved within a proposed industrial container area development.

The section immediately downstream the detention pond includes the crossing of Nelson Mandela road with two additional DN 1,200 mm concrete pipes followed by a closed concrete frame which crosses the existing school/college.

3. Keko drain

For the Keko drain a rectangular open channel with a bottom width from 3 to 7 m will be constructed that will join with the Serengeti drain. This solution maintains the existing natural alignment of the stream to a large extent, and it has the potential to improve the existing situation with the inclusion of lateral pathways along the stream.



(PROCESL/COWI, 2014)

FIGURE 4

SERENGEITI AND KEKO CHANNEL DEFINITION

4. Kwa Shego open drain valley

The Rehabilitation/Improvement of Kwa Shego Valley drain will include the following interventions:

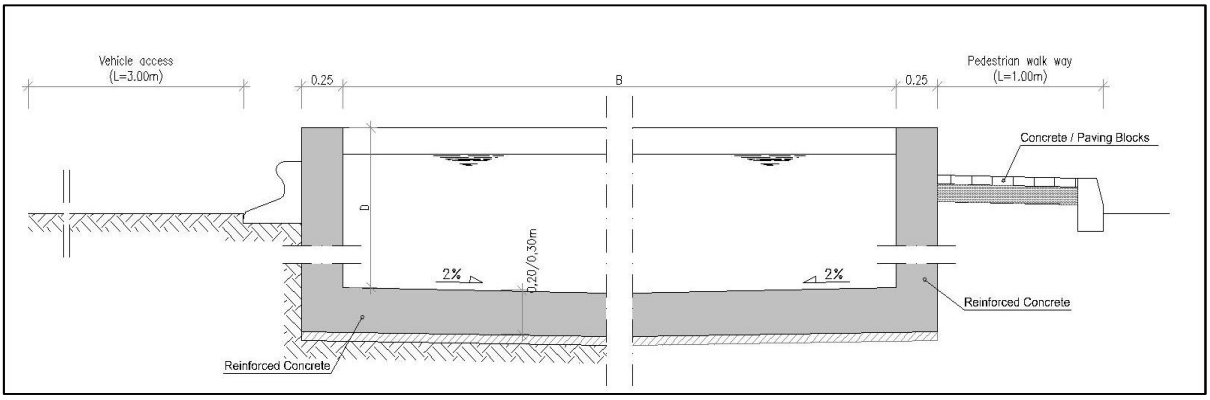
a. Initial section between Km 0+ 000 (1) and 0 + 570 (7A): improving and deepening of the existing channel with an underground concrete frame after a first stretch (about 100 m) collecting the storm water from the existing culvert under Mbande Road. The dimensions of this new frame are from 0.75 x 0.75 m^2 up to 2 x 1.75 m^2. The construction works along this section are predictably difficult because it will be implemented in areas with narrow paths and partly between house walls.

b. Open Channel between Km 0+570 (7A) and 1 +125 (11A): to deepen and/or raise the existing channel/corridor to approximately Km 0+895 changing the cross section to a

concrete rectangular open channel with 2.0 m height and widths from 2.0 to 3.0 m and lining it with concrete. The existing culvert at Km 0+895 will be maintained. From this culvert to the end of this section, the existing earth channel that crosses a private property will be replaced by a concrete open channel following the existing path.

c. Intermediate section between Km 1 +.125 (11A) and 2+460 (21): the proposed drainage for this section is entirely composed by underground concrete rectangular frames with cross sections from 3.0 x 2.0 m^2 up to 5.5 x 2.25 m^2 with either vehicle or pedestrian paths on the sides to replace existing stormwater channels to lower number of houses to be demolished and properties invaded. This new underground drain ends in a location where the top level of the frame reaches the existing terrain and an open channel solution can be established.

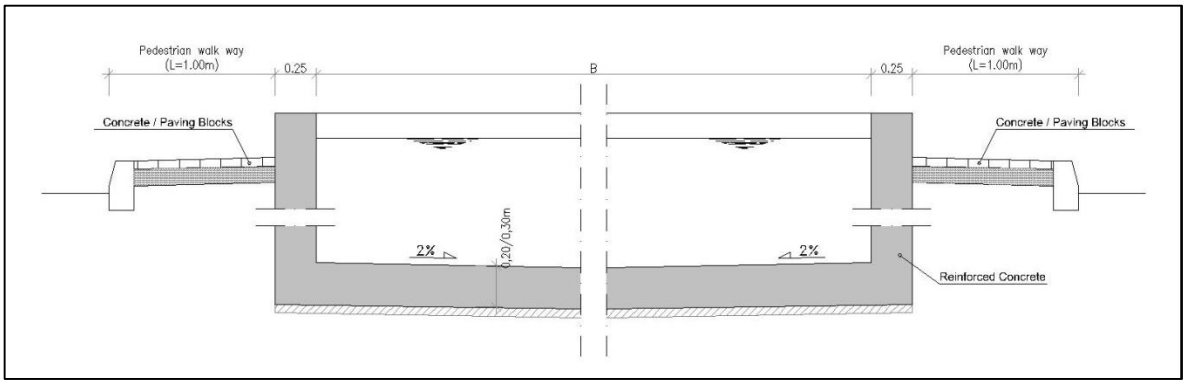
d. Final section – open channel from Km 2+460 (21) to 3+145 (24): The final section is an open rectangular channel in concrete, to be implemented along the current storm water path, actually used as an access road. The proposed channel will be deeper and narrower to ease the pedestrian crossings over it and will be positioned to one side of the existing corridor for leaving some space for access on the other side. The existence of some free (agricultural) land will allow the deviation of the open channel axis to the east where a pedestrian path will be established leaving around 3 to 4 m on the west for vehicle path. Where there is insufficient space for a vehicle path, two pedestrian walkways one in each side of the channel are proposed. The final discharge of the proposed channel will be deepened and enlarged to significantly lower the height of water and the velocity for a smooth concordance with the existing natural stream. From this point the existing valley is sufficiently wider not to require any specific improvement.



(PROCESL/COWI, 2014)

FIGURE 5

PEDESTRIAN + VEHICULAR ACCESSES



(PROCESL/COWI, 2014)

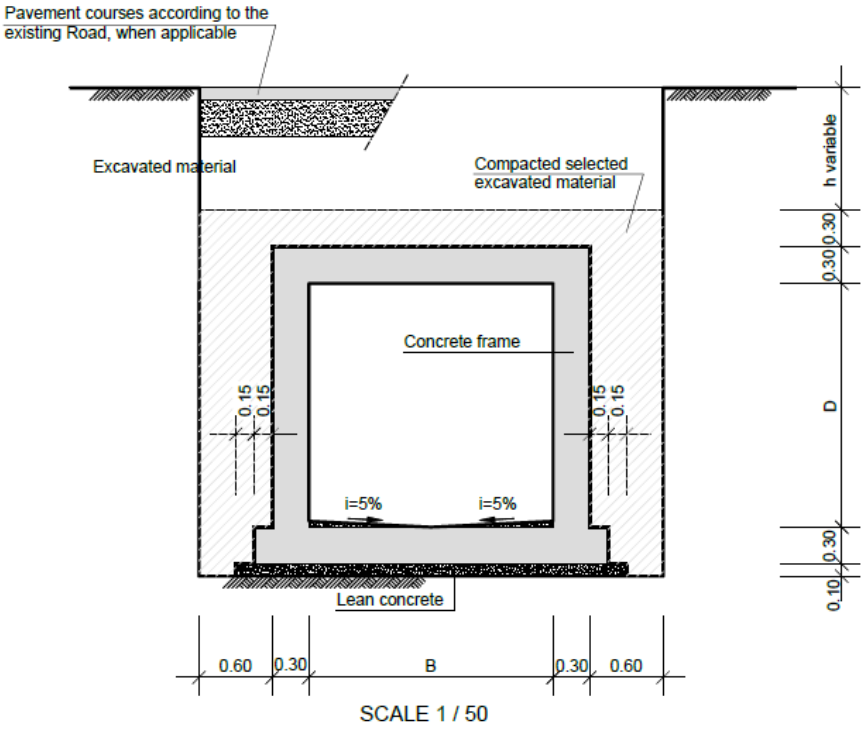
FIGURE 6

PEDESTRIAN ACCESS

5. Mpogo drain

a. Mpogo River section between the detention pond and 1+020 m: will be rectified and reshaped in order to accommodate the T=10 years flows (considering the effect of the detention pond). The proposed cross section will have a trapezoidal shape with a 1H:1V side slope and a bottom width of 5m. The riverbed and the riverbanks will be constituted by concrete. During the construction phase there will be a need for temporary barriers to isolate part of the river cross section (probably half river section).

b. Mpogo River section downstream 1+020 m: the intervention for the last stretches of the Mpogo River between the section 1+020 m and the final section will consist of the construction of marginal concrete walls to protect the adjacent terrain and houses against flooding. Some houses located in the riverbed must be demolished. The proposed walls were designed for a period of 10 years.



(PROCESL/COWI, 2014)

FIGURE 7

CONCRETE FRAME

6. Serengeti detention pond at Miburani

The construction of one detention pond is proposed immediately upstream the Nelson Mandela Road using undeveloped land next to the Serengeti Breweries and the Police houses. This land constitutes a natural depression but additional earthmoving will be needed to create extra volume for water.

The use of a detention pond provides significant technical, environmental and economic benefits. The pond is designed to intercept flood water upstream, thereby throttling the downstream flows during the flood event. Serengeti detention pond will have a volume of 32 000 m^3 and an area of 21 000 m^2.

The detention pond' walls will be constructed in gabions along its whole length, with a top elevation giving a clearance of 200 mm above the water surface elevation obtained for a 100years+15% period of return.

There will be two outlet structures in the ponds. In the bottom section of the wall are proposed 2 circular pipes (with diameters of 1,200mm) to allow, with the existing 2 x 800 mm pipes, the

ordinary flows to pass. The top spillway was designed to discharge the 100years +15% flow and will not be needed for flows with periods of return lower or equal to 10 years. The spillway width will be 20 m.

TABLE 2
CHARACTERISTICS OF MAIN COMPONENTS – PROPOSED SOLUTION

TE3 - TEMEKE DRAIN		
KM	**Length (m)**	**Works description**
0+000 to 0+926	926	Lay and supply of underground concrete pipe with 1.20 m diameter
		Construction of road drainage inlets consisting in a trapezoidal open channel (L=5m) along the roadside, a reinforced concrete box to retain the solid materials, a reinforced concrete manhole to collect the storm water and a pipe to link to the storm water network.
	20 units	Construction of reinforced concrete manholes including cast iron frame and cover and steps in glass fiber reinforced plastic.
	1 units	Construction of final outlet in reinforced concrete, including a grade in stainless steel to protect the outlet pipe entrance
TE2 - SERENGETI DRAIN		
KM	**Length (m)**	**Works description**
Detention pond		Construction of a complete detention pond including excavation, embankment construction with impervious materials, inlet and outlet protected from erosion (last section of Evareth drain adequately channeled in concrete rectangular open channel), gravel access road and surrounding fence, diversion of existing streams, as well as all the associated ancillary works with volume of 35,000 m^3.
0+000	48	Installation of 2 concrete pipes with 1,200 mm diameter under Nelson Mandela Road by pipe jacking or open trench
0+000 to 0+058	58	Construction of rectangular open channel with 2.00 m depth and 3.00 m width with bed and banks on reinforced concrete
0+058 to 0+184	126	Lay and supply of underground concrete rectangular frame with 3.0 m width and 1.3 m depth
0+184 to 0+260	76	Construction of rectangular open channel with 2.00 m depth and 4.00 m width with bed and banks on reinforced concrete
0+260 to 0+965	705	Construction of rectangular open channel with 2.50 m depth and 4.00 m bottom width with bed and banks on reinforced concrete
0+965 to 1+401	436	Lay and supply of underground concrete rectangular frame with 2.5 m width and 2.5 m depth
1+401 to 2+037	636	Lay and supply of underground concrete rectangular frame with 3.0 m width and 2.5 m depth
2+037 to 2+291	254	Lay and supply of underground concrete rectangular frame with 2.5 m width and 2.5 m depth

2+291 to 2+347	56	Construction of rectangular open channel with 2.50 m depth and 2.50 m width with bed and banks on reinforced concrete
2+347 to 2+380	23	Construction of rectangular open channel with 2.50 m depth and 5.00 m width with bed and banks on reinforced concrete
2+380 to 3+260	880	Construction of rectangular open channel with 2.50 m depth and 10.00 m width with bed and banks on reinforced concrete
3+260 to 3+411	151	Lay and supply of underground concrete rectangular frame with 7.0 m width and 3.0 m depth
	2 units	Enlargement of culverts to a depth of 2.50m and a width of 10.00 m.
		Enlargement of bridge section/culvert under Bandari Road to a depth of 2.50m and a bottom width of 6.00 m.
	13 units	Construction of reinforced concrete manholes including cast iron frame and cover and steps in glass fiber reinforced plastic.
	1 unit	Construction of reinforced concrete manhole with a special structure to divide the water to relief channel including cast iron frame and cover and steps in glass fiber reinforced plastic.
	1 unit	Diversion of existing water supply pipe
	1 unit	Diversion of existing gas supply pipe
		Construction of road drainage inlets consisting in a trapezoidal open channel (L=5m) along the roadside, a reinforced concrete box to retain the solid materials, a reinforced concrete manhole to collect the storm water and a pipe to link to the storm water network.
Several		Construction of lateral drainage along the sections where the top of the channel or the wall is higher than the involving terrain
	3 units	Construction of pedestrian crossing consisting in a concrete slab over the channel and a protection steel rail, including steps to access it if needed
TE9 - KEKO DRAIN		
KM	**Length (m)**	**Works description**
0+000 to 0+500	500	Construction of rectangular open channel with 1.25 m depth and 3.00 m width with bed and banks on reinforced concrete
0+500 to 0+684	184	Construction of rectangular open channel with 1.50 m depth and 5.00 m width with bed and banks on reinforced concrete
0+684 to 0+923	239	Construction of rectangular open channel with 1.50 m depth and 7.00 m bottom width with bed and banks on reinforced concrete
Several		Construction of lateral drainage along the sections where the top of the channel or the wall is higher than the involving terrain
	2 units	Construction of pedestrian crossing consisting in a concrete slab over the channel and a protection steel rail, including steps to access it if needed

	5 units	Construction of vehicular crossing consisting in a concrete slab over the channel and a protection steel rail, including steps to access it if needed

TE4 - KWA SHEGO		
KM	**Length (m)**	**Works description**
0 to 0+094	94	Enlargement of rectangular open channel to 0.75 m width and depth with bed and banks on reinforced concrete
0+094 to 0+223	129	Lay and supply of underground concrete rectangular frame with 0.75 m width and depth
0+223 to 0+305	82	Lay and supply of underground concrete rectangular frame with 1.25 m width and depth
0+305 to 0+433	128	Lay and supply of underground concrete rectangular frame with 2.0 m width and 1.5 m depth
0+433 to 0+555	122	Lay and supply of underground concrete rectangular frame with 2.0 m width and 1.75 m depth
0+555 to 0+685	130	Enlargement of rectangular open channel to 2.0 m width and depth with bed and banks on reinforced concrete
0+685 to 0+901	216	Enlargement of rectangular open channel to 2.5 m width and 2.0 m depth with bed and banks on reinforced concrete
0+901 to 1+113	212	Enlargement of rectangular open channel to 3.0 m width and 2.0 m depth with bed and banks on reinforced concrete
1+113 to 1+408	295	Lay and supply of underground concrete rectangular frame with 3.0 m width and 2.0 m depth
1+408 to 1+954	546	Lay and supply of underground concrete rectangular frame with 3.0 m width and 2.25 m depth
1+954 to 2+067	113	Lay and supply of underground concrete rectangular frame with 4.0 m width and 2.25 m depth
2+067 to 2+236	169	Lay and supply of underground concrete rectangular frame with 4.5 m width and 2.25 m depth
2+236 to 2+307	71	Lay and supply of underground concrete rectangular frame with 5.0 m width and 2.25 m depth
2+307 to 2+449	142	Lay and supply of underground concrete rectangular frame with 5.5 m width and 2.25 m depth
2+449 to 2+604	155	Enlargement of rectangular open channel to 5.5 m width and 2.5 m depth with bed and banks on reinforced concrete
2+604 to 2+935	331	Enlargement of rectangular open channel to 6.0 m width and 2.5 m depth with bed and banks on reinforced concrete
2+935 to 3+145	210	Enlargement of rectangular open channel to 7.0 m width and 2.5 m depth with bed and banks on reinforced concrete
	63 units	Construction of reinforced concrete manholes including cast iron frame and cover and steps in glss fiber reinforced plastic.

	1 unit	Construction of final outlet in reinforced concrete
Several		Construction of road drainage inlet consisting in a trapezoidal open channel (L≈5m) along the roadside, a reinforced concrete box to retain the solid materials, a reinforced concrete manhole to collect the storm water and a pipe to link to the storm water network.

TE8 - MPOGO RIVER		
KM	**Length (m)**	**Works description**
Detention pond		Construction of a complete detention pond including excavation, embankment construction with impervious materials, inlet and outlet protected from erosion, gravel access road and surrounding fence, diversion of existing streams, as well as all the associated ancillary works with volume of 100,000 m^3.
0+000 to 1+026	1,026	Construction of trapezoidal open channel with 1.25 m depth and 5.00 m width with bed and banks on reinforced concrete
Before 1+026	2,200	Construction of marginal concrete walls to protect terrains/ houses from flooding.
0+000		Enlargement of bridge section under a minor road to a depth of 1.25m and a bottom width of 6.00 m.

TE8 - MPOGO RIVER		
KM	**Length (m)**	**Works description**
0+335		Enlargement of bridge section under a minor road to a depth of 1.25m and a bottom width of 6.00 m.
1+670		Enlargement of bridge section under a minor road to a depth of 1.25m and a bottom width of 6.00 m.
3+623		Enlargement of bridge section under a minor road to a depth of 2.00m and a bottom width of 20.00 m (2x10.0m).
Several		Construction of lateral drainage along the sections where the top of the channel or the wall is higher than the involving terrain
	4 units	Construction of pedestrian crossing consisting in a concrete slab over the channel and a protection steel rail, including steps to access it if needed
	3 units	Construction of vehicles crossing consisting in a concrete slab over the channel and a protection steel rail, including ramps to access it if needed

Safety and Maintenance aspects

This infrastructure was characterized above and its design includes a set of strict safety measures developed as described in the table below, taking cognisance of advice detailed in "Usual Safety Deficiences in Urban Stormwater Detention Ponds", following the summary published in the Urban

Drainage & Flood Control District Seminar of April 11, 2006, by Jonathan E. Jones et al. In fact It is proposed that the detention pond will remain accessible for regulated agricultural uses.

All the area influenced by the detention pond will be fenced being not accessible for the people in general.

TABLE 3

DETENTION POND SAFETY MEASURES

Usual Safety Deficiencies in Urban Stormwater Detention Ponds	Recommended actions	Considered actions/details for guaranteeing the public security
Outlets are open and unprotected	Outlets must be protected by trash racks	One trash rack has been designed upstream of each detention pond outlet
They lack trash racks	All pipe inlet structures shall have a trash rack sized to prevent entry of children. A trash catching device must be installed on all outlets and be accessible for removing the collected debris	One trash rack has been designed upstream of each outlet. The inlets are the existing Temeke and Evareth drains
The existing trash racks have openings larger than the recommended	No greater than 12" (300 mm) and preferably 6" (150mm)	A width of 150 mm will be specified
The racks are too close to the outlets and that will impinge a person against them	To consider a rack surface area many times larger than the surface area of the outlet pipe(s) and deviate them from the outlets (not established distance)	The main trash racks are about 18 m from the outlets and the "free" trash area is about 8 times the total outlets area (approximately 28.6 m^2 against 3.3 m^2)
Gaps between bars and concrete walls are too wide	The same for trash rack openings	A width of 150 mm will be specified
Side slopes of the facility are excessively steep or vertical without safety rails	No less than 3H/1V side slopes	Except the main gabion wall all the detention pond area are designed with slopes less or equal to 3H/1V
Pond inflow and outflow pipes are in close proximity to one another	No criteria defined	The distances between the inlet and outlet of the designed detention pond is around 180 m, which is quite distant
Pond depths increase very rapidly and the outlet/inlet pipes are quickly inundated and not visible	No criteria defined	It will be at least half an hour after an intense rainfall occurs before the water in the detention pond completely inundates the outlet pipes. The total time to fill the detention area is at least 1.5 hours. The outlets will be not visible during about 2.5 hours
Prolonged pooling of shallow, stagnant water with potential for the mosquitoes presence and reproduction	The ponds must be designed for having less than 72 hours of stable, shallow, stagnant water	The detention pond will have stored water for about 24 h for the design period of return. For a 100 year (+15%) period of return this time is approximately the same.

Usual Safety Deficiencies in Urban Stormwater Detention Ponds	Recommended actions	Considered actions/details for guaranteeing the public security
Dams and embankments are not designed to withstand overtopping forces during floods larger than they were designed to detain	-	The structural design of the main embankment wall has been modelled and verified considering the hypothesis of being overtopped for periods of return longer than 100years (+15%).
Adjacent land uses are incompatible with storage facilities	To confirm especially if there are not nursery schools in the adjacent vicinity not adequately protected	The detention pond is currently used as urban farming area which usually accumulates water. The maximum height of water is around 2.1 m and the access will be restricted. An overall fence was proposed.
Signs warning the public of the presence of the detention pond and/or warning of rapidly rising floodwaters and the associated danger are not posted	Use signs that warn of rapidly rising floodwater placed for maximum visibility from adjacent streets, sidewalks and paths. Distribute flyers. Inform homeowner associations and property owners of these risks	Warning signs (in Swahili and English) are proposed to be located in all the probable access paths to the detention pond area, advising of the proximity of areas subjected to periodic flooding and/or to prohibited access to areas concerning their hazardous conditions and the danger of drowning
Some detention pond facilities will invite use by children with activities like skateboarding on smooth concrete surfaces	To create rough surfaces	Rough surfaces are proposed where concrete is used.
Barriers/fences to protect the access to the steep side slopes	Ponds designs will incorporate vegetative and barrier plantings or fences to discourage access to portions of a pond where steep slide slopes increase the potential for slipping into the pond	The overall area of detention pond is fenced. The eventual urban farming use will be conditioned and regulated.
The operational reliability of the detention ponds depend very much in the hydraulic capacity of the outlet structure. Should the bottom orifices be totally or partially obstructed by solid waste during an intense flood and the safety conditions of the pond will lowered with danger for the downstream reach.	To guarantee that all orifices as well as the area upstream the outlet structure is free of any kind of waste is very important.	Some protective passive measures were considered in this project.

(PROCESL/COWI, 2014)

2.2.3 Materials

For the sections of proposed open channels after enlargement/rising, were assumed a construction detail using vertical walls and concrete for banks and bed. The relatively significant size of these infrastructures and the overall lack of free space to deploy them make the concrete the best solution to consider.

The rehabilitation/improvement of the Storm Water System in Temeke Municipality will require the following construction materials and quantities:

- Concrete;
- Shotcrete;
- Reno mattress;
- Precast concrete slabs;
- Stone masonry;
- Iron;
- Soil earth materials, block and sand;
- Water:
- Oil.

TABLE 4

QUANTITIES

	Gerenzani	Yombo	Shego
Excavations (m^3)	65.000	165.000	32.500
Fillings using excavated materials (m^3)	17.500	15.000	12.500
Fillings with materials from borrow sites (m^3)	12.500	13.500	0
Removal and restatement of road gravel pavements (m^3)	5.500	1.750	1.800
Surplus material to dispose in certified dump (m^3)	59.000	170.000	20.000
Clearing vegetation and bushes (m^2)	23.000	40.000	0
Rock for gabions in detention ponds and channel linings (m^3)	3.000	500	0
Reinforced concrete (m^3)	11.500	9.000	7.500

(PROCESL/COWI, 2014)

Some of these materials might be used in the operation phase for activities of reparation, relining channels and small masonry and concrete repairs. All materials will be obtained locally obtained.

It was conducted a construction material investigation aimed at identifying suitable and sufficient sources of construction material within economical haulage distance.

The investigation included identification of:

- Borrow sites-sources of fill material

- Sand deposits-source of concrete sand
- Quarry sites-source of concrete aggregates
- Water sources for construction water

BORROW SITES

Two borrow area have been identified and investigated namely three borrow pits have been investigated, sampled for further laboratory testing; these include Bokotimiza and Bunju borrowpit.

TABLE 5

BORROW SITES

Borrowpit name	Overburden thickness (m)	Average thickness seam material(m)
Bokotimiza	0.25m	2.5
Bunju	1.5m	2.0

(PROCESL/COWI, 2014)

SAND DEPOSITS

One sand deposit has been identified namely Mpiji river sand and forwarded to the laboratory for further laboratory testing.

QUARRY SITES

Two quarry sites namely Ihembe and Safa at Lugoba area in Coast region, have been identified, sampled and forwarded to the laboratory for further laboratory testing.

EARTHMOVING

For the realization of the construction works, it is estimated that the volume of land being excavated approach of 262.500 m^3. Regarding filling the value of land rounds 71.000 m^3.

Given the above, it will be necessary to rely on other sources for obtaining material for filling, for instance in existing quarries in the region.

2.2.4 *Equipment*

The equipment to be used at the construction sites will include:

- Heavy construction plants like bulldozers, graders, wheel loader, vibrators etc.;
- Hauling trucks;
- Trans mixer trucks (ready mix);
- Concrete vibrators;
- Trucks for material haulage;
- Generators.

All equipment referred may be obtained locally and will be provided by the contractor.

The equipment and machinery to be used at the operation phase will include:

- Shovels;
- Drainage pumps;
- Diesel compressor
- Dump trucks;
- Sewer rods and jet machines.

All equipment referred will be obtained and provided locally by the TMC /Contractor.

2.2.5 *Construction Camps*

Potential location sites will largely depend on the e.g. size of the land, space, accessibility to the site, haulage distances for transferring construction equipment etc. Locations and types of construction camps have not yet being developed in this design. However, the developer has commit to provide potential camp sites during construction phase.

2.2.6 *Human Resources*

Creation of temporary employment during construction is expected to increase income of the people around the project sites. The project will create temporary employment particularly for Engineers, Foremen, skilled and non-skilled labour.

Some labour forces will be recruited from local communities - especially for simple and manual operations that could easily be accomplished using local skills. However, the main contractor will

be responsible for the recruitment of the work force since he will be aware of the work schedule, quality of the work that is needed, the budget for the workforce and safety issues.

It is estimated a number of workers between 100 to 200. The range depends on the contractors working method/equipment etc. It is anticipated that every sub-project will be independently constructed, by independent contractor. If some of the drainage sub-projects are performed by same contractor, the total amount of workers will be reduced but this has not been taking in to consideration.

2.2.7 Compensation and Resettlement Issues

The draft valuation report of affected assets recorded a total of affected households in Temeke Municipal and a total cost of TZS 2,477,979,067.61 (excluding management and contingency) (Appendix 14.7). The affected assets include land, houses, external toilets, chambers/septic tanks, fences and foundations.

2.2.8 Water and Sewerage System

During construction and operation phase, water will be supplied by DAWASCO. However, based on the nature of the Sub-project and the construction works to be performed, it is not possible to estimate the amount of water required for the works. Nevertheless, it is expected that no large amounts of water will be required.

For what concerns the sewerage system during the construction phase this shall be ensured by DAWASA in the quality of Water Supply and Sewerage Authority.

DAWASA was contacted, in particular to obtain the cadastre of existing infrastructure in the area where the projects are being developed. They have replied that they do not have any layout plans but that they will give us some assistance during Project Execution.

2.2.9 Type and Source of Energy

According to the interview conducted between consultant and TANESCO it was mentioned that TANESCO may provide services from its regional offices[4]. For construction and operation purposes, standby diesel power generators will be used.

Power supply to the construction activities will be from TANESCO or standby generators.

[4] Meeting Notes Conducted on 10.15.2013 with TANESCO Regional Manager – Kinondoni South

2.2.10 Waste Management

During construction, various kinds of wastes will be generated including organic matters from vegetation clearance of the site, papers and households wastes from office and from the site, iron pieces and scraps from cutting and fixing of parts, waste oil from services and maintenance of vehicles and machinery, concrete, soil and rocks from rehabilitation works of the Storm Water System. During operation phase, waste will be generated from the production of organic materials and sediments from clearing existing drainage infrastructure facilities, waste concrete, debris, iron and steel wastes from the reparation of pipes and gabions (see **TABLE 6**). It will be the responsibility of the contractor to clean the site after construction. Large amount of waste will be collected by contractor's equipment / trucks or sub-contractor whom will be appointed by the contractor.

TABLE 6

PRODUCTS AND WASTE PRODUCED

Products	Waste produced
---	Mixture of debris (due to demolition)
---	Organic matters (from vegetation clearance)
Water, soil and earth materials	Mud slurry
Concrete, shotcrete, precast concrete slabs	Concrete waste
Iron	Iron waste
Steel	Steel waste
Blocks and stone masonry	Mixture of debris
Paper, plastic, glass	Households wastes (paper, plastic, glass, organic matter)
Oil	Waste oil

(PROCESL/COWI, 2014)

The project is not expected to generate hazardous materials which are toxic to human beings and other living creatures, nevertheless there is high degree of contamination from many toxic sources that enter surface water drainage systems.

All wastes produced will be collected and disposed of in an appropriate manner. Thus, for households and office waste, there will be four bins: paper materials; organic material; glass wastes and plastic materials. The contractor is to oversee this process and collect these in a secure area at the contractor's camp site.

The contractor is to be responsible to collect waste during construction period and municipal council service provider during operation period. During construction contractor has option of sorting waste and have scrap metal, wood and plastic bottles sold to local petty traders who collect them.

Similarly, for construction works wastes, those which are easily segregated will be categorized according to their characteristics as far as practically possible. Metal wastes, toxic and chemical wastes, plastic wastes, liquid wastes and solid wastes will be separated and disposed-off in environmental friendly manner. The methods of disposal include the following:

- Specialized dealer: these are experts in disposing special wastes such as chemicals and waste oil.
- Pits: these are common for organic materials such as foodstuff which can decompose quite easily. It is a low-cost, low-tech disposal method that does not require wastes to be transported away from the construction site, and, therefore, is very attractive to many people as long as there is enough land.
- Landfills: landfills are used throughout the world for disposing of large volumes of municipal, industrial, and hazardous wastes. In this method wastes will be placed in an engineered impoundment in the ground and then waste will be covered with a layer of clean soil or some other inert cover material. Dar es Salaam City will be subcontracted to dispose the wastes, thus all waste are to be dumped at the current official dump which is at Pugu Kinyamwezi, and not to be taken to any transfer station. If the official dump changes during the course of the project implementation, the municipal will specify where the official dump is.

2.3 PROJECT ACTIVITIES

2.3.1 Mobilization phase

Prior to the commencement of civil works, there will be cleaning of the project area. This process may involve vegetation and crop removal in addition to the demolition of structures, infrastructures and waste removal.

Moreover, the works will include acquisition and / or mobilization of construction equipment and machinery, vehicles, bulldozers, excavators, concrete vibrators, generators and stockpiling of materials.

The organization and mobilization of equipment is estimated to last for at least four weeks.

2.3.2 Construction phase

The rehabilitation/improvement of interventions TE2, TE3, TE9, TE8 and TE 4 will involve excavation, ditching and levelling activities.

The important stages of the construction phase with involves the rehabilitation/improvement of the channels and construction of a detention pond, can be summarized as follows:

- Establishment of parks, construction camps and machinery;
- Engineering works for earthmoving, cutting and filling;
- Transport of materials;
- Possible temporary construction of access roads to workplaces;
- Cleaning and removal of materials in areas intervened;
- Enlargement of rectangular open channels;
- Lay and supply of underground concrete rectangular frames;
- Construction of reinforced concrete manholes;
- Construction of final outlet in reinforced concrete;
- Construction of road drainage inlet;
- Restoration of the landscape;
- Land expropriation and resettlement of houses and infrastructures.

The construction period will last approximately 16 to 18 months.

2.3.3 Operation phase

The main activities during operation phase will be the maintenance of the system by:

- Regular maintenance of the storm water drain by cleaning of all components of the storm water drainage system;
- Relining channels and concrete repairs;
- Cleaning of all components of the storm water drainage system;
- Development of an inspection programme with regular inspection of the storm water drainage system;
- Intervention in case of system crashes;
- Monitor the capacity of the system, including structural integrity of the system;
- Activities for public awareness on the sustainable use of the storm water drainage network established.

2.3.4 Decommissioning Phase

Decommissioning phase is not anticipated in the foreseeable future. However, if this were to occur, may entail change of use (functional changes) or demolition of structures which may trigger:

- Change of land use at the proposed detention pond;
- Laying off workers;
- Disposal of spoil material and debris and where necessary; and
- Rehabilitation of the area.

CHAPTER 3.0: RELEVANT POLICY, LEGAL AND INSTITUTIONAL FRAMEWORK

3.1 POLICY FRAMEWORK

National Environmental Policy (NEP), 1997

The National Environmental Policy outlines the framework of fundamental changes that are needed to bring environmental considerations into the mainstream of decision making in Tanzania. It provides policy guidelines, plans, guidance on priorities, and recommendations for monitoring and review of policies, plans and programmes that directly relate to the environment.

The National Environmental Policy, particularly stress on the need to formulate environmental legislation and sectorial legislations as an essential component for an effective and comprehensive environmental management and improvement of life. Meaningful and effective environmental law must be clearly understood and treasured by the communities and individuals whom it is aimed.

The Sub-project addresses these policy objectives by ensuring that environmental issues are mainstreamed into the project planning and implementation.

National Land Policy (NLP), 1995 (Revised in 1997)

The NLP is a comprehensive policy pronouncement regarding land tenure, management and administration. The overall objectives of this policy among other things are; to promote and ensure the existence of a secure land tenure system in Tanzania and; to sustainably foster optimal use of land.

This policy emphasizes on integrated planning and improved management of urban centres and the designation of urban and land uses, based on environmental impact considerations.

NLP recognises the importance of social services such as water supply, road networks, waste management and energy development that take place on land for human benefits, to be done in a right manner so as to protect land for other uses and avoid land degradation. In addition, the policy identifies the need for conservation and preservation of prehistoric/historic sites and buildings.

As this policy recognizes the importance of protect public service utilities for environmental protection, the design and rehabilitation/improvement of the Project will consider restoration of public service utilities and road infrastructure. The Project design, rehabilitation/improvement and operation

will also ensure that solid waste does not accumulate and create blockage of drainage systems through periodic cleaning of open drains.

National Human Settlements Development Policy, 2000

Among other important objectives of this policy is to recognize environmental protection within human settlements and protection of natural ecosystems against pollution, degradation and destruction with two main objectives:

(i) To promote development of human settlements which are sustainable;

(ii) To facilitate the provisions of adequate and affordable shelter to all income groups in Tanzania.

Additionally, the policy recognizes the role of the National Environment Policy and other sectoral policies for attainment of urban development and need for coordination and cooperation with other sectors / stakeholders, including Community-Based Organisations (CBO), and Non-Governmental Organisations (NGO) in urban development planning.

From a very preliminary stage of project development, the importance of stakeholder's involvement and interested parties was recognized. The project itself has an ultimate objective of ensuring the safety and welfare of the people while considering the protection and sustainable development of human settlements.

National Water Policy (NAWAPO), 2002

The National Water Policy recognises water as an important requirement for all humans to maintain health, and to restore and maintain the functions of natural ecosystems. The main objective of this policy is to develop a comprehensive framework for sustainable development and management of water resources. The policy aims to ensure that beneficiaries fully participate in all stages of water resource development and recognizes the fundamental but intricate linkages between water and socio-economic development, including environmental requirements.

The Proposed Surface Water Drainage System Sub-projects in Temeke Municipality will contribute to the protection of the water resources once it will allow the natural storm water to flow into the receiver water bodies and the minimization of surface and underground water resources pollution.

National Policy on HIV/AIDS, 2001

The overall goal of the National Policy on HIV/AIDS is to provide for a framework for leadership and coordination of the national multisectoral response to the HIV/AIDS epidemic. This includes formulation, by all sectors, of appropriate interventions which will be effective in preventing transmission of HIV/AIDS and other sexually transmitted infections, protecting and supporting vulnerable groups, mitigating the social and economic impact of HIV/AIDS. It also provides for the framework for strengthening the capacity of institutions, communities and individuals in all sectors to arrest the spread of the epidemic.

The Sub-project rehabilitation/improvement and operation will likely lead to hiring of local people from Dar es Salaam City who will interact with the surrounding community. It is the responsibility of the Project developers to participate in the fight against HIV/AIDS by raising workers awareness and their individual responsibility in the prevention of the epidemics.

Community Development Policy, 2003

The objective of the Community Development Policy is to enable Tanzanians as individuals or in their families and/or groups/associations to contribute more to the government objectives of self-reliance and therefore bring about development at all levels and finally the nation as a whole.

The relevance of this policy for the project relates to the fact that the project contributes towards community development for the eradication of poverty. The selection of Sub-projects priorities was done by the local communities. Relevant authorities which have influence on the projects have been also consulted, including DAWASCO and TANESCO.

3.2 LEGAL FRAMEWORK

Constitution of Tanzania, 1997-1995

The current Constitution of the United Republic of Tanzania was ratified in 1977. It is the country's fourth Constitution since the independence from the United Kingdom, (9 December 1961 for Tanganyika and 10 December 1963 for Zanzibar) and recognises the basic rights for its people to the protection of their life by the society in accordance with the law.

The National Constitution has to be taken into account in the project especially in matters concerning human rights as stipulated in the constitution. It is expected that the rehabilitation/improvement of the Sub-projects leads into land acquisition and loss of properties, which shall consider the execution of compensation according to the national laws.

Environmental Management Act (EMA) No. 20, 2004

The National Environmental Management Act (EMA) No. 19 of 1983 started the process of regulating environmental management in Tanzania. Although draft EIA guidelines and procedures were produced in 1997 and amended in 2003, the country lacked a coherent code of supporting legislation to enable effective environmental management. Therefore a study was initiated with funding from the World Bank, known as the Institutional and Legal Framework for Environmental Management Project. This culminated in the promulgation of the Environmental Management Act (EMA) No. 20 in 2004.

EMA stipulates the need to conduct Environmental Impact Assessment (EIA) for development projects in Tanzania. EMA provides a policy framework for environment and natural resources management and:

- provides the legal and institutional framework for the sustainable management of the environment;
- stipulates impact and risk assessments, the prevention and control of pollution, waste management, environmental quality standards, public participation, compliance and enforcement;
- provides for the implementation of the National Environment Policy;
- repeals the National Environment Management Act of 1983,
- provides for the continuance of the National Environment Management Council, as well as the National Environment Trust Fund.

Sub-section 129 (1) of the Act states that every local government authority shall construct storm water drains within its area of jurisdiction and make sure they remain clean. The rehabilitation/improvement of the Proposed Surface Water Drainage System Sub-projects in Temeke Municipality will be done in collaboration with Temeke Municipal Council (TMC).

Other important EMA Act provisions which are relevant to this project include the following;

<u>Part ix - Management of Solid Waste</u>

Among other relevant issues of concern, cap 141 (2) c states that *"the Local Government must ensure the appropriate sorting of waste is made right at the source and in accordance with standards or specifications prescribed by the local government authority concerned".*

<u>Cap 123 (1) - Management of Liquid Waste</u>

This provision states that "The local government authorities may prescribe and issue guidelines on how liquid waste from domestic and commercial premises is to be treated and finally disposed of both within the site".

Cap 118 (1) - Waste Transfer Stations

The local government authorities may designate transfer stations to serve as collection centres of solid wastes to serve cities, or municipalities, or towns or other areas where large amounts of solid waste are generated.

Local Government (Urban Authorities) Act Cap 288 (1982)

The Local Government Act directs the registrar of villages to register an area as a village and issue a certificate of incorporation which enables the village council to become a corporate body with a perpetual succession and official seal; in its corporate name a village is capable of suing and being sued; and a village is capable of holding and purchasing or requiring in any other way any movable or immovable property.

The Act gives authority to local governments to regulate matters that are local. A pertinent example of such authority to the Project is that the local government may opt to regulate extraction of minerals or building material, through their bylaws. Despite the authority of local governments the bylaws should not derogate any principal legislation e.g. in the case of extraction of material, the Mining Act.

Land Acquisition Act No. 47, 1967

The Land Acquisition Act of 1967 stipulates the power and the procedures for acquiring land and the required degree of compensation. The Act repeal and replace the Land Acquisition Ordinance, to provide for compulsory acquisition of lands for public purposes and in connection with housing schemes.

The relevance of this Act relates to the compensation of land taken and loss of properties of the people affected by the project.

Public Health Act No. 1, 2009

This Act provides for the promotion, preservation and maintenance of public health with a view to ensuring the provisions of comprehensive, functional and sustainable public health services to the

general public. Public Health Act also addresses the protection of the environmental health and sanitation including healthcare waste management.

The central theme of this act is to provide for the promotion, preservation and maintenance of public health with a view to ensuring the provisions of comprehensive, functional and sustainable public health services to the general public and to provide for other related matters. Major issues addressed in this act include operation of housing & hygiene, human settlements, solid & liquid waste, food & nutrition, control of diseases and workers' health. Relevant sections of this Act related to the implementation of this project include the following;

Section 81 Transportation and Disposal of Liquid Waste:

a) The authority shall ensure that sewage from cesspool and sludge from septic tanks are collected and transported by specified vehicles for liquid waste disposal.

b) Ensure that sewage is appropriately treated prior to its discharge into water bodies or open land, the sewage will not increase the risk of infections or ecological disturbance and environmental degradation.

c) Designate and ensure compliance with designated disposal ponds, sewage treatment facilities and sewer points.

Section 73 (1) (c): To collect, transport and dispose of solid and liquid waste from buildings, premises and land.

These sub sections are relevant in the operation of the Sub-project as it describes the manners in which solid and liquid waste will be collected, transported and disposed appropriately particularly during operation phase.

Occupational Health and Safety Act No. 5, 2003

The Occupational Health and Safety Act repeal the Factories Ordinance. It is an Act design to make further provisions for securing the safety, health and welfare of person at work; it provides for the protection of persons at work against hazards to health and safety arising out of or in connection with activities of persons at work; and provides for other health matters.

The current Occupational Health and Safety (OHS) Act aims at protecting the safety, health and welfare of people engaged in work or employment. The goal of occupational safety and health act is to foster a safe and healthy working environment for all employees.

Some of other important goals of this act include:

- Review of the effectiveness of health and safety measures;
- Identification of Potential hazards /incidents in a factory / workplace;
- Examination of major causes of incidents at the factory or workplace and,
- Internal health or safety auditing.

The relevance of this act relates to the rehabilitation/improvement of the Proposed Surface Water Drainage System Sub-projects in Temeke Municipality where risks of injury may occur and where workers will be required to apply safety gears such as boots, hand gloves and masks to ensure their safety during the operation phase.

Water Resources Management Act No. 11, 2009

The Water Resources Management Act (WRMA) repeals the Water Utilisation (Control and Regulation) Act No. 42 of 1974.

This law coves issues of institutional and legal framework, principles for water resources management and prevention and control of water pollution. It established the National Water Board, BWB, catchments and sub-catchments and offences and penalties.

The objective of the WRMA is to ensure that the nation's water resources are protected, used, developed, conserved, managed and controlled to meet the basic human needs of present and future generations.

The EIA will be developed taking into account this act and mitigate the impacts on water resources in their quantity and quality aspects.

Water Supply and Sanitation Act No.12, 2009

The Water Supply and Management Act established the legal framework to the management and adequate operation and transparent regulation for water supply and sanitation services with a view to give effect to the National Water Policy, 2002.

The Act outlines the responsibilities of government authorities involved in the water sector, establishes Water Supply and Sanitation Authorities as commercial entities and allows for their clustering where this leads to improved commercial viability. It also provides for the registration and operation of Community Owned Water Supply Organisations and regulates the appointment of board members.

The design and implementation of the project will take into consideration the provisions of water supply and sanitation especially those which relate to the potential interruption of utility services for water and sanitation.

Mining Act No. 5, 1998 repealed 2010

The mining act regulates the law relating to prospecting for minerals, mining, processing and dealing in minerals, to granting, renewal and termination of mineral right, payment of royalties, fees and other charges and any other relevant matters. Mining license applicants are required to submit plans for environmental protection.

The relevance of this Act for the proposed Sub-project relates the possible need for earth materials acquisition and gravel for the construction activities. In order to minimize the environmental impacts associated with this operation recourse should be made preferably in quarries which area already licensed and in operation.

Urban Planning Act No. 8, 2007

The Urban Planning Act No. 8 of 2007 regulates land use in the country. It requires the occupier to pay land rent in order to get the Certificate of Occupancy.

Other conditions stipulated in the act include:

- Erecting building by using permanent materials designed for the building in accordance with the condition of the issued Right of Occupancy.
- Conforming to the building line decided by the Authority.
- Providing plans for the building showing position of the building.
- Submitting drawings, elevations, plans and specifications to the Authority.
- Maintaining buildings in good order and repair to the satisfaction of the Commissioner for Lands.
- Protecting all beacons on land and re-establishing at the occupier's expenses as assessed by the Director of Surveys and Mapping.
- Providing adequate water supply, drainage and disposal of trade refuse and effluent to the satisfaction of the Authority.
- Fencing the land with good quality fencing and provide car parking as required by the Authority and provide loading and unloading facilities within the boundaries of land.

The Act gives the Commissioner for lands absolute discretion to give or withhold building consent.

The project will respect the individual right of occupancy as prescribed in the Act. Thus, the improvement of storm water drainage will be carried out carefully without affecting public or individual plots and shall make compensation for any acquired land or damage caused. The project proponent will collaborate with local authority to ensure enforcement of the legislation and by-laws regarding solid waste disposal and discharge of effluents from residential areas.

Land Act No 4, 1999

Compensation under Section 156 of the Land Act No. 4 of 1999 applies for non-governmental corporate body, institutions, or group of persons. Section 156 of the Land Act 1999 requires compensation to be paid to any person for the use of land of which he / she is in lawful or actual occupation as a communal right of way and with respect to a way leave. These include:

- Any damage suffered in respect of trees, crops, and buildings as result of creation of way leave;
- Damage due to surveying or determining the route of that way leave.

It is the responsibility of the government department of Ministry, Local Government authority or corporate body that applied for right of way to pay compensation.

The construction of storm water drainage system could lead into destruction of trees, utilities, buildings, or private properties, hence requiring compensation to be effected people according to existing legislation. The project proponent will pay compensation in accordance to the requirements stipulated in the legislation.

Energy and Water Utilities Regulatory Authority, 2001

This Act consolidates the laws in relation to energy and water utilities in Tanzania Mainland. Under this Act, the Energy and Water Utilities Regulatory Authority (EWURA) with prior approval of the Minister, make rules in respect of the regulated goods and services (being the electricity, petroleum, natural gas, water and sewerage sectors). The Act gives EWURA the legal mandates to issue renew and cancel licenses of service providers in the regulated sectors.

Employment and Labour Relations Act, 2004

This Act entails provisions for all core Labour rights and related matters including to; establish basic employment standards, provide a framework for collective bargaining, provide for the prevention and settlement of disputes. As the proponent shall employ people during construction and operation of the proposed project should make sure that all the requirement of this Act are

adhered to. The proponent shall ensure that promotes an equal opportunity in employment and strives to eliminate discrimination in any employment policy or practice. The proponent should provide the legal framework for effective and fair employment relations and minimum standards regarding conditions of work.

Workers Compensation Act, 2008

This Act provides for compensation to employees for disablement of death caused by or resulting from injuries or diseases sustained or contracted in the course of employment and establishment of Fund for administration and regulation of workers compensation. Under this Act, the Contractor shall be obliged to compensate employees in case of injuries, death, and diseases while rendering their services to the employer. The proposed project will involve construction and operation phases which may subject workers into injuries or health risks. It is therefore a responsibility of the project proponent to make sure that all requirements of this Act and working standards are adhered to in order to ensure safe working environment for workers and prevent accidents and other occupational health and safety risks.

Engineers Registration Act and its Amendments 1997 and 2007

The Acts regulate the engineering practice in Tanzania by registering engineers and monitoring their conduct. It establishes the Engineering Registration Board (ERB). Laws require any foreign engineer to register with ERB before practicing in the country. Foreign engineers working with this project shall abide to the law requirement. The proponent is advised to engage only registered engineers.

The Contractors Registration Act (1997)

The Contractors Registration Act requires contractors to be registered by the Contractors Board (CRB) before engaging in practice. It requires foreign contractors to be registered by the Board before gaining contracts in Tanzania. The Temeke Municipal council shall comply with the law requirement during the recruitment of contractors for project implementation.

Public Health, Sewerage and Drainage Ordinance, Chapter 336

The ordinance seeks to make provision for the preservation of public health by measures of sewerage, drainage and sanitation. Under this Ordinance the municipal and town councils as well as township authorities have the duty to construct and maintain public sewers and sewage disposal works. The discharge of industrial effluent into public sewers is restricted, such discharge being

only feasible where there is an agreement between a local government authority and the industry or factory concerned.

3.3 REGULATORY/INSTITUTIONAL FRAMEWORK

Environmental Impact Assessment Guidelines and Audit Regulations, 2005

These Regulations provide rules related to the procedures for carrying out environmental impact studies and environmental audits as provided in the Environmental Management Act. They prohibit the carrying out projects without an environmental impact assessment required under the Environmental Management Act and define the contents and form of an environmental impact assessment and the basic principles of an environmental audit.

A developer shall apply for an environmental impact assessment certificate as prescribed by these Regulations. The final decision on an environmental impact assessment shall be taken by the Minister. The Regulations also provide for public hearings in relation with environmental impact assessments and appeal against decisions of the Minister.

Environmental Standards

In terms of section 140 of the EMA, the National Environmental Standards Committee of the Tanzanian Bureau of Standards (TBS) is required to develop, review and submit proposals for environmental standards relating to: water quality, discharge of effluent, air quality, noise and vibration, subsonic vibration, ionising and other radiation, soil quality, noxious smells, light pollution, electromagnetic waves and microwaves.

Air Quality Standards Regulations, 2007

This regulation aims to set baseline parameters on air quality and emissions based on a number of practical considerations and acceptable limits and enforce minimum air quality standards prescribed by the National Environmental Standards Committee.

It helps developers such as industrialists to keep abreast with environmentally friendly technologies aiming to ensure the protection of human health and the environment from various sources of pollution.

The relevance of this standard to the project is reflected in section 1 (3) (d) where it states the objectives of this standard among others, is "to ensure protection of human health and the environment from various sources of pollution".

Soil Quality Standards Regulations, 2007

The Soil Quality Standards Regulation provides a framework for environmental protection considerations by different sectors into the mainstream of decision making to ensure minimum environmental negative impacts due to agricultural practices and use of external inputs. It requires the agriculture sector to ensure food security and eradication of rural poverty through the promotion of production systems, technologies and practices that are environmentally sound, with emphasis on strengthening of environmentally sound use, monitoring, registration and management of agro-chemicals use.

There is a risk for soil pollution at the rehabilitation/improvement sites generally limited to accidental spillages of hydraulic oil, fuel oil and petroleum at individual work sites and along the drainage routes.

The contractor shall comply with these regulations concerning the control and abatement of soil pollution.

Solid Waste Management Regulations, 2009

These documents regulate the implementation of the EMA (2004). The regulations are guided by three principles: the precaution principle, the polluter pays principle and the producer extended responsibility principle, meaning that manufactures or any person exercising jurisdiction under this Act shall, in relation to any decision, order, exercise of any power or performance of any function, be guided by these principles of environment and sustainable development relevant to waste disposal and management.

Local governments implement the regulations and Schedule 1 of the regulations highlight the types of waste and recommended modes of treatment for the same. The contractor and proponent for the drainage project will be expected to comply with these regulations when dealing with solid waste.

Water Quality Standards Regulations, 2007

The object of these Regulations is to protect human health and to promote the conservation of the environment, enforcing minimum water quality standards prescribed by the National Environmental Standards Committee. At the same time the water quality standards enable the National Environmental Standards Committee to determine water usages for purposes of establishing environmental quality standards and values for each usage and ensure that all discharges of

pollutants take into account the ability of the receiving waters to accommodate contaminants without detriment to the uses specified for the waters concerned.

Since the interventions under the Sub-projects will be held in streams the risk of water contamination during construction phase is high, particularly in regard to accidental spillages of oil and fuel from the vehicles and machinery allocated to works.

The Contractor shall comply with all applicable regulations concerning the control and abatement of water pollution

The Land (Assessment of the Value of Land for Compensation) Regulations, 2001

These regulations provide the possibility of claiming for compensation for land or "unexhausted improvement" to be paid by the Government. The assessment basis shall be the market value of the land and certain allowances may be granted: Compensation for loss in any interest in land shall include the value of unexhausted improvement, disturbance allowance, transport allowance, accommodation allowance, and loss of profits.

All affected people in this project will be compensated as stipulated in this regulation.

3.4 INSTITUTIONAL/ADMINISTRATIVE FRAMEWORK

According to the EMA of 2004 the institutional set-up for environmental management from national level to village level includes:

- National Environment Advisory Committee;
- Minister Responsible for Environment;
- Director of Environment (DOE);
- National Environment Management Council (NEMC);
- Sector Ministries;
- Regional Secretariats; and
- Local Government Authorities (Municipality and District, Ward and Village).

The Office of the DOE and NEMC are the main regulatory bodies for environmental management in Tanzania. However, other sector ministries and agencies, play an important role in implementing environmental policy objectives. The environmental management functions of each institution are outlined in the Environmental Management Act and here presented in brief in **TABLE 7**.

The following table presents the main institutions involved and responsibilities.

TABLE 7

RESPONSIBILITIES OF INSTITUTIONS

Administrative level	Institution	Responsibility
National	Vice President's Office, Minister Responsible for Environment	• Responsible for approval of the Environmental Impact Assessment; • Coordinate and monitoring environmental issues; • Environmental Planning; • Environmental research.
	National Environmental Management Council (NEMC)	• Undertake enforcement compliance; • Review and monitoring of the EIA; • Facilitate public participation in environmental decision making; • Disseminate environmental information; • Carry out environmental audits.
	Ministry of Lands, Settlement and Housing Development	• Land use planning; • Valuation and compensation; • Issuing of right of occupancy.
	Ministry of Infrastructure Development	• Issuing policy and guidelines.
	Prime Minister's Office – Regional Administration and Local Government (PMO-RALG)	• Carrying out EIA study; • Project implementation including mitigation measures; • Carrying regular environmental monitoring and internal audit.
District	Local Government Authorities – Temeke Municipal Council	• Responsible for overseeing municipal development activities and issuing of permits; • Issuing permission to conduct any activity in the municipality; • Responsible for monitoring the project implementation activities for the benefit of municipal environment; • Ensure the implementation of mitigation measures of the project as recommended in the EMP.
	District Departments of Planning, Natural Resources, Health, Lands, Community Development and Education	• Baseline data on socioeconomic conditions; • Extension services; • Plan and coordinate activities on community-based natural resources and environmental management in their areas of jurisdiction.
Community	Ward and Village Offices	• Provide the link between the project development and the community; • Overseeing the environmental matters at ward level.

3.5 WORLD BANK SAFEGUARDS

This EIA has been designed so that all investments under this contract will comply with all the Environmental laws of the United Republic of Tanzania and the Environmental and Social Safeguard Policies of the World Bank.

World Bank Safeguard Policies considered:

- OP[5] 4.01, BP[6] 4.01Environmental Assessment
- OP 4.11 , BP 4.11 Physical Cultural Resources
- OP 4.12, , BP4.12 Involuntary Resettlement

OP/BP 4.01 - Environmental Assessment

Environmental Assessment (EA) is used in the World Bank to examine the environmental and social risks and benefits associated with Bank lending operations.

This policy requires Environmental Assessment (EA) of projects proposed for Bank financing to help ensure that they are environmentally sound and sustainable, and thus to improve decision making. The EA is a process whose breadth, depth, and type of analysis depend on the nature, scale, and potential environmental impact of the proposed investments under the DMDP and on potential environmental impact of the Sub-Project under Dar es Salaam metropolitan area.

The EA process takes into account the natural environment (air, water, and land); human health and safety; social aspects (involuntary resettlement, indigenous peoples, and cultural property) and trans boundary and global environmental aspects.

The DMDP has classified this project as a Category "B" project under the World Bank's environmental and social safeguards policies.

Although an EIA is not always required, some environmental analysis is necessary. Category B projects have impacts that are "less significant, not as sensitive, numerous, major or diverse. Few, if any, impacts are irreversible, and remedial measures can be more easily designed." Typical projects include rehabilitation, maintenance, or upgrades, rather than new construction.

OP/BP 4.11 Physical Cultural Resources

The World Bank Operational Policy (OP) 4.11 aims to protect physical cultural resources, defined as "movable or immovable objects, sites, structures, groups of structures, and natural features and landscapes that have archaeological, paleontological, historical, architectural, religious, aesthetic, or other cultural significance". These resources "are important as sources of valuable scientific and

[5] Operational Policy

[6] Bank Procedure

historical information, as assets for economic and social development, and as an integral part of a people's cultural identity and practices".

This policy applies to all projects requiring a Category A or B Environmental Assessment under OP 4.11, project located in, or in the vicinity of, recognized cultural heritage sites, and projects designed to support the management or conservation of physical cultural resources.

Physical cultural resources and cultural heritage sites are not located in the project area.

Although it is not expected the proposed Sub-project to have effects to physical cultural resources and cultural heritage, appropriate conservation of archaeological artefacts and cultural values and its chance finds during rehabilitation/improvement and maintenance of the main infrastructure works will have to be considered.

OP/BP 4.12 Involuntary Resettlement

The World Bank Operational Directive (OD) 4.30 on Involuntary Resettlement and the World Bank Operational Policy (OP) 4.12 on Involuntary Resettlement were consulted while preparing the Resettlement Action Plan (RAP).

The main features OP 4.12 that have been considered in the assessment include the following:

- Involuntary resettlement should be avoided whenever feasible, or minimized, exploring all viable alternative project designs;
- Where it is not feasible to avoid resettlement, resettlement activities should be conceived and executed as sustainable development programs, providing sufficient investment resources to enable the persons displaced by the project to share the project benefits; and
- Displaced persons should be assisted in their efforts to improve their livelihoods and standards of living or at least to restore them, in real terms, to pre-displacement levels or to levels prevailing prior to the beginning of project implementation, whichever is higher.

3.6 INTERNATIONAL TREATIES AND AGREEMENTS

Tanzania is a party to several international agreements and conventions relating to the environment. The proposed project is required to comply with those international agreements for which Tanzania has ratified. Agreements of potential importance are briefly described below.

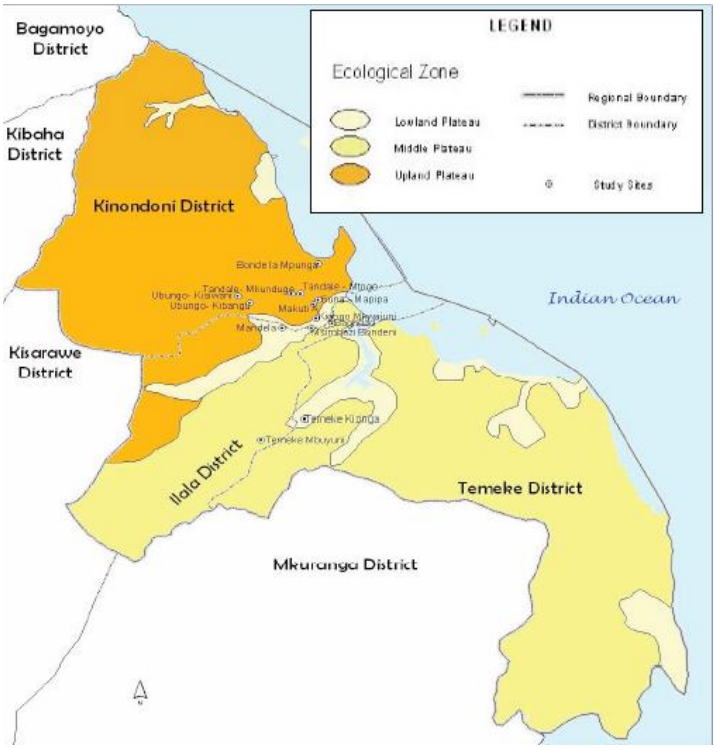
- Tanzania has ratified the UNESCO Convention concerning the Protection of the World Cultural and Natural Heritage (World Heritage Convention 1972). Project proponent has the obligation as well to preserve any cultural heritage found in the project site.
- Convention concerning Protection of Workers against Occupational Hazards in the Working Environment due to air pollution, noise, vibration and radiation. The aim is to ensure safe working environment for the workers. Tanzania adopted it in 1977 and became into force on May 30th 1984.
- Convention on Biological Diversity (CBD): species need to be protected especially endangered and threatened ones. The proposed project however, is not located in the sensitive area that is rich in biodiversity. However, pollution to soil, air and water may affect the existence of some species. It is the obligation of the project proponent to avoid pollution as is practically possible.

CHAPTER 4.0: ENVIRONMENTAL AND SOCIO-ECONOMIC BASELINE CONDITIONS

4.1 BIOPHYSICAL CHARACTERISTICS

4.1.1 Topography

Dar es Salaam city is divided into three zones, namely the upland zone comprising hilly areas to the west and north of the city, the middle plateau, and the lowlands, which include Msimbazi Valley, Jangwani, Mtoni, Africana and Ununio areas (**FIGURE 8**).

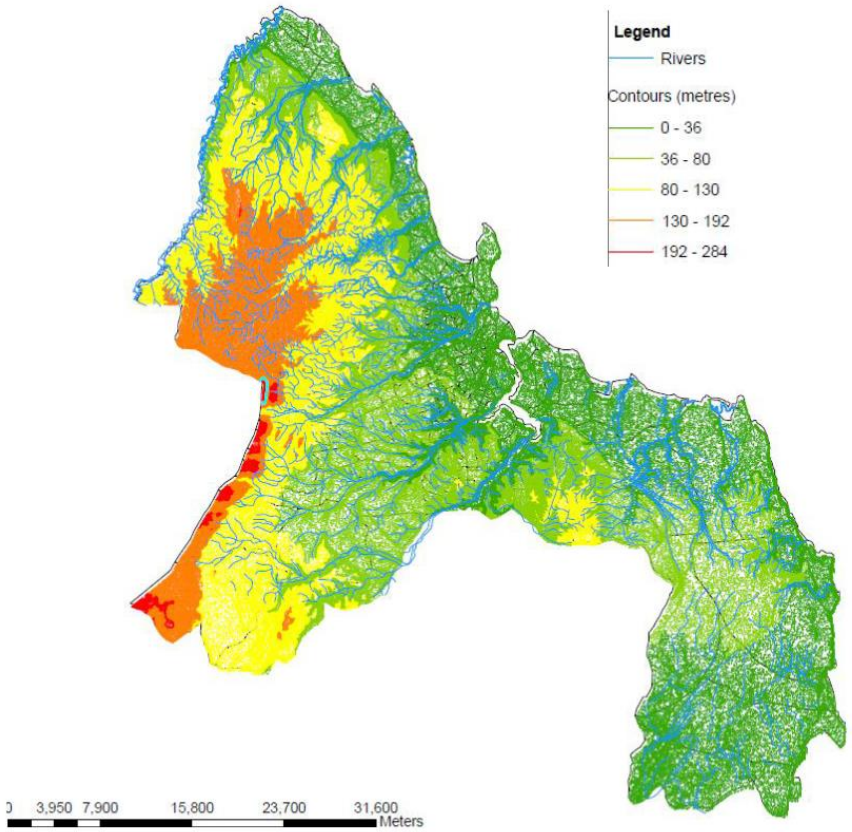


(PROCESL/COWI, 2014)

FIGURE 8

MAP OF DAR ES SALAAM MUNICIPAL DISTRICTS AND GEOMORPHOLOGICAL ZONES

Topographically the city lies in the flood plain and/or near flood plains and thus flooding is one characteristic of the city, particularly when there are heavy rains. The beach and shoreline comprise sand dunes and tidal swamps. Coastal plains composed of limestone extend 10 km to the west of the city, 2-8 km to the north, and 5-8 km to the south. Inland, alluvial plains comprise a series of steep-sided U-shaped valleys. The upland plateau comprises the dissected Pugu Hills (Dongus, 2000). The local topographical conditions can be seen in **FIGURE 9** below and in **TABLE 8**.



(PROCESL/COWI, 2014)

FIGURE 9

MAP SHOWING THE TOPOGRAPHY OF DAR ES SALAAM REGION

TABLE 8

LOCAL TOPOGRAPHICAL CONDITIONS IN DAR ES SALAAM

	Level	Condition
Lowland	< 5 m	Areas at the bay area, river mouths and hinterland along the coast. Marsh and swampy areas widely spread; soft soil, thick and drains poorly
Plain/Terrace	5-20 m	Flat plans/terraces, extend along the coast and are generally a few kilometers wide. Geologically it belongs to the coastal plain.
Terrace/Hill	20-60 m	This makes up the dominant part of the residential terrain of Dar es Salaam, and are gently sloped areas, consisting of residual weathered limestone (Murram-earth material); many of these terraced areas of 500 m to 1 000 m are observed around the banks of Dar es Salaam, and have been known to act as flood plains
Hill	60-150 m	This zone extends to the Southwest of the study area, the geological origin of which is raised coral reefs, the undulation of which is dependent on the degree of weathering.
Mountain	> 150 m	In the Western region of Dar es Salaam, 30 km inland, composed of limestone

		associated with sandstone of the older geological area, steep and rigid slopes are formed

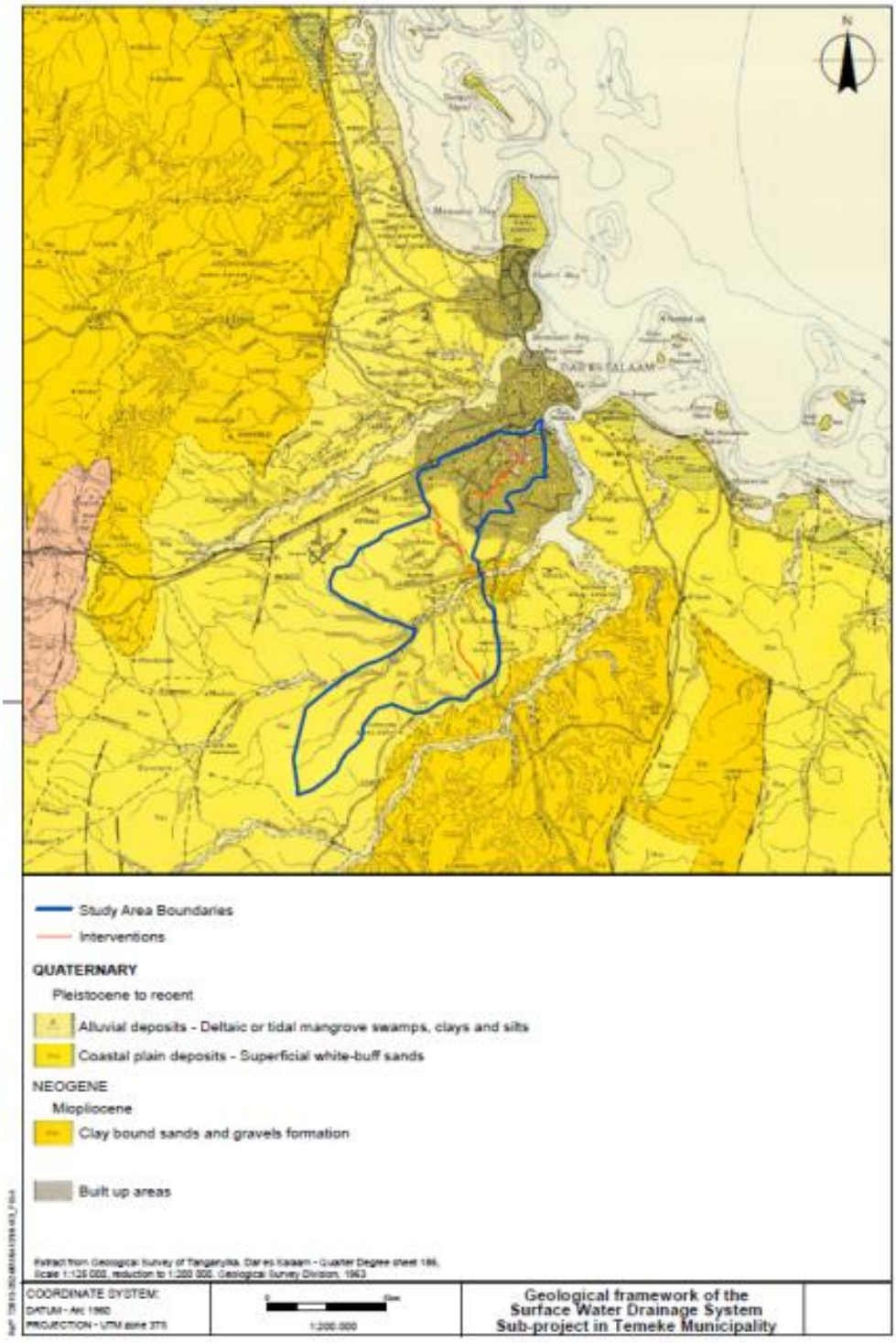
(PROCESL/COWI, 2014)

Specifically, the topography of the Core Impact Area of the Sub-projects can be considered to be relatively flat, with the highest elevation of about 59 meters from the terrain and the lowest levels being 31 metres.

4.1.2 Geology and soils

GEOLOGY

According to the Quarter Degree Sheet 186 of the Geological Survey of Tanganyika (1963) (see Figure below) the study area has two major geological units: (i) the underlying substratum of (semi-consolidated formations and outcropping rocks that consist of Neogene clay-bound sands to hard sandstone; and (ii) the superficial mainly loose sediments of the Quaternary System which are more extensive in the central and southern parts of Dar es Salaam region and consisting of less consolidated terrace sands and sandstones and recent alluvium (Mtoni et al., 2012).



(Adapted from the Quarter Degree Sheet 186 of the Geological Survey of Tanganyika, PROCESL/COWI, 2014)

FIGURE 10

GEOLOGICAL FRAMEWORK OF THE SURFACE WATER DRAINAGE SYSTEM SUB-PROJECT IN TEMEKE MUNICIPALITY

SOILS

The soil is a finite, limited and non-renewable resource. The degradation processes associated with loss of ability to perform its functions are reflected in its inability to maintain or sustain vegetation.

It is on this basis that it is important to analyse the types of soils in the study area of the Project, whose physical and chemical characteristics associated with external factors provide greater or lesser suitability for their use.

Soil types map of Tanzania was used for the identification of soils that occur in the study area (scale 1: 5 000 000, Soil Map of the World; latest version presented in 1988) where the soils are distinguished into two taxonomic levels established by this classification. (1). a first level identified with the units correspondent to the designation of major soil groups and; (2) a second level corresponding to the soil-units in which those groups are subdivided.

Additionally, Draft Report of Soils of Tanzania and their Potential for Agriculture Development (2006) was consulted.

Legal framework

As mentioned in chapter 3 Tanzania soils protection is regulated by the Environmental Management (Soil Quality Standards) Regulations, 2007. Considering that the area where will be deployed Serengeti detention pond is a natural area it is important to emphasizes the provisions of paragraph 6 of Part II, in which it is stated that "(...) *every person shall comply with soil quality standards and minimum standard of soil quality standards approved and published under these Regulations*," establishing for this purpose, maximum allowed limits in habitat and agricultural soils for the following pollutants: volatible organic compounds, heavy metals, pesticides and others chemicals.

SOILS CHARACTERIZATION

The thematic map developed for this characterization (**FIGURE 11**, presented below) shows the presence of two main groups in the study area, divided on a soil-unit (**TABLE 9**).

TABLE 9

SOILS IN THE STUDY AREA

Main groups	Soil-unit
Acrisols (AC)	Orthic Acrisols (Ao)
Arenosols (AR)	Cambic Arenosols (Qc)

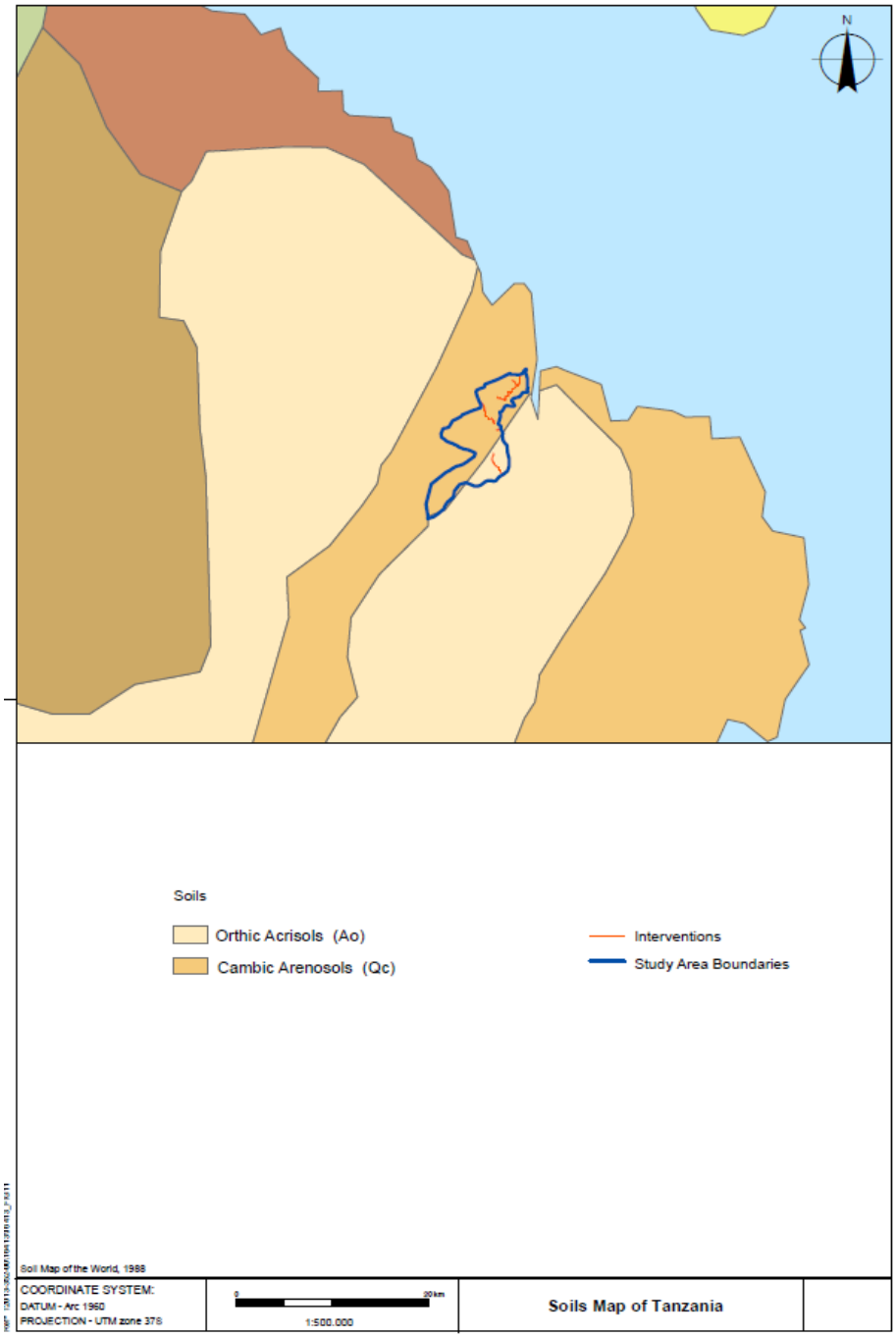
(PROCESL/COWI, 2014)

The Soil Group of the **Arenosols (AR)** occurs in the study area where interventions TE2, TE3, TE9, TE8, part of TE4 and Serengeti detention pond will be carried out. This group is conditioned by the particular properties of their parent material, usually quartz-rich soil material or rock, and soils developed in recently deposited sands. In the French classification system (CPCS, 1967), Arenosols correlate with taxa within the "Classe des sols minéraux bruts" and the "Classe des sols peu évolués". Other international soil names to indicate Arenosols are `siliceous, earthy and calcareous sands' and various `podsolic soils' (Australia), `red and yellow sands' (Brazil) and the Arenosols of the FAO Soil Map of the World.

Arenosols occur in vastly different environments and possibilities to use them for agriculture vary accordingly. All Arenosols have a coarse texture, accountable for the generally high permeability and low water and nutrient storage capacity and present a very low fertility.

The Soil Group of the **Acrisols (AC)** occur in part of TE4 intervention. These soils are typical red and yellow of wet tropical and subtropical regions. They are characterized by accumulation of low activity clays in an argic subsurface horizon and by a low base saturation level. Acrisols correlate with `Red-Yellow Podzolic soils" (e.g. Indonesia), "Podzolicos vermelho-amarello distroficos a argila de atividade baixa" (Brazil), "Sols ferralitiques fortement ou moyennement désaturés" (France), "Red and Yellow Earths" and with several subgroups of Alfisols and Ultisols (Soil Taxonomy, USA).

Acrisols are acid soils rich in kaolinite, poor in nutrient, of low fertility and accumulate clay in the subsoil.



(Adapted from Soil Map of the World, PROCESL/COWI, 2014)

FIGURE 11
SOILS MAP OF TANZANIA

RISK OF EROSION

The Tanzania Erosion Hazard Map (scale 1:1 500 000, to reduce scale 1:2 000 000), published by the Southern African Development Coordination Conference (SADCC) was used to identify and analyse erosion risk areas within the project area. In this map the risk of erosion is classified into four classes [low, medium, high and very high] associated to a combination of factors, natural and anthropic and listed in the following table, each with a specific action (**TABLE 10**).

TABLE 10

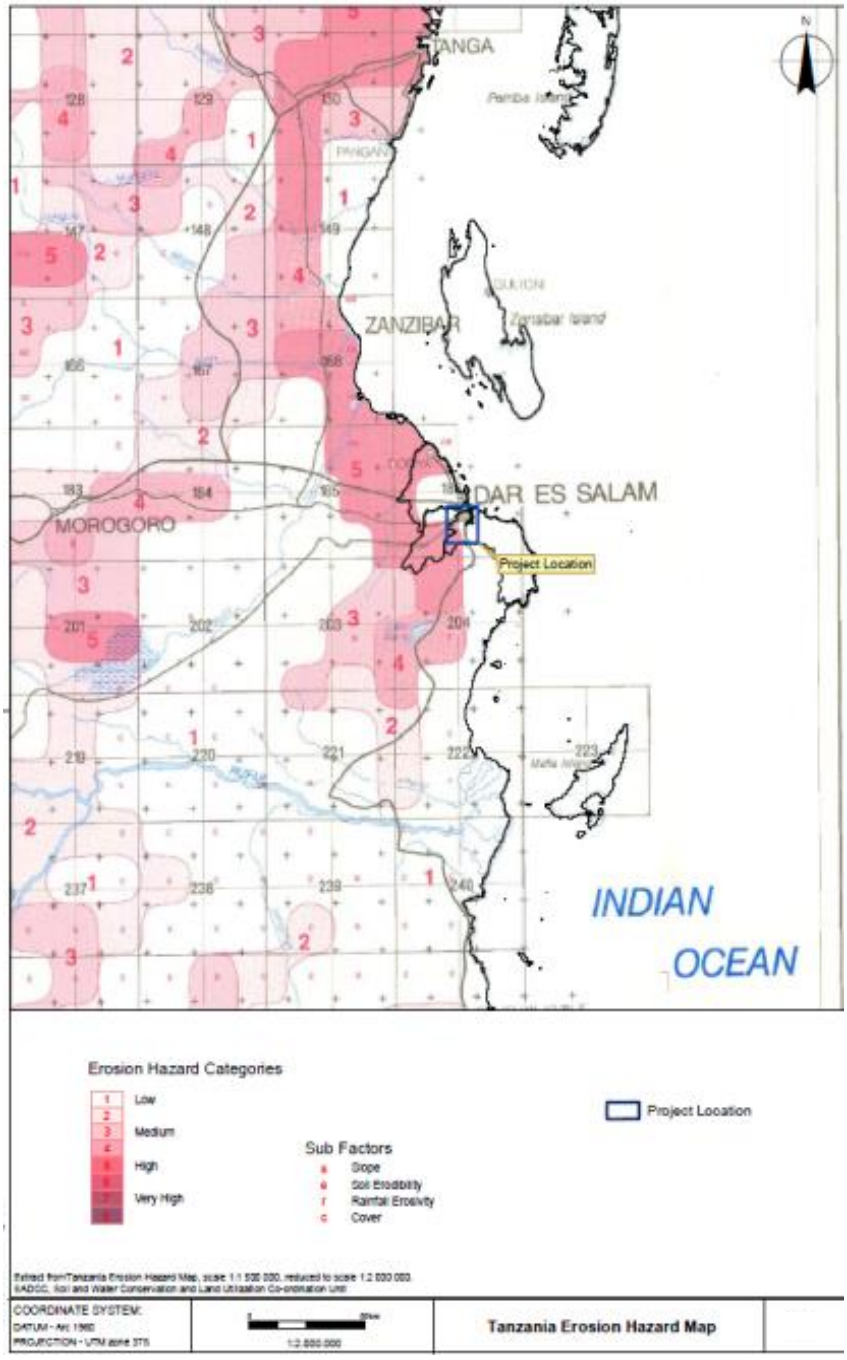
EROSION FACTORS

Factors		Action
Natural	Slope	The higher the slope, the greater the flow rate and consequently, minor is the susceptibility to erosion.
	Soil erodibility	Influences the erosion resistance. The higher the erodibility of soil, the lower is its resistance and consequently the higher the susceptibility to erosion.
	Rainfall erosivity	Increase the intensity of erosion. The higher the rainfall erosivity, greater the risk of erosion.
Anthropic	Cover	Influence exposure to erosion. The higher the vegetative soil cover, the greater the resistance to impact of rainfall and infiltration, reducing runoff and consequently minor to erosion susceptibility.

(PROCESL/COWI, 2014)

The figure presented below, suggests the following conclusions:

- The study area has a low risk of erosion;
- The synergetic effects of natural factors have small influence in determining the risk of erosion. Although identified soil conditions give them high susceptibility to erosion, the associated relief, essentially flattened, wavy with almost zero or very weak slopes, decreases the flow conditions and the slow surface runoff decreases the risk of erosion;
- The risk of erosion results primarily from human activity, mainly by inadequate management of soil, where the plant cover is replaced by relatively dense urban areas with sparse vegetation.



(Adapted from Tanzania Erosion Hazard Map, PROCESL/COWI, 2014)

FIGURE 12

TANZANIA EROSION HAZARD MAP

There are several erosive evidences observed in the study area. The most threatening phenomena is siltation caused by spoils of waste improperly thrashed by local people into the rivers. This situation further aggravates the existing flooding problems (**PHOTO 7**).

(Field work, PROCESL/COWI, 2014)

PHOTO 7

EROSION ON SOILS AND DEPOSIT OF DEBRIS, KWA SHEGO

4.1.3 Climate

Characterizing the climate of a region will contribute to the prediction and evaluation of impacts on other environmental factors such as air quality and water resources since it is not expected that the project, given its characteristics, lead to changes in climate and weather conditions prevailing, both locally than regionally.

Dar es Salaam is located in the East African region within an equatorial type of climate. Tanzania generally lies in the tropical savanna belt while Dar es Salaam is located in the wetter and warmer coastal area. The climate in the coastal region is characterized by relatively high annual precipitation, well over 1000 mm per year.

Tanzania has been assessed and divided into climatic zones (Dry, Moderate and Wet) as described by the Tanzania Pavement and Materials Design Manual, 1999. This documentation gives relevant guidance on pavement and earthworks design standards in relation to prevailing climatic conditions. Dar es Salaam falls within the Moderate Zone.

4.1.4 Hydrology and water resources

Gerenzani Creek river has a length of approximately 2 km and a basin area of 13,1 km^2. Kizinga river has a length of approximately 80 km and a basin area of 211,5 km^2 and Yombo river has a basin area of 24,9 km^2.

Like the rest of Dar es Salaam city, rainfall catchment at these basins occurs in two seasons: March – June and October – December, and the annual rainfall ranges between 1 000 and 1 200 mm.

Water quality

Dar es Salaam is the most industrialized city in Tanzania, accounting for 80% of the country's industries, exerting pressure to its surroundings and overall environmental quality. Many industries like chemical factories, agro-industries, breweries, soap and steel-manufacturing establishments discharge untreated effluents directly or through storm water drainage, river creeks and streams or estuary drainage into the sea.

Surface waters are generally heavily polluted by wastewater originating from industries, households, road surfaces, drains and small-scale enterprises. On this basis it is likely that shallow surface waters are unsuitable for potable water supply.

Water quality standards and guidelines are set up by the government or international organizations such as the World Health Organization (WHO). In Tanzania standards are set by the Tanzania Bureau of Standards (TBS).

Sources of pollution

According to Dar es Salaam Master Plan (2012 – 2032) heavy metal contamination has been reported in several areas of Dar es Salaam.

Much of the lead contamination is traffic related, with a strong correlation between average traffic density and soil lead levels. Traffic also contributes to soil contamination with hydrocarbons. [Dar es Salaam Master Plan (2012 – 2032)].

Several other hydrocarbon based industrial activities in Dar es Salaam anticipate an extensive hydrocarbon contamination in the city [Dar es Salaam Master Plan (2012 – 2032)]. According to Dar es Salaam Master Plan (2012 – 2032) the major sources of pollution and contamination of waters include:

- Oil refineries, pipelines, tank farms, fuel depots and fuel stations;
- Landfills and self-disposal of waste;
- Industry, particular where these discharge untreated effluents directly or through storm water drainage into water courses or the sea;
- Industry, general contamination (heavy metals, organics, etc.);
- Pit latrines and other forms of sewage treatment/disposal;
- Lead contamination from traffic;
- Hydrocarbon leakages from transport.

Storm water

Storm water channels are managed by TANROADS along the trunk roads. Along smaller or informal roads the channel are the responsibility of the local municipality.

The city drainage is broken down into two components, the main drainage system and flood protection structures that are managed by the Dar es Salaam City Council (DCC). The second component is street and local drainage that is provided by individual landowners [Dar es Salaam Master Plan (2012 – 2032)].

TABLE 11 below presents the length and state of Temeke Municipality Council storm water drainage system network.

TABLE 11

TEMEKE MUNICIPALITY COUNCIL TYPE OF STORM WATER DRAINAGE

Type of System	Condition			
	Good (km)	Fair (km)	Poor (km)	Total (km)
Lined	104	---	24	128
Unlined	---	---	87	87
Underground	---	---	10	10
Total	104	---	121	225

(Dar es Salaam Master Plan (2012 – 2032))

Hydrogeology

Groundwater is one of the most important sources of water supply in the world. In highly urbanized areas, like the study area, population growth has lead led to an increase in socio-economic activities causing an increasing demand for water supply.

In the last two decades, the use of groundwater in Dar es Salaam city has increased considerably due to the scarcity of surface water sources. Since 1997, different organizations have promoted the drilling of boreholes to try to meet the demand of water supply in the city. It is estimated that about 1 000 boreholes are drilled annually (Baumann et al., 2005). All these put a strain on the fresh groundwater promoting threats like pollutants contamination and over abstraction that can lead to intrusion of salt water in fresh water aquifers (Mtoni et al., 2012).

According to Mtoni et al. (2012) over 50% of the residents rely on groundwater for drinking, irrigation and industrial purposes. There are more than 7 500 active boreholes/wells in different locations of the city, extracting water from the Quaternary coastal aquifer and annual exploitation of the aquifer has reached around 69,3x106 m^3 (ibid).

4.1.5 Air quality

Ambient air quality standards are ambient air quality levels established and published through national legislative and regulatory processes, and ambient quality guidelines refer to ambient quality levels primarily developed through clinical, toxicological, and epidemiological evidence, such as those published by the World Health Organization (WHO)[7].

Considering that it is expected that during the construction phase of the project impacts on ambient air quality arise through the emission of dust and exhaust fumes from construction equipment and machinery, it is important to understand the legal framework in relation to air pollution that may be taken preventive and mitigation measures.

The International Finance Corporation (IFC) (World Bank Group) Environmental, Health and Safety (EHS) Guidelines state that emissions should not result in pollutant concentrations that reach or exceed relevant ambient air quality as outlined in the legislative standards, or in their absence, the current WHO Air Quality Guidelines (WHO, 2005). Air quality standards are outlined in "Environmental Regulations and Standards, Tanzania Bureau of Standards, 2007". The standards look at ambient air as well as emissions from stationary sources.

TABLE 12 presents the ambient air quality Tanzanian Standards and WHO Guidelines.

[7] WHO air Quality Guidelines for particulate matter, ozone, nitrogen, dioxide and sulphur dioxide. Global update 2005. Summary of risk assessment, World Health Organization and; Air Quality Guidelines for Europe. World Health Organization Regional Office for Europe Copenhagen WHO Regional Publications, European Series, No. 91 Second Edition, 2000.

TABLE 12

AMBIENT AIR QUALITY STANDARDS AND GUIDELINES

Pollutant	Averaging period	Tanzania Standards in µg/m³ [8]	WHO Guidelines in µg/m³ [7][9]
Sulphur dioxide (SO_2)	24-hour	100	125 (Interim target-1) 50 (Interim target-2) 20 (guideline)
	10 minute	---	500 (guideline)
	Annual	40-60	---
Nitrogen dioxide (NO_2)	1-year	100	40 (guideline)
	1-hour	---	200 (guideline)
	8-hour	120	---
	24-hour	150	---
Black Smoke	--	40-60	---
Particulate matter PM_{10}	1-year	60-90	70 (Interim target-1) 50 (Interim target-2) 30 (Interim target-3) 20 (guideline)
	24-hour		150 (Interim target-1) 100 (Interim target-2) 75 (Interim target-3) 50 (guideline)
Particulate matter $PM_{2.5}$	1-year	---	35 (Interim target-1) 25 (Interim target-2) 15 (Interim target-3) 10 (guideline)
	24-hour	---	75 (Interim target-1) 50 (Interim target-2) 37,5 (Interim target-3) 25 (guideline)
Carbon monoxide (CO)	8-hour	10 000	10 000
	1-hour	30 000	30 000
	15 min	100 000	100 000
	30 min	60 000	60 000

[8] Environmental Management (Air Quality Standards) Regulations, 2007. First Schedule – Permissible weight concentration (emission Limits) from the atmosphere to a receptor and respective test Methods.

[9] Interim targets are provided in recognition of the need for a staged approach to achieving the recommended guidelines.

Pollutant	Averaging period	Tanzania Standards in µg/m³ (8)	WHO Guidelines in µg/m³ (7)(9)
Lead (PB)	1-year	2	0,5
Ozone (O_3)	8-hour daily maximum	120	160 (Interim target-1) 100 (guideline)
	1-year	10-100	---

(PROCESL/COWI, 2014)

Air quality is affected by various pollutants. The major sources of air pollution in Dar es Salaam city are motor vehicles (believed to be the primary source affecting ambient air quality), industrial pollution and residential burning of fossil fuels[10].

According to Dar es Salaam Master Plan (2012 – 2032)[11] residents living in areas within the vicinity of major roads, such as Pugu Road and Kilwa Road (B2), are likely to be exposed to long-term concentrations of nitrogen dioxide (NO2) and inhalable particulate matter (PM_{10}) that exceed WHO Guidelines.

Urban Air Quality Monitoring has been undertaken as part of the Air Quality Monitoring Capacity Building Project (ARMCBP).

The AQMCBP is a project concluded in 2007 and was implemented in three municipalities of the city of Dar es Salaam with the aim of establishing baseline data and information on the content of selected impurities in ambient air. The major project activities included monitoring of air quality through sampling and establishing a database information on ambient air quality.

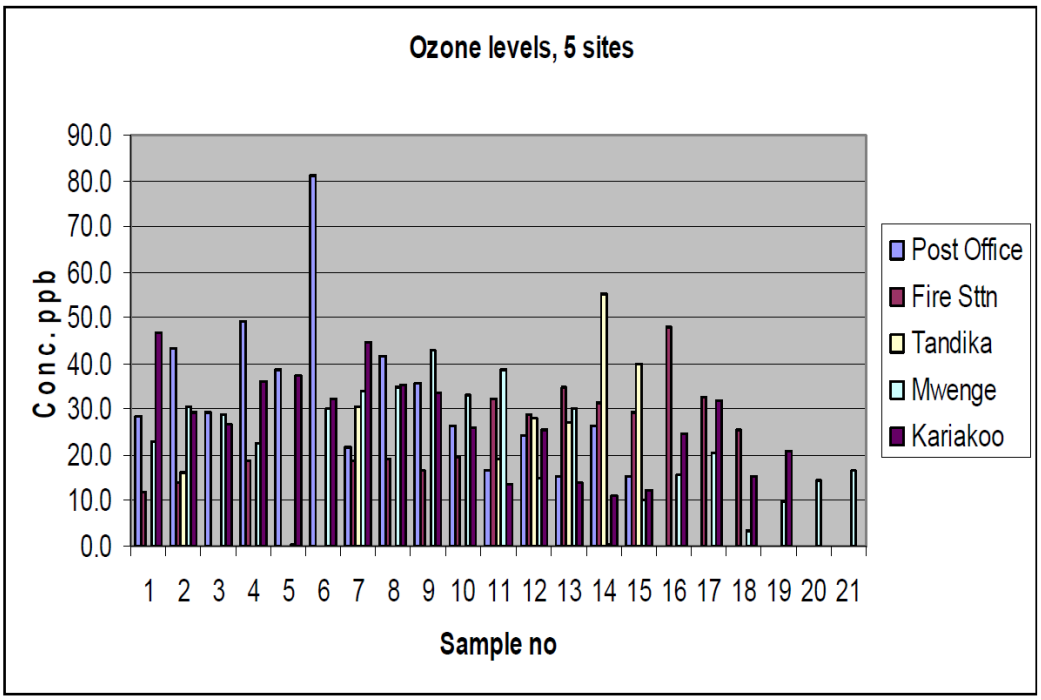
Five locations have been selected within the city and a number of pollutants were monitored (PM_{10}, NO_x, SO_x and O_3):

- 2 roadside sites along Morogoro road;
- 2 residential and 1 commercial.

The following figures present the available obtained results.

[10] Geofrey Kamukana " The City of Dar es Salaam striving to resolve environmental problems"

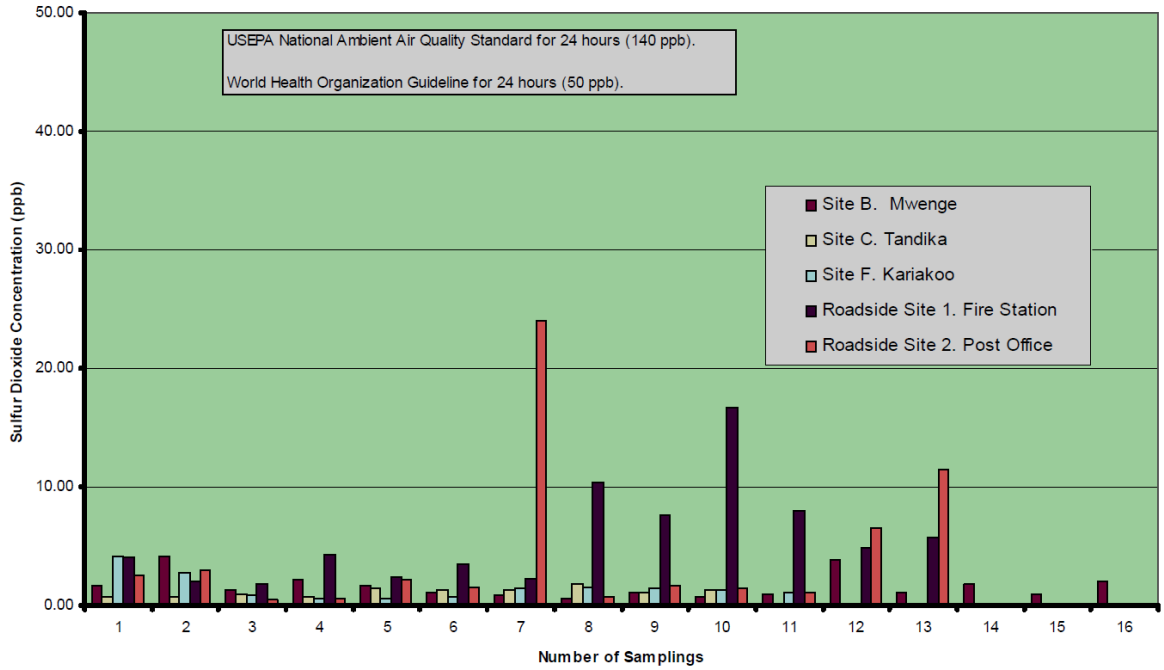
[11] Dar es Salaam Master Plan 2012 – 2032. Dodi Moss, Buro Happold, Afri Arch, QConsult, March 2012.



(Adapted from AQMCBP, PROCESL/COWI, 2014)

FIGURE 13

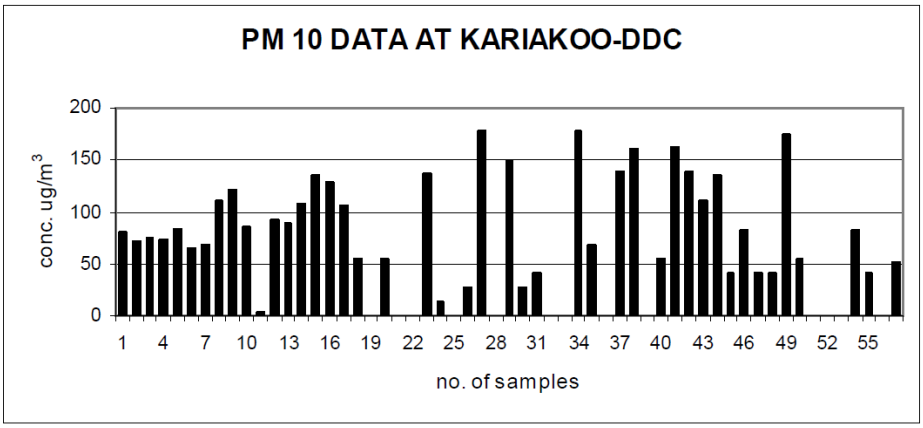
OZONE LEVELS



(Adapted from AQMCBP, PROCESL/COWI, 2014)

FIGURE 14

SULPHUR DIOXIDE CONCENTRATION



(Adapted from AQMCBP, PROCESL/COWI, 2014)

FIGURE 15

PM_{10} CONCENTRATION

Despite the distance to the study area, Karakoo site is the one that better characterize the Sub-projects area, once Tandika data is not available.

Analysing the figures, it can be said that only the PM_{10} levels exceeded the pollution limits set in the Tanzania standards and WHO guidelines, presenting average levels above 100 µg/m^3.

The deterioration of air quality in these areas has been, mainly linked with increased traffic volume, industrial activities and the poor state of roads (i.e. unpaved).

4.2 ECOLOGICAL AND ENVIRONMENTAL CHARACTERISTICS

4.2.1 General vegetation (flora)

Temeke Municipality has a total of 2 041 ha of natural forest reserve area including the coastal mangrove along the creeks and estuaries and on coastal shores occupying an area of about 27,03 ha. These forests contain unique indigenous wood species such as teak and ebony.

Specifically, in the project area, the existing vegetation is scarce and located close to the open drain, mainly bush thickets mixed with annual herbs, grasses and some trees, mainly palms, *Acacias* and banana and papaya trees.

4.2.2 General wildlife (fauna)

Temeke Municipality contains a significant amount of domestic and non-domestic fauna species including livestock, poultry, wild birds, snakes and other reptiles on the fringes of peri-urban areas e.g. Kigamboni and Mbagala areas.

The main fauna found in close to the Sub-projects in Temeke Municipality include domestic animals and some wildlife, predominantly generalist and tolerant to human presence like house rat (*Rattus rattus*), bufo (*Amietophrynus gutturalis*), crows and sparrows.

In summary, it can be said that the Sub-projects area has no remarkable wildlife resources.

4.2.3 Conservation status

Sub-project areas do not contain in any forest reserves, no National Parks or any form of conservation area as defined in the National Wildlife Policy. The nearest protected area is Vikindu Forest Reserve, located 4 km S the study area (**FIGURE 16**).

Vikindu is a forest reserve located in Pwani where tree harvesting was extremely intensive due charcoal burning (Ahrends, 2005). Thus large part of vegetation is generalist (ex. *Markhamia obtusifolia, Lannea schweinfurthii, Hymanaea verrucosa, Afzelia quanzensis*) or sunloving/pioneer (ex. *Acacia brevispica*).

Temeke Municipality is located in one of the biodiversity hotspots for conservation (Coastal Forest of Tanzania/Kenya - Myers *et al.*, 2000). This area belong the Northern Zanzibar-Inhambane Coastal Forest Mosaic ecoregion that are among areas with highest densities of plant species in the world.

Municipal encompasses a wide variety of ecosystems, including aquatic and terrestrial, such as freshwater wetlands, coastal & marine, forests, savannah, dry lands and hilly areas and is characterized by notable distinct land forms having homogenous potential for development as follow:

(i) High Land

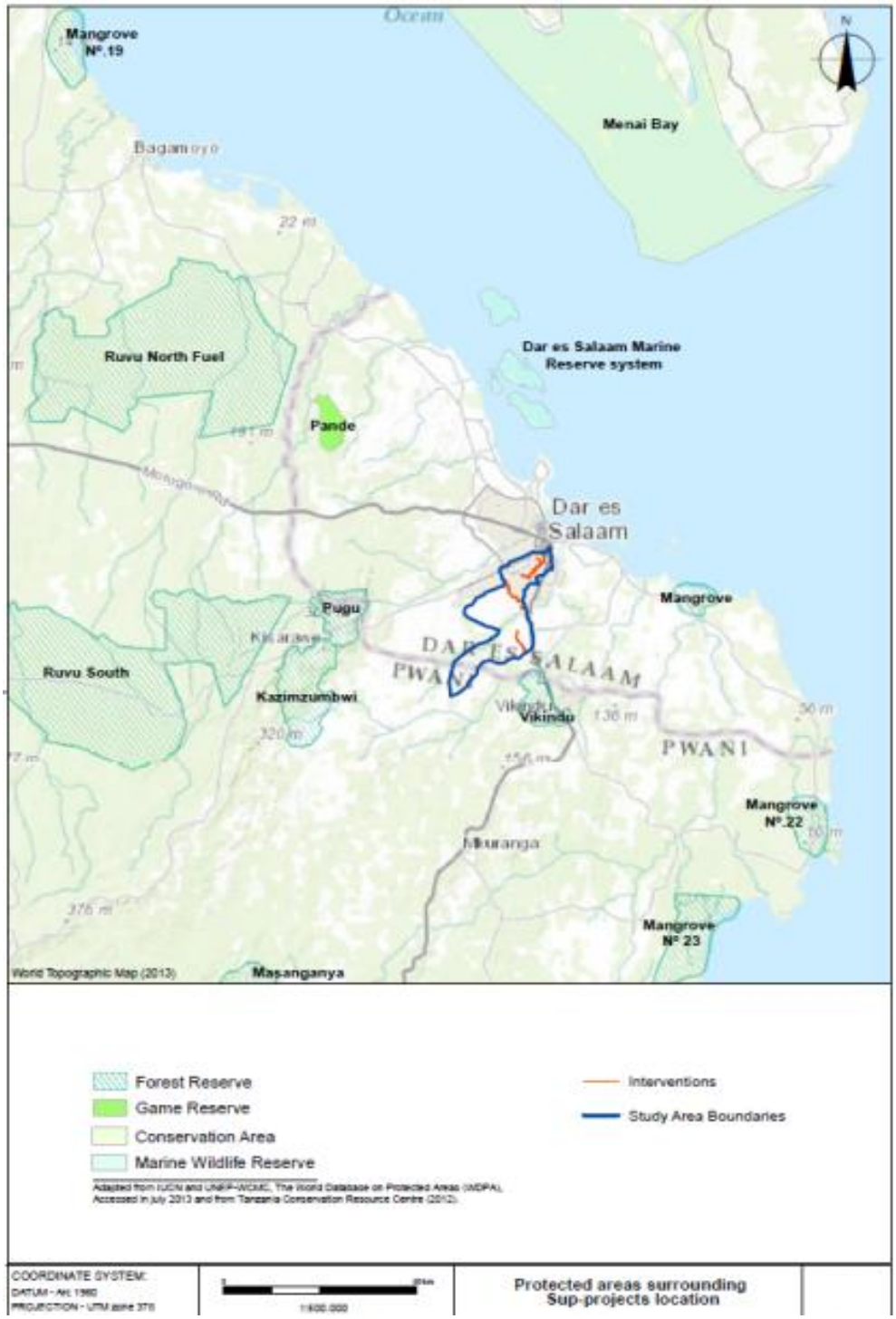
The highland consists of small hilly ridges of Chekeni Mwasonga and Chamazi. In this zone, the soil is steadily being degraded due to continuous cultivation. The highland in Temeke Municipality is where woodland and seasonal streams originate from and where farming activities and informal residential development are actively taking place.

(ii) Relative upper land

In upper land zone construction developments have occupied a large part of the area due to continuing urbanisation process. Most parts have been developed into either residential, industrial or commercial area such as Mbagala, Miburani, Kibada and Tuangoma.

(iii) Lowland

The low and is found along flood plains of Yombo River, Keko valley, Unubini, Migombani and Kigamboni. The land is suitable for urban farming activities such as gardening. However, in most parts, these areas are characterised by unplanned settlements which are prone to seasonal flash flooding.



(Adapted from The world Database of Protected Areas, PROCESL/COWI, 2014)

FIGURE 16

PROTECTED AREAS SURROUNDING SUB-PROJECT LOCATION

(iv) Ecological Zones

Temeke Municipal Council is divided into three ecological zones:

a) The northern upland zone of Mtoni Kijichi escarpment, Keko, Temeke, Mtoni and Tandika;

b) The central zone of Mbagala, Chamazi, Yombo Dovya, Kongowe plateau and Kigamboni;

c) Southern low land parts of Kisarawe II, Amani Gomvu, Kimbiji, Chekeni Mwasonga;

d) Most of these areas are covered by sandy soil. The main natural vegetation is Coastal shrubs, Miombo woodland, Coastal swamps and mangrove trees.

(v) The Mangroves

The mangroves cover a total area of 2,051.7 ha within Temeke area (**TABLE 13**). Mangroves are located along the creeks and estuaries and on coastal shores. Mangrove forests serve as a nursery for many species and provide physical habitat for numerous fish, crustacean and many varieties of important marine species. Mangroves are cut and used by local people for construction, export, firewood and charcoal making. Most of illegal mangrove cutting in Tanzania are conducted on unregulated bases and are carried out without permits although mangrove forests are gazette as forest reserves areas.

TABLE 13

MANGROVE DISTRIBUTION WITHIN TEMEKE DISTRICT

S/N	District	Area (in hectares)
1	Mbezi River	570.3
2	Mbuyuni	476.7
3	Shugu/ Mtandika	270.8
4	Ras Dege	245.0
5	Mbwa Maji	29.6
6	Mji Mwema	80.9
7	Mtoni	378.4

(Dar es Salaam Marine Ecology Conservation Project)

4.3 FINANCIAL AND ECONOMIC BASELINE CHARACTERISTICS

4.3.1 Agriculture

Agriculture is still an important economic activity especially in the peri-urban area of the municipality. Out of the Municipal's 656 000 ha of land, 40 000 ha is potential arable land. However, only 28 000 ha (70%) is used for crop production[12].

In the last 10 years, agricultural lands in the fringes of urban settlements have been an important reserve for city expansion, especially in areas like Charambe, Mbagala, Mjimwema, Pembamnazi, Kimbiji, Somangila, and Kisarawe II. An improved road infrastructure in Kigamboni areas has not only led to faster settlement development, but also foster agricultural production through better market access.

In addition, small nurseries that produce trees and ornamental plants have been cropping up for the last two years particularly in Mjimwema Chamazi, Charambe, Toangoma, Kurasini and Temeke areas. Apart from the private nurseries, Temeke Municipal Council has been playing a role model by providing two botanical gardens at Mtoni and Gezaulole that provide tree seedlings and ornamental plants. The peri-urban and rural areas of Kimbiji, Somangira, Chamazi Pembamnazi, Mjimwema, Toangoma, Vijibweni and Kisarawe II wards are famous for maize, rice, legumes, cassava, sweet potatoes, fruits and nuts.

Food Crops Production

Food production contributes only 30% of the requirements. The remaining 70% is obtained from outside the municipality. The major food crops produced include Cassava, paddy, maize, sweat potatoes and cowpeas.

Cash Crops

Traditionally cashew nuts used to be the major cash crop in Temeke Municipality. Introduced late in the 19th century, the crop dominated as a cash earner for most of the householders. However, in late 1970s to 1980s people started diversification to other crops such as tomatoes, vegetables and fruits. Agriculture diversification was precipitated by marketing problems associated by falling prices of cashew nuts. Most of the farms were abandoned or simply left unplanted. The government, through agricultural policies and strategies, started making efforts to revamp the

[12] Temeke Municipal Profile (2012)

cashew nuts crop countrywide. In Temeke Municipality cashew nut production began to pick up again during the late 1990s.

4.3.2 Livestock keeping

Livestock is another important component of agriculture which contributes to about 20% – 30% of milk supply within the municipality. There are about 5 982 dairy cattle, 6 480 indigenous cattle, 304 dairy goats, 7 080 indigenous goats, 1 948 sheep, 176 721 broiler chickens and layers, over 2945,00 indigenous chicken, 30 210 ducks, 586 rabbits, 22 horses, 46 camels, 25 donkeys and 4 880 pigs.

Livestock production in the municipality is divided into two categories: urban and peri-urban. In urban areas livestock is raised in bookshelf cages and well-built sheds on backyard of houses. In peri-urban areas some farmers practice zero grazing (especially farmers in projects like HPI, Heifer in Trust Scheme & DADP's) and a large number of indigenous cattle are kept in tradition grazing system.

4.3.3 Fish and fisheries

Temeke Municipality Council has a coastal area for fishing of 70 km in length, from Kigamboni to Tundwi (Pemba mnazi). The Municipal Council is responsible for all fishing activities to ensure that fisheries zone is sustainable for the present generation and the new coming generation. The municipal council is planning good strategies to utilize the fish resources to present and future beneficiaries. According to the statistics in 2010 (Marine Survey) the numbers of fishermen were 5 320 and a total of 3 195 fishing vessels (2 099 registered fishing vessels and 1 096 unregistered vessels).

4.3.4 Tourism

Tourism in Temeke is mainly attracted to white sand beaches and hotels located along the coastal areas. There are also other sites of interest such as geological sites and historical centers like Kimbiji, Mbwamaji and Gezaulole. Currently, tourism in the Country is under central government, where by there is a tourist authority which is responsible for tourism development. There is very little room for the Municipal Council to develop tourist programmes.

4.3.5 Mining

There are two main extraction activities in the municipality: salt production and sand quarrying. Sand is mined for use as building materials. Sand extraction is carried out in quaternary sand

deposits and in several rivers and streambeds and around built-up areas in the municipality including Vijibweni, Charambe, Mbagala and Yombo Vituka, Kizinga and Mzinga.

To prevent environmental degradation specific areas have been allocated and legal actions taken against culprits who fail to comply with established laws and regulations intended to protect mineral resources. In 2009/2010 it estimated that about 211 heavy duty trucks had transported sand/gravel per day averaging 8-10 tons.

4.3.6 Industrial development

There are nearly 40 major industries clustered in Temeke Municipality along Chang'ombe Industrial area which is situated in the northern part of the municipality. The other over 158 medium scale industries are located in Mbagala, Kurasini and Vijibweni. Manufacturing and processing industries are dominant in Chang'ombe, Mbagala and Vijibweni. Service industries which include garages and warehouses are situated in Kurasini, along Mandela highway and part of Kilwa road. Wood products such as furniture making and manufacturing industries are concentrated in Keko Magurumbasi and Temeke Yombo.

4.4 SOCIAL SERVICES AND INFRASTRUCTURAL CHARACTERISTICS

4.4.1 Water supply and sanitation

Water supply

Water required for Temeke Municipality is 88 365 million liters per day while the current supply level is only 68 43 million liter per day which is equivalent to 68.43%. The major source of water is the water distribution system owned by Dar es Salaam Water and Sewerage Authority (DAWASA) and managed by Dar es Salaam Water and Sanitation Corporation (DAWASCO) which partially serve 12 wards out 30 wards i.e Mbagala, Kizuiani, Charambe, Mianzini, Keko, Kurasini, Tandika, Azimio, Temeke, Mtoni, Chang'ombe and Miburani (**TABLE 14**). The other source of water is 231 boreholes which are managed by institution, water user association (water committees) and private owned boreholes.

As mentioned in the project description chapter, in this regard refers that is not expected that the project rehabilitation/improvement will require large amounts of water, therefore water supply to the population should not be affected.

TABLE 14

STATUS OF WATER SUPPLY IN TEMEKE MUNICIPALITY

S/N	Ward	Water Well	Join to DAWASCO
1	MBAGALA	16	712
2	CHARAMBE	20	552
3	YOMBO VITUKA	25	0
4	MAKANGARAWE	12	0
5	KEKO	5	972
6	KURASINI	12	112
7	VIJIBWENI	5	0
8	MJIMWEMA	13	0
9	P/MNAZI	4	0
10	KIMBIJI	6	0
11	SOMANGILA	13	0
12	TOANGOMA	9	0
13	TANDIKA	10	613
14	AZIMIO	2	425
15	SANDALI	4	0
16	MBAGALAKUU	17	0
17	TEMEKE	5	891
18	KISARAWE II	8	0
19	MTONI	6	728
20	CHAMAZI	7	0
21	CHANG'OMBE	10	704
22	MIBURANI	10	328
23	KIBADA	2	0
	TOTAL	**231**	6,037

Sanitation

DAWASA has nine sewage treatment networks, eight of which use stabilization ponds to treat water before discharging to nearby stream and rivers. The ninth covers the Central Business District (CBD) and discharges directly to the sea via a 1 km pipe. These networks serve around 10-14% of the city area [Dar es Salaam Master Plan (2012 – 2032)].

The project area is characterized not only by poor drainage but also inadequate sanitation facilities. This situation causes runoff to be mixed with excreta, which can spread pathogens around communities and increase health problems from various waterborne diseases. For example, infiltration of polluted water into low-pressure water supply systems can contaminate drinking water and can become a potential cause of gastrointestinal disorders. The poor sanitation condition makes the area become contaminated with faecal matter, hence providing ideal conditions for the eggs of parasitic worms, such as roundworm and hookworm, which can cause debilitating intestinal infections.

Regarding this, the Municipal Council will be required to promote on-site sanitation through introduction of appropriate pit latrine technology in unplanned settlement in Sub-projects area. The effort of TMC should be supplemented by DAWASCO, in order to introduce construction of sewerage systems and encourage local residents to be connected to the sewerage systems. The introduction of sewerage system will minimize the problem of discharging raw sewage by local residents into storm water drainage systems.

4.4.2 Waste Management

Currently Dar es Salaam faces a great challenge regarding the municipal waste management strategy. Waste collection system in place has been proven inefficient posing environmental and health hazards to the population.

According to the Municipal Solid Waste Management Project in Dar es Salaam, in preparation for the DMDP[13], the municipal waste is collected nearby households, commercial establishments, institutions and industry by either the DLAs or private sector and taken directly to Pugu dump (**PHOTO 8**).

[13] Municipal Solid Waste Management in Dar es Salaam - Draft Baseline Analysis. Prepared for the World Bank. Washington, DC. October, 2012. Dar es Salaam Metropolitan Development Projects 2011, Waste Management Projects.

(Field work, PROCESL/COWI, 2013)

PHOTO 8

PUGU DUMPSITE

In some cases, where collection vehicles cannot access, waste is collected and taken to the collection sites by handcarts before being transported to Pugu waste dump.

According to the same study, there is no current waste management practice in the unplanned areas of the city. Thus, population disposes of their waste into drainage ditches, streams and by the roadside. In some cases in large amount of waste is disposed, potentially leading to disease vectors for soil, water and groundwater pollution.

Smaller, informal dumping sites used by residents in unplanned areas and one improper waste dumpsite have been closed in Temeke Municipality in the past two decades. These generated, and in some cases continue to generate, environmental concerns; namely Mtoni dumpsite that operated from 2008 to 2010 located adjacent to harbour (gas collection and flaring in place).

Solid waste production in Dar es Salaam is estimated to be about 4,161 tons/day against an approximate collection and disposal of only 1,533 tons/day, which means that nearly 63% of the produced solid waste is improperly disposed of, usually near the urban unplanned settlements and illegal commercial spots alongside roads and watercourses.

According to Temeke District Profile the amount of waste produced in Temeke Municipality is 1,035 tons per day containing domestic and non-domestic waste such as plastics, paper, metals, glass and other organic materials.

TABLE 15 and **TABLE 16** below shows sources and amount of waste produced in Temeke Municipality in the year 2010. Due to lack of resources, funds and equipment, the council was able to collect only 280 tons per day (37%). Thus, the council's capacity to collect and manage solid waste within Temeke Municipality lags far behind the actual production.

TABLE 15

WASTE PRODUCTION

No.	Source	Quantity/day (tons)	Percentage (%)
1	Domestic	743	71.78
2	Street sweepings & drainage cleaning	51	4.92
3	Hotels and Restaurants	15	1.5
4	Markets	29	2.8
5	Commercial establishments	147	14.20
6	Hospitals & dispensaries	14	1.35
7	Industries	36	3.37
Total		**1035**	**100**

TABLE 16

TYPES OF WASTE PRODUCED

Constituent	Average
Physical characteristics (%)	
Paper	11,0
Plastic	7,5
Metals	6,0
Glass	7,9
Organic and compostable	67,6

Solid waste management practices in Temeke Municipality

Temeke Municipal Council, like other Local Authorities in Tanzania, is vested with the responsibilities of removal of wastes from public areas as well as from households [Local Government (Town Authorities) Act No. 8 of 1982 sect. 55 g]. The council carries out this function through primary and secondary collection methods within the municipality.

1. **Primary collection**

Primary collection method entails collection of wastes from generating units such as households (house to house solid waste collection). This method is commonly used by CBO's, NGO's and contractors.

2. **Secondary collection**

The secondary collection method entails secondary collection points or transfer stations/kiosks. By this method, solid waste generated from household units/producers is taken to collection points by individuals or contracting agents using wheelbarrows and push carts. Waste produced is deposited in the common ground or kiosks where the contactor or the municipal truck will collect to the dumping sites. There are about 4 waste kiosks within Temeke Municipality including Mwembe Yanga, Temeke Mwisho, Malawi cargo and Kwa Mpogo.

3. **Disposal Facilities/ Dump Sites**

Solid waste disposal facility is at Pugu kinyamwezi, in Ilala municipality. The facility is managed by the Dar es Salaam City Council at a fee.

The collected wastes are transported from collection points to the dumping facility by the municipal trucks or contractors.

It is clear that improper waste disposal, together with the insufficient storm water drainage infrastructures and the unplanned urban development, should be considered one of the major contributors to flooding events within the City of Dar es Salaam. Considerable amounts of waste scattered along the existing drains and water courses normally blocks the storm water natural flow routes.

The dumping of solid waste into the storm water drainage infrastructure is a practice widely spread all over the study area, especially through the informal settlements where the absence of wide roads makes access for collection difficult. In some regularly flooded areas the population uses the compacted solid waste as a protection barrier to deviate water flow from their houses/properties. With the rehabilitation/improvement of the Proposed Surface Water Drainage System Sub-projects in Temeke Municipality is expected the involvement of TMC to conduct periodic cleaning of open drainage channels with the participation of the local residents. The Municipal Council will also be required to enforce its by-laws to discourage people from throwing solid wastes and discharging raw sewage into the open drainage channels.

These activities will increase the aesthetic value of the surrounding environment due to improved solid waste collection.

4.4.3 Energy

In peri-urban areas of Temeke Municipality only about 1% of householders are served with electricity, however, recently, about 52 percent of urban dwellers in Temeke Municipality are supplied with electrical power.

4.4.4 Transport and telecommunications

In general the road system is poor or worse in per-urban areas of Temeke Municipality (**TABLE 17**). More than 56% of the road network is constructed of gravel and bare earth and are destroyed during the rainy season. Despite their poor conditions, roads are the most important means of transportation within the Municipality and to other parts of the Southern Regions of Lindi and Mtwara which passes through Temeke Municipality. The port access road (Mandela Road) within Temeke Municipality plays an important role of ferrying goods from the port to the inland destination.

TABLE 17

ROADS IN TEMEKE MUNICIPALITY

S/N	Level of Road	Type of Road			Total
		Tarmac	Gravel	Earth	
1	District Roads	77	155	269.1	182
2	Rural Roads	0	100	82	182
TOTAL		**77**	**255**	**351,1**	**683,1**

4.4.5 Education

PRIMARY EDUCATION

There are 124 primary schools in the municipality out of which 107 are government and 17 are privately owned. Statistics show that the number of enrolment primary school students has been increasing from year to year since the inception of Primary Education Development Plan (PEDP) and the number of girls being enrolled has been higher than boys. There has also been improvement for students joining secondary education within the Municipal since 2009.

SECONDARY SCHOOLS

Temeke Municipal Council has 76 secondary schools out of these, 39 are government owned and 37 are privately owned. Temeke Municipal Council and other stakeholders have been able to mobilize the required resources to construct some 1 142 class rooms.

4.4.6 Health Services

Health services in Temeke Municipality are being provided by the Government in collaboration with other partners. Health services include private non-private and supervised by chief Municipal Medical Officer.

HEALTH FACILITIES

Temeke Municipality has a total of 117 health facilities which are public and private. The municipal has a total of 33 public facilities, 2 hospitals, 1 health centre, 28 dispensaries and 2 Reproductive and Child Health (RCH) Clinics. There are 84 private facilities of which 2 are hospitals, 5 health centers and 77 dispensaries (**TABLE 18**). The table below shows the general health statistics in Temeke Municipality.

TABLE 18

SUMMARY OF HEALTH FACILITIES IN TEMEKE MUNICIPALITY

Health Facilities	Government Facilities	Non-Governmental Faculties	Total
Hospital	2	2	4
Health centre	1	5	6
Dispensaries	28	77	105
RCH Clinic	2	-	2
Total	**33**	**84**	**117**

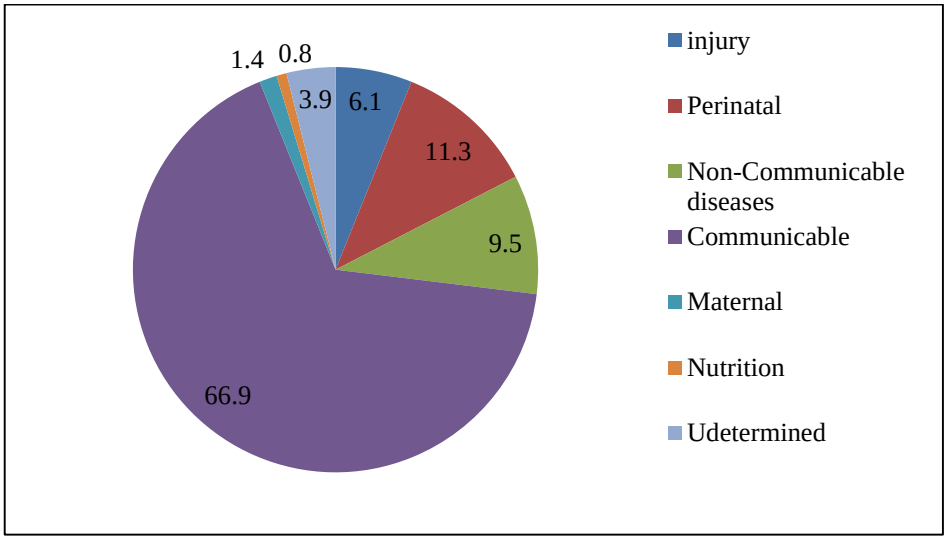
HEALTH CONDITIONS OF TEMEKE RESIDENTS

The health conditions of many Temeke residents is like any other residents within Dar es Salaam region. The common diseases affect many residents include both communicable and non-communicable diseases. Data from Health and statistics (AMMP /NSS 2002) showed that communicable diseases rates are higher than the non-communicable diseases as shown in the chart below[14]. The reproductive health status is shown in Table 19 below.

[14] Temeke Municipal Council (http://tmc.go.tz/health%20and%20waste.pdf)

TABLE 19

REPRODUCTIVE HEALTH IN TEMEKE MUNICIPAL



(Temeke Municipal Council, PROCESL/COWI, 2014)

FIGURE 17

COMMON HEALTH ISSUES IN TEMEKE MUNICIPAL

Health Parameters	Temeke Municipal
Women of Reproductive Age (15 – 49) 177,306	177,306
Children < 5	177,306
Total new antenatal attendance 2006/07	45,069 (Fill Dec., 06 (HMIS)
Total health – facility deliveries 2006/07	22,895 (Fill Dec., 06 (HMIS)
Total home deliveries 2006/07	350 (Fill Dec., 2006 (HMIS)
Maternal Mortality Ratio	578/100,000
Under five mortality	181/1000
Infant Mortality	109/1000
Neonatal Mortality	National
Crude death rate	14/1000
Fertility rate	6 births/woman

(Temeke Municipal Council, PROCESL/COWI, 2014)

4.5 SOCIO-CULTURAL CHARACTERISTICS

ETHNIC COMPOSITION

The main native ethnic groups in Temeke Municipality are Zaramo and Ndengereko but, due to urbanization many people of different ethnicity have immigrated in making heterogonous tribal composition whereby, no single ethnic group accounts for more than 25% of the total population.

SETTLEMENTS

The greater part of Temeke Municipality is occupied by human settlements. However, there is a large section of the land which has been developed as unplanned settlements. The Urban Development Planning of 2009/2010 included a planning scheme to develop 10 000 new land plots.

The Municipal Council has taken steps to try to ensure proper use of land development through *"Urban Settlement Upgrading Programme"* by improving standards of living to residents especially the low income people in unplanned areas. This programme is envisioned to be achieved through various related sub projects such as sanitation and safety, infrastructure development and provision of new land plots.

CULTURAL HERITAGE

Cultural heritage represents the identity of a community and its environment. Cultural heritage can include monuments or other buildings that represent important events or eras in local or national history, traditional lifestyles, such as the performing arts and handicrafts, and even the everyday activities of local people as they farm, fish or prepare food.

Tanzania, as other countries in the world, is legally protecting cultural heritage. The legal protection of the country's tangible cultural heritage is affected through the Antiquities Act of 1964 (Act No. 10 of 1964 Ca.550) that is principal legislation and the Antiquities (Amendment) Act, 1979 (Act No. 22 of 1979). The 1964 Act repealed the Monuments Preservation Ordinance of 1937 and 1949 and enlarged the scope of the heritage, which needed to be conserved. The legislation offers general protection to objects or structures, which are of archaeological, palaeontological, historic, architectural, artistic, ethnological or scientific interest.

The built environment of Dar es Salaam City today, is a product of four main administrative periods: the Arab Period (1860-1890), the German Period (1890-1916), the British Period (1916-1960) and the Post Independent Period (1960-today).

4.6 SOCIO-ECONOMIC BASELINE CONDITIONS – WARD LEVEL

Administratively, Temeke Municipal Council is divided into three divisions namely; *Kigamboni*, *Mbagala* and *Chan'gombe.* The divisions are auxiliary divided into 30 wards; which also are divided into 180 sub wards. The Municipal Council has 44 Councilors 2 of whom are elected Members of Parliament, 30 are elected Councillors and the remaining 12 are women nominees for special seats.

Temeke Ward

Many residents in the area are employed in different economic sectors including small-scale trade, food vending and formal employment. Self-employed individuals mainly own small shops (locally known as *maduka*). Temeke has four schools in total, one secondary and three primary, which are all state-funded. While there is limited provision of healthcare in the area and no instituted HIV/AIDS programmes, there are some committees under the municipality that provide certain kinds of support for HIV/AIDS patients. The public toilets in the area are mainly of the pit latrine type. There are few private/government funded projects such as a safe water supply scheme (borehole) which is located in Ndalu. The condition of the sanitation and sewerage system is poor and the collection of solid waste funded by the Municipality is poor, however members of the community are actively involved in solid waste collection through local initiatives executed by hand-pull carts (locally known as *mikokoteni*).

Mbagala

There are three schools in Mbagala (all of which are primary schools) and two dispensaries. There are no known instituted HIV/AIDS programmes in the area. Water is mainly supplied to Mbagala through boreholes and pit latrines are used. Most of the residents in the area are either employed in various sectors of the economy, or are self-employed as food vendors or owners of small shops. Most of the residents live in brick houses and many are connected to the electrical grid.

Kiburugwa

There are four schools in the area. Three are primary while one is secondary. Healthcare services in the area are limited but there is one dispensary available to residents. There is a popular HIV/AIDS programme in the area known as HUWANYU which is a home base HIV/AIDS treatment for affected individuals. Through trained peers HIV/AIDS patients are treated at home by means of counselling. There are no public or private economic development schemes as many of the residents are business people employed in various sectors of the economy, and some are self-employed and

engage in small-scale trade or own their own businesses such as small shops, vending stalls, hair salons, butcheries and carpentry. Few people are engaged in small-scale farming for vegetables and fruits, especially along the river valleys. There is no provision of either a solid waste collection system or an established sewerage system by the municipality.

Miburani

Most of the residences in the area are brick houses, but there are also a few mud houses. These houses are separated by a network of dirt roads. There are both private and state-owned schools in the area, as well as one university. Employed residents fall into various categories; many are either civil servants, company employees, or self-employed. Many of the women in the area are mainly housewives or self-employed as food vendors. There are a few privately owned clinics in the area as well as some HIV/AIDS support groups such as HBC and Kasada. The Dar es Salaam Water and Sewerage Corporation (DAWASCO) provides the area's water supply, but there is also water available for purchase at 50 Tanzanian shillings per bucket. There is a scheme established by the Municipality that concerns the collection of solid waste in the area.

Yombo Vituka

There are around five secondary schools in the area, one of which is state-owned, and seven primary schools, three of which are state-owned. Residents mainly live in brick houses (although there are a few mud houses in the area) and acquire their water mainly through boreholes in the area. About two thirds of the population in the area are either employed or self-employed. Self-employed residents are mostly owners of small shops, while other employed residents engage in small-scale trade. Healthcare services are limited, but there is an HIV/AIDS support group available to residents. The municipality is responsible for solid waste collection in the area.

Kilakala

All three schools in the area are state-owned, one is a secondary school while the other two are primary. There is one clinic in the area. All residents have access to water in boreholes, and most are connected to the electrical grid. Many of the residents are employed as civil servants or in other formal employment. Some residents engage in small-scale farming of vegetables while others engage in small-scale poultry, cattle or pig farming. Most of the female residents work as cleaners and/or food vendors. There are two registered companies in the area that have been assigned the task of collecting solid waste, however the services offered by those entities is poor. Many of the pit latrines in the area are elevated because there is poor drainage in the area; this problem is

particularly noticeable in the rainy season. The majority of houses in the area are brick houses that are not plastered, while a minority are mud houses or of standard quality.

Buza

There are five primary schools in the area (three of which are state-owned) and two secondary schools (one of which is state-owned). Furthermore, there are five general clinics (four of which are privately owned) and one maternity clinic in the area. Residents have access to water via boreholes (the digging of at least two of the boreholes was government-funded) where there are roughly six households per borehole. Water is also available for sale between 50 and 100 Tanzanian shillings per bucket. There are no flush toilets in the area and many are pit latrines. Sewerage and drainage services in the area are poor, and two waterways/canals affect the surrounding areas of Mji Mpya during the rainy season. In addition to Red Cross, there is an international development organization that offers support to HIV/AIDS patients. Residents are largely self-employed as independent construction workers, owners of small shops, hair salons or employed in bars, grocery stores or guesthouses. A small percentage of residents engage in the farming of vegetables, poultry and cattle. Women are mainly employed in hair salons, or sell ready-made food and/or vegetables. Only a small percentage of the residential population are employed as civil servants. Virtually all of the houses in the area are brick houses (plastered) and have access to the electrical grid. There is an informal system in place for the collection of solid waste whereby youth collect the waste in hand-pull carts from individual households and accumulate this by the main road for collection by trucks owned by the municipality that take these to a dump in Pugu.

Tandika

There is one borehole provided by the government in this area. Many of the houses here are either brick houses or informally made out of corrugated iron. Many of the houses have access to the electrical grid, and only few have none. There is a combination of flush toilets and pit latrines in the area, but no established sewerage system. While many of the residents are employed in various sectors of the economy, few are either agriculturalists or self-employed. Many women housewives.

TABLE 20

TEMEKE WARD POPULATION DATA

Municipal	Ward	Mtaa	Population		
			Men	Female	Total
Temeke	Temeke	Temeke	2,220	3,600	5,800
	Miburani	U/Taifa	-	-	
	Kiburugwa	Kiburugwa	20,593	21,354	
	Kurasini	Mivinjeni	-	-	2,940
	Azimio	Azimio	6,037	5,984	12,021
	Kilakala	Kilakala	4,618	6,992	11,610
	Makangarawe	Yombo Dovya	4,273	4,556	8829
		Msakala	7447	7147	14594
	Buza	Buza	22,541	32,541	55,082
	Tandika	Nyambwera	2,851	2829	5680

TABLE 21

SCHOOLS AND HEALTH SERVICES

Municipal	Ward	Mtaa	Schools		Health services	
			Primary	Secondary	Private	Public
Temeke	Temeke	Temeke	3	1	2	0
	Miburani	U/ Taifa	1	2	1	
	Kiburugwa	Kiburugwa	3	1	1	1 V/A & Hospital
	Kurasini	Mivinjeni	--	1	0	2
	Azimio	Azimio	2	1	0	0
	Kilakala	Kilakala	2	0	1	0
	Makangarawe	Yombo Dovya &	2	0	2	0
		Msakala	0	0	0	0
	Buza	Buza	5	2	0	0
	Tandika	Nyambwera	0	0	0	0

TABLE 22

OTHER SERVICES

Municipal	Ward	Mtaa	Schools		Health services	
			Primary	Secondary	Private	Public
Temeke	Temeke	Temeke	3	1	2	0
	Miburani	U/ Taifa	1	2	1	
	Kiburugwa	Kiburugwa	3	1	1	1 V/A & Hospital
	Kurasini	Mivinjeni	--	1	0	2
	Azimio	Azimio	2	1	0	0
	Kilakala	Kilakala	2	0	1	0
	Makangarawe	Yombo Dovya &	2	0	2	0
		Msakala	0	0	0	0
	Buza	Buza	5	2	0	0
	Tandika	Nyambwera	0	0	0	0

4.6.1 Land Tenure Systems

Three different types of land tenure systems exist in the project area based on individual right of occupancy as follow;

Successive Inheritance. This type of land tenure is acquired through inheritance from close family member e.g. from the father to the son. Traditionally, in many parts of Tanzania, land inheritance is strictly for male siblings and not for females. However, in recent years the government of Tanzania has tried to advocate for land tenure reforms in the country to include women to the heir family land from their respective families.

Land lease: This is another type of land tenure in the project area where land is leased for small scale crop cultivation such as fruits and vegetables. This type of lease is particularly notable along the Mpogo River valley. Vegetables grown such as *Mchicha"* are sold commercially in local markets places where fruits are consumed domestically.

Land Purchase: This is the most common type of land tenure along the project areas. The land plot is sold to any interested potential buyer for economic development such as house construction,

business premises, storage area etc. In land purchasing agreement, local government authority is liable to attest and document the transaction of sale for future reference.

4.6.2 Affected Assets

The project will affect the following compensable assets:

- 404 households along Mpogo, Serengeti, Kwa Shego and Keko drains
- 7 Medium size commercial businesses
- 3 government owned institutional lands.
- 3 retail shops, and 7 areas with urban husbandry or agriculture
- 19 electrical poles and 7 water main pipes.
- 17 pit latrines
- 89 fences/ walls
- 4 boreholes
- 23 concrete foundations
- 33 chambers / sceptic tanks
- *Crops: 18 seasonal crops, 3162 permanent crops and 522 indigenous/shade trees.

NB:

Seasonal crops are defined as follow:

Fruits (seasonal e.g. papaya, watermelon, pineapple) and vegetables e.g spinach, callaloo (mchicha)

Permanent: Food crops (e.g. maize, banana, cassava, potatoes, etc.) and Commercial crops/trees (coconut, mango, cashew, avocado etc.)

Trees: Shade/wood/Indigenous trees

CHAPTER 5.0: STAKEHOLDERS IDENTIFICATION AND METHODS OF PARTICIPATION

5.1 INTRODUCTION

Stakeholder consultations are an important element in the process of impact assessment in order to gather the necessary information for completion of the study. Consultations aimed at providing

issues that are likely to be of interest to the communities, client, concerned stakeholders and developer.

This process provides an opportunity for all Interested and Affected Parties (IAP) to air their views and opinions with regard to project operation and to disseminate information within the respective project areas.

5.2 SPECIFIC OBJECTIVES OF STAKEHOLDERS INVOLVEMENT

Specific objectives of stakeholders' involvement in this project are as follows:

i. To identify major stakeholders of the project;
ii. To gather opinions and concerns of all major stakeholders involved in the project;
iii. To identify potential environmental and social impacts of the project;
iv. To identify the physical extent and boundaries of the project;
v. To integrate views and opinions of stakeholders to the design process;
vi. To inform surrounding communities objectives of the project;
vii. To provide the design team expert opinion on the main issues and problems which are necessary during project implementations;
viii. To disseminate information to the main government institutions which provide services in the area such as DAWASCO, TANESCO and DAWASA;
ix. To collect relevant information related to the project area.

5.1 ADOPTED METHODOLOGY

5.1.1 Stakeholder Identification

The primary aim of stakeholder identification is to name individuals or groups which in one way or another can be affected by the project or have a stake in it. In consideration of this process the following stakeholders were identify;

- Ministry of Works
- Ministry of Water
- Ministry of Lands and Human Settlement Development
- Dar es salaam regional Commissioner Office
- Temeke Municipal Council

- Local People
- Local Leaders
- Business Vendors
- NGOs & CBOs
- Religion Organization
- Peer Groups
- Political Parties
- Micro Finance Organization
- DMDP
- TENESCO
- DAWASCO
- DAWASA
- The World Bank

5.1.2 Stakeholder Analysis

Stakeholder analysis is a process of systematically gathering and analysing qualitative information to determine whose interests should be taken into account when developing and/or implementing a project. Stakeholders' analysis helps to determine who are the key actors of the project and who are less involved but have interest in the project. The table below shows type, level and functions of each stakeholder in relation to the project.

TABLE 23

STAKEHOLDERS ANALYSIS

S/N	Level	Stakeholder's Name	Major Functions	Key Stakeholder	Minor Stakeholder	Consulted	Comments/ Description
1	National	Ministry of Works	Policies formulation, plans and strategies Upgrading and Management of the Construction Sector Rehabilitation and Maintenance of Roads, Ferries, Bridges, and Government Buildings		✓	not consulted	The primary objective of this project is to upgrading major surface drainage channels and not related infrastructure such as roads, bridges, ferries etc.
		Ministry of Water	Overseer of all fresh water supply to rural and urban region. Entrusted with the responsibility of developing and managing water resources of the country. Formulate and regulate policies, plans, strategies and agencies related to water supply	✓	✓	Consulted	Ministry of water is the sole stakeholder in any water development scheme
		Ministry of Lands , Housing and Human Development Settlements	Formulation of policies and strategies for development of land; preparation of land use plans; manage planning of towns and villages; preparation of maps; registration of land ownership; land valuation; manage acquisition and maintenance of land records	✓		Consulted	The project involves valuation of properties and land to the affected individuals which has to be approved by the Ministry of lands
2.	Regional	Dar es salaam regional Commissioner	Among other important roles of the Regional commissioner (RC) are to ensure peace and tranquillity in the region; to facilitate and assist LGAs in the Region; to be the representative of the Central		✓	not consulted	The RC office mostly assist administrative issues related to government projects

S/N	Level	Stakeholder's Name	Major Functions	Key Stakeholder	Minor Stakeholder	Consulted	Comments/ Description
			Government (CG) within the region. The RC implement the government development project through the LGAs				
		Temeke Municipal Council	Among other important function of Municipal councils is to Formulate coordinate and supervise the implementation of all plans for economic and social development in their areas of jurisdiction.	✓		Consulted	The project falls under its jurisdiction
4.	Ward & Mtaa	Local People	Community Members	✓		Consulted	Affected people; main project stakeholders
		Local Leaders	Community Members	✓			Community leaders and affected by the project
		NGOs & CBOs	Non-Governmental Organizations	✓		To be consulted	Community based organization –affected by the project
		Religion Organization	Non-Governmental Organizations		✓	not consulted	Emphasis on religion matters within communities

S/N	Level	Stakeholder's Name	Major Functions	Key Stakeholder	Minor Stakeholder	Consulted	Comments/ Description
		Peer Groups	Community Members		✓	not consulted	Community based groups
		Micro Finance Organization	Non-Governmental Organizations		✓	not consulted	Community based groups mainly related to financial matters
5.	Government Agencies & Departments	TENESCO	Government agency entrusted by the government to provide services related to electricity generation, electricity transmission, electricity distribution and sale of electricity in the country	✓		consulted	Power supplier to the community
		DAWASCO	Responsible for supplying clean water and transport sewerage to all inhabitants of the city	✓		consulted	Water and sanitation service providers in te community
		DAWASA	Mainly provide sewerage sanitation services to Dar es Salaam and its satellite towns of Bagamoyo and Kibaha	✓		consulted	Clean water service provider in the community
		DMDP	The client; Dar es salaam Metropolitan Development project	✓		consulted	Project developer / Cleint
		NEMC	National Environment Management Council – A government agency entrusted to oversee all environmental related issues	✓		consulted	Environmental Management
6.	International Organizations	The World Bank	Project financier	✓		Consulted	Project Financier

(PROCESL/COWI, 2014)

5.1.3 Stakeholders Consultation Process

Consultation process started with the identification of major stakeholders of the project who had interest in the project and who were directly or indirectly involved. Most stakeholders identified were those who used utility services such as water supply, sanitation and electricity. Other stakeholders identified included regulatory authorities, municipal authorities and local people of respective jurisdictions. Most stakeholders were identified during early environmental scoping stage while investigating the main environmental and social issues of concern. Stakeholders were also identified through discussion and interviews with other stakeholders who thoroughly identified roles and responsibilities of different government organs, institutions and groups. Expert opinion was also used to identify major stakeholders of the project.

Consultations

Phase I

Preliminary consultations involved major institutions and local government leaders in order to obtain basic information related to project area and public institutions. During preliminary stage of this Project, several stakeholders were consulted, not only to obtain the literature, references, maps and other documents necessary for the project development but also to introduce the Project and obtain their views regarding it. These visits started on February 13th 2013 and included the following stakeholders and representatives:

Phase I Consultation Results

The collected information and visits included the following:

- Background information about the existing drainage system, mapped, written and/or drawn;
- History about periodic reported severe flooding;
- Studies, designs and specific available reports about the drainage systems;
- Cartographic / topographical available information;
- Visits to the sites already identified as the most critical and vulnerable ones;
- Analysis, review and establishment of the design criteria to adopt in the next stages of the work.

TABLE 24

STAKEHOLDERS CONSULTATION IN FEBRUARY 2013

Institution	Name
Temeke Municipal Council	Technical Council Officers
National Environmental Management Council	Eng. Ignace A. J. Mchallo – Director of Environmental Impact Assessment Department
Ministry of Lands, Housing and Human Settings Development	Eng. Linus Shao – Physical Planning Division Settlement Regularization Section
DAWASA – Dar e Salaam Water and Sewage Authority	Engineer responsibly for the sewage

(PROCESL/COWI, 2014)

Phase II

The second consultations were conducted from 24th to 27th June 2013 under the "World Bank Review Mission for the Dar es Salaam Metropolitan Development Project Preparation". This meeting aimed to present the DMDP, including the Drainage Plan and Pre-Feasibility Study, and to discuss it together with the stakeholders involved. Attended to this meeting besides PMO-RALG and World Bank were representatives from the ministries and the three municipalities involved. Following this meeting, it was clear that stakeholders involved were concerned about the occupation of the detentions pond areas.

Phase II Consultation Results

- This meeting was conducted together with the Basin Authority – Wami/Ruvu River Basin Office (at the Water Ministry), with Mr Mshuda Wilson and Mr Peter Bibyarugaba where the key project issues and the proposed interventions were presented. The main concerns raised by the Basin Authority were the importance of the aquifers recharge in the proposed solutions for interventions leading to soil impermeabilization. It was also suggested to construction retention ponds in non-polluted areas instead of detention pond, which would promote the aquifers recharge.
- During the project development a number of utility institutions/companies, (DAWASCO, TANESCO, TTCL and TPDC) have been contacted in order to identify possible coincides between existing underground utilities and the proposed interventions.
- TPDC (Tanzania Petroleum Development Corporation) has provided their digitalized infrastructure plan – Gas network (PANAFRICAN 585/PAET/500/025 drawing – Dar es Salaam Natural gas distribution System, rev. N. Dated 21.09.13).

- TANESCO (Tanzania Electric Supply Company) has not been able to provide a digitalized infrastructure plan of their utilities. TANESCO has verbally informed that they do not have significant underground infrastructure in the areas of the proposed interventions. They further informed that overhead infrastructure is easy identified on site and to be dealt with during rehabilitation/improvement.
- DAWASA/DAWASCO (Dar es Salaam Water and Sewerage Authority / Dar es Salaam Water and Sewerage Corporation) and TTCL (Tanzania Telecommunications Company Limited) has not been able to provide us with digitalized infrastructure plans of their utilities. Both companies have informed that they will assist in on site utility identification and coordination of possible interactions during rehabilitation/improvement.

Phase III

Phase III of consultations involved government utility agencies and departments which cater utility services in project areas which include TANESCO, DAWASCO, DAWASA, OSHA and the Ministry of Land, Housing and Human Settlement Development (MLHHSD). These consultations were conducted during October 2013 and involved meetings, discussions and interviews with local government officials from Kinondoni Municipal Council, DAWASCO, DAWASA and TANESCO as shown in **TABLE 25** below.

TABLE 25

STAKEHOLDERS PARTICIPANTS – TEMEKE MUNICIPALITY

Name	Institution	Jurisdiction Area	Position
Eng. Gasper Msigwa	TANESCO	Kinondoni South	Manager
Lameck Victor	DAWASCO	Temeke	Acting Manager
Dickson P. Lema	Municipal Council	Temeke	Municipal Engineer
Mathias Mlagambwa	DAWASA	Dar es Salaam Area	Engineer

(PROCESL/COWI, 2014)

Phase III Consultation Results

TABLE 26

MAJOR ISSUES RAISED BY TANESCO

Issue Raised
The main issues of concern reiterated by the TANESCO regional manager were as follows: 1. Problems and challenges Most unplanned settlements have limited spaces for construction of roads and installation/placement of electrical infrastructure facilities. Vandalisms, theft and sabotage According to the manager, many areas of unplanned settlements experience serious problems related to vandalism, theft and sabotage of infrastructure facilities particularly for materials made up of copper and metals such as electrical cables. Costs of Moving /Relocated Infrastructure Facilities The company has limited funds for relocation of infrastructure facilities e.g. electrical poles and transformers especially for big infrastructure projects. Moreover, some people are reluctant to provide land space for installation of facilities such as pathways, water pipes or transformers. This reluctance complicates the process of providing power supply to some individuals located in such areas. It should be noted that the customer is liable to bear connection costs to the main power supply. Limited Capacity of Power Supply Most power supply systems in Dar es Salaam were built many years ago when the population was relatively small in the city. Currently, electrical power consumption is very high due to the growth and expansion of the city and other economic activities in Dar es Salaam. Thus, supplying electricity into unplanned settlements needs establishing new connections and power lines into these neighbourhoods. 2. Measures Taken to Provide Reliable Services Education TANESCO is vigorously conducting education campaigns in many areas where there are problems related to vandalism, theft and sabotage of electrical infrastructure facilities. Local leaders have been involved to spearhead education campaigns within their areas of jurisdictions by explaining to community members the importance of protecting and proper use of infrastructure facilities including power meters, transformers and electrical cables. Compensation Whenever individual land space is annexed for expansion or installation of electrical facilities, TANESCO pays dully compensation to the affected individual as prescribed by the laws of Tanzania related to relocation and resettlement. Limiting /Avoiding Vandalism To limit / avoid sabotage and vandalism many transformers have been moved from open public space areas to front yards of individual community members. Alternative Material Usage TANESCO has tried to apply alternative materials to substitute copper and metal materials whenever possible. There have been many cases where copper and metal infrastructure products have been stolen and sold as scraper to authorised dealers.

(PROCESL/COWI, 2014)

TABLE 27

MAJOR ISSUES RAISED BY DAWASCO TEMEKE

Issue Raised
Consultation with DAWASCO Temeke acting manager was conducted on October 11th 2013. The main issued raised were as follows: Water leaks from main water supply pipes According to the manager, water leaks from main water supply pipes in many unplanned settlements are common problem experienced by many customers. However he mentioned that, many water leaks are caused by either corrosion, limited services and improper connection by some individuals. Increasing water demand Water availability in many unplanned settlements is limited due to growth of population over time especially in Dar es Salaam. Water infrastructure facilities have been slowly upgraded to meet the ever increasingly growing demands for water supply for Dar es Salaam residents with many challenges. Up to date very few areas in the city get sufficient quantities of water supply on daily basis. Corporation with other Utility Agencies Timely execution of civil works with other utility agencies such as TANESCO, TANROASDS (Roads agency) and municipal council is difficult to be implemented since each agency has its own budget, work plan and goals for specific period of time. Thus, simultaneously execution of works related to water supply, electrical power supply and sewerage will be complex and difficult to implement. Billing and service follow-up It is difficult to follow up repairing works and water bills in unplanned settlements since DAWASA uses maps to identify problem areas for repairing and other civil works. In many unplanned settlements residential areas are not officially mapped for services. Other Challenges facing the agency includes: Infrastructure vandalism According to DAWASCO manager, many water supply pipes are being detached from water meters to distort readings of actual amount of water used per month period. Unpaid bills Unpaid bills leads to weaker financial position of the agency and hence poor services and maintenances. Illegal connection Many areas are characterized by illegal water connections which is common phenomenon in many parts on the city.

(PROCESL/COWI, 2014)

TABLE 28

MAJOR ISSUES RAISED BY DAWASA

Issue Raised
Consultation with DAWASA engineer Mathias Mlagwanda was conducted on 15.10.2013 at DAWASA Kisutu offices. The main issues discussed include the following: Mode of operation (Mode Operandi) Dawasa is strictly operates for sewerage services in the city of Dar es Salaam. DAWASA does not have legal mandate to instruct users on how to handle waste /sewerage from household but rather the agency provides services for those who are willing to pay for. Most of DAWASA infrastructure facilities are found underground Few/limited infrastructure facilities DAWASA has fewer infrastructure facilities since many parts of the city do not have central sewerage systems for sewerage waste. The only area which has extensive and planned underground sewerage central system is Kariakoo area. Sewerage blockade One of the main problems facing DAWASA is the shortage water to facilitate draining of sewerage leading to blockade of sewerage in many parts of Dar es Salaam. Vandalism of facilities Like water and power supply facilities, DAWASA is faced with sabotaged and vandalism of its infrastructure facilities particularly storm water covers which are located in public places. Most covers are stolen and sold to authorized metal scraper vendors who will then sell to recycle centres where the materials are melt and moulded into different product. Sewerage overflow and bad odour In many parts of the city, sewerage systems do not function properly as a result of sewerage overflow can be observed in many parts of the city and in unplanned settlements as well. The role of DAWASA is to collect and transport sewerage on contractual basis from households which subscribe to the services. Measures taken DAWASA has started vigorous campaign trying to educate people on the effects of health and safety to the community caused by vandalism of sewerage infrastructure facilities especially storm water covers. Awareness education campaign is planned to be aired by Radio Clouds on weekly basis. Other measures include legal procedure such as legal action and fine according to the laws of the country.

(PROCESL/COWI, 2014)

TABLE 29

MAJOR ISSUES RAISED BY MUNICIPAL ENGINEER

Issue Raised
The main issues of concern discussed were as followed: Limited land space to develop infrastructure in unplanned settlements Municipal engineer argued that there are limited land spaces to develop infrastructure facilities in unplanned settlements of the city such as roads, sewerage, electrical poles etc. Thus, it is difficult to provide services such as waste collection in such areas. Enhance Waste Collection Points Since there are fewer wide roads in many unplanned settlements it was argued that the local community should enhance waste collection points in areas where trucks can easily be accessed. The Need for Spatial Planning According to municipal engineer, whenever possible, the government should acquire land from land owners in unplanned settlements and zone accordingly. The government must prohibit unregulated construction of houses and other infrastructure in such areas. This is important because the compensation costs for land are increasingly becoming expensive over the years. Health and Safety

Strictly rules and local government by-laws related to health, safety and waste management must be enforced and followed up to ensure health and safety of people in unplanned settlements. The government must provide new land plots to discourage people to congest in the same locality thus, reduce health and safety risks in such locality. Land and Property Compensation To avoid high costs of compensation, local roads must be aligned in areas where there are fewer residential houses. Local community leaders must work together with local government authority to ensure residents do not encroach open spaces and other public lands.

MAJOR ISSUES RAISED BY MUNICIPAL ENGINEER (CONT.)

Issue Raised
Public Participation Municipal engineer stressed public participation in large scale project involving local people residing in unplanned settlements. Due to the nature of such settlements vandalisms, theft and sabotage activities have been experienced in many projects. Experience has shown that once local people are engaged from the beginning they develop a sense of project ownership which is essential for future project sustainability. Institutional Coordination Institutional coordination between different utility agencies is essential during project implementation such as DAWASCO, DAWASA and TANESCO. Coordination will help to reduce inconveniences to local residents especially during construction period such as digging trenches for water supply pipes and road construction on the same locality. Education Campaign According to municipal engineer it is important to educate people on the objectives and goals of a project before execution. Education campaigns will help local people to understand why and how the project will be implemented and for whose benefit.

(PROCESL/COWI, 2014)

Phase IV: Wards and Mtaa Consultations

Consultations with Ward and Mtaa were conducted between 10th and 13th April 2014 consisting of consultant, local government leaders (WEOs) and local people of respective wards. The aim was to obtain views and opinion regarding the project. The list of stakeholders involved is provided in the table below. The comprehensive list of local people consulted is attached in Appendix 14.3.

TABLE 30
STAKEHOLDERS CONSULTED DURING PHASE IV

Name	Institution	Jurisdiction Area	Position
Victor Ndonde	Temeke Municipality	Temeke	Municipal Valuer
Local People	Temeke Municipality	Temeke	Local People
Denis Matele	Local Government	Temeke	WEO
Mary Twamgabo	Local Government	Mbagala	WEO
Edna Bakengi	Local Government	Mbagala Kiburugwa	Assistant WEO
Hzron Msuya	Local Government	Yombo Vituka	WEO

Name	Institution	Jurisdiction Area	Position
Rajabu A. Loundum	Local Government	Miburani	WEO
Tatu Mtatiro	Local Government	Uwanja wa Taifa	WEO
G.E. Mfuko	Local Government	Mgulani Keko Juu	WEO
Paulina J. Mtambo	Local Government	Kurasini	WEO
	Local Government	Azimio	WEO
Peter Makoye	Local Government	Kilakala	WEO
E. A. Lyimo	Local Government	Makangarawe	WEO
Sabina Saidi	Local Government	Mbagala	WEO
Kuruthumu Ngalawa	Local Government	Buza	WEO
F. Kyando	Local Government	Tandika	WEO

Phase IV Consultation Results

1. The councilor of Charambe Mr Chaurembo started by saying that the effect of unplanned settlements is witnessing a serious flooding problem since its construction after (as many as 20 years). He added that the World Bank has decided to help by providing funds through the project known as Dar es Salaam Water Surface Improvement project which will improve surface water by reconstruction of selected river channels in various Dar es salaam municipals.

2. It was argued that in some areas within Mbagala Charambe the problem of water flooding particularly during rainy seasons is closely associated with construction / upgrading of Mbande road where water was directed towards downstream areas of Nzasa B and Zomboko. This project has been designed to correct the flooding problem in the area.

3. It was elaborated that some of the main properties to be valued for compensation shall include; buildings, crops, land, business premises, bore holes, shallow wells, graves, fences etc.

4. During compensation two types of forms i.e. (Form No 69 and form No. 1) will be issues to PAP to be filled in for reference and record keeping. It was also mentioned that all property owners must be present during valuation exercise in order to attest their properties to be affected, photographing and form signing.

5. The valuer (Mr Ndonde) wanted to ensure that all participants understood property valuation exercises. He explained that valuation will be conducted according to the Land Act No.4 of 1999 which stipulates that all affected people must be compensated for property loss and paid various allowances as follow;

    a) Accommodation allowance - (Posho ya makazi)
    b) Disturbance allowance - (Posho ya usumbufu)
    c) Transport allowance - (Posho ya usafiri – km 20 mzigo tani 12 pesa itakayolipwa 200,000)
    d) Loss of profit - (Posho ya upotevu wa faida)

The valuer also explained that all properties to be affected by the project will be measured and data recorded for future reference. This is important in case of any misunderstanding between the property owner and the government

6. Other comments raised by participants were as follows:

    i. How many meters to be avoided from the edge of the river?
    ii. Will the rivers be covered? or remain as open channels?
    iii. Will the consultant prepare leaflets which explain the project concept? This will help to reduce amount of questions to be asked to local leaders

It was agreed that copies of the project design be left at the relevant ward offics for residents to refer to.

7. During RAP and Valuation exercise consultants are advised to wear gumboots due to continuing heavy rains

CHAPTER 6.0: IMPACT IDENTIFICATION AND ASSESSMENT OF ALTERNATIVES

6.1 IMPACT ASSESSMENT

The approach used in the impact identification took also into account the Core Impact Area (CIA), the Immediate Impact Area (IIA) and Area of Influence (AI). The CIA is the identified drainage pathways which will be directly affected by project activities including sources of non-industrial construction material and sources of water. The immediate adjacent areas (or immediate impact areas) are those immediately outside the core impact area and are indirectly likely to be affected by the project activities. These include structure within the drainage corridor likely to be affected by resettlement. The AI is the area beyond the DIA which will be indirectly affected by the construction activities. These include sources of industrial construction materials, and centres of decision-making (e.g. Ward, District and City Council offices).

Impact analysis or evaluation followed a methodology based on the following sequential steps:

- Impact identification – listing all potential positive and negative impacts of a project, including cumulative and residual impacts;
- Impact prediction – determining the magnitude, intensity, extent or size of a particular impact or set of impacts;
- Impact evaluation – determining the significance or importance of a predicted impact i.e. why we should be concerned or worry about this significant impact.

Environmental and social impacts were identified using standard EIA methodology i.e. field observations, public consultations and reference to relevant secondary information. Expert opinion and public views also provided the basis of the analysis of the significance of the individual impacts.

Following, each potential impact was analysed by its root cause (project activity or action) that will result in an impact (change in status in the natural and social environment, be it positive or negative) on a receptor (the natural environment or community that will be impacted).

First, each potential impact was rated based on set criteria, including its Nature, Effect, Extent, Duration, Magnitude and Likelihood.

TABLE 31

IMPACT RATING TABLE

Term	Definition
Nature - Nature of the consequence of the impact of a particular environmental component. If the impact in question benefits or depreciates environmental quality	
Positive Benefit	An impact that is considered to represent an improvement on the baseline or introduces a positive change.
Negative Impact	An impact that is considered to represent an adverse change from the baseline, or introduces a new undesirable factor.
Effect - The effect of a particular project action that directly affects the environment or causes impacts which in turn have side effects that result in new environmental impact	
Direct Impact	Impacts that result from a direct interaction between a planned project activity and the receiving environment/receptors.
Indirect Impact	Impacts that result from other activities that are encouraged to happen as a consequence of the project.
Cumulative Impact	Impacts that act together with other impact, affect the same resource/receptor.
Extent – The spatial extent or the zone of influence of the impact	
On-site	Impacts limited to within the Direct Area Impact Area.
Local	Impacts that affect the Area of Influence of the Project.
Regional	Impacts that affect regionally important environmental resources or are experienced at a provincial or regional scale.
National	Impacts that affect nationally important environmental resources or affect an area that is nation-ally important/ or have macro-economic consequences.
Trans boundary / International	Impacts that extend beyond country borders or affect internationally important resources.
Duration - Defines if an impact occurs only during a certain period of time, if it occurs occasionally throughout the life span of the project or if it occurs throughout the entire lifetime of project	
Temporary	Impacts are predicted to be of short duration and intermittent / occasional.
Short-term	Impacts that are predicted to last only for the duration of mobilization/construction/operation period.
Long-term	Impacts that will continue for the life of the project, but ceases when the project stops operating.
Permanent	Impacts that cause a permanent change in the affected receptor or resource (e.g. removal or destruction of ecological habitat) that endures substantially beyond the project lifetime.
Likelihood – The likelihood that an impact will occur	
Unlikely	The impact is unlikely to occur.
Likely	The impact is likely to occur under most conditions.
Definite	The impact will occur.
Magnitude – The degree of change brought about in the environment	

Term	Definition
Negligible	The impact on the environment is not detectable and there is no perceptible change to people's livelihood.
Low	The impact affects the environment in such a way that natural functions and processes are not affected. People/communities are able to adapt with relative ease and maintain pre-impact livelihoods.
Medium	Where the affected environment is altered but natural functions and processes continue, albeit in a modified way. People/communities are able to adapt with some difficulty and maintain pre-impact livelihoods but only with a degree of support.
High	Where natural functions or processes are altered to the extent that it will temporarily or permanently cease. People/communities affected will not be able to adapt to changes and continue to maintain pre-impact livelihoods.

Once a rating was determined, the significance definition in was used to determine the overall significance of the impact. An impact may be negative or positive and therefore the final significance rating is colour coded.

The significance of an impact is the biophysical and social importance that the impact represents, being a more subjective variable since it depends on the sensitivity of the evaluator. Defining significance includes the assessment of the above criteria to determine how severe the impact will be.

TABLE 32

SIGNIFICANCE DEFINITIONS

Significance Definitions	
Negligible significance	An impact of negligible significance is where a resource or receptor will not be affected in any way by a particular activity, or the predicted effect is deemed to be imperceptible or is indistinguishable from natural background levels.
Minor significance	An impact of minor significance is one where an effect will be experienced, but the impact magnitude is sufficiently small and well within accepted standards, and/or the receptor is of low sensitivity / value.
Moderate significance	An impact of moderate significance is one within accepted limits and standards. The emphasis for moderate impacts is on demonstrating that the impact has been reduced to a level that is As Low as Reasonably Practicable (ALARP). This does not necessarily mean that "moderate" impacts have to be reduced to "minor" impacts, but that moderate impacts are being managed effectively and efficiently.
Major significance	An impact of major significance is one where an accepted limit or standard may be exceeded, or large magnitude impacts occur to highly valued / sensitive resource/receptors. A goal of the EIA process is to get to a position where the Project does not have any major residual impacts, certainly not ones that would endure into the long term or extend over a large area. However, for some aspects there may be major residual impacts after all practicable mitigation options have been exhausted (i.e. ALARP has been applied). An example might be the visual impact of a development. It is

Significance Definitions	
	then the function of regulators and stakeholders to weigh such negative factors against the positive factors, such as employment, in coming to a decision on the Project.

TABLE 33

COLOUR SCALE FOR RATINGS

Negative rating	Positive Ratings
Negligible	Negligible
Minor	Minor
Moderate	Moderate
Major	Major

6.2 IMPACT IDENTIFICATION

During mobilization and construction phases the main activities which can potentially generate environmental impacts are summarized as follow:

- Material storage, transport and earthworks;
- Land clearing and earthworks;
- Movement of machinery and vehicles;
- Installation of work facilities and work camps;
- Increment on human presence and noise associated;
- Land take;
- Social interaction;
- Disruption of service utilities;
- Excavations;
- Surface water drainage system operation;
- Illegal discharges;
- Surface water drainage infrastructures maintenance;
- Surface water drainage channels clearing.

During operation phase of the project, whenever there is a need to repair or replace infrastructure facilities, mitigation measures must be considered in advance to minimize or limit the risk of impact to the environment and or to the people. Construction activities (through the use of equipment and machinery) can impact the environment such as air pollution and noise nuisance.

Below are presented the environmental and social impacts during mobilization, construction and operation phases, identified through stakeholder involvement, field work and literature review.

6.2.1 Potential impacts during mobilization phase

Positive impacts

i) Local employment opportunities;
ii) Opportunities for local traders;

Negative impacts

i) Landscape disturbance and loss of vegetation cover and habitats;
ii) Air pollution;
iii) Soil pollution;
iv) Surface water pollution;

6.2.2 Potential impacts during construction phase

Positive impacts

i) Impact on local employment opportunities;

Negative impacts

i) Ground water pollution;
ii) Landscape disturbance;
iii) Soil pollution;
iv) Noise levels increment;
v) Air pollution;
vi) Surface water pollution;
vii) Disruption of natural drainage network;
viii) Waste production;
ix) Loss of habitat, ecosystem and land use;
x) Destruction of flora and fauna disturbance;
xi) Land take;
xii) Traffic accidents;
xiii) Disruption of services;
xiv) Impacts on occupational and community health and safety;

xv) Impacts on cultural heritage;

6.2.3 Potential impacts during operation phase

Positive impacts

i) Improved storm water drainage system;
ii) Improvement of landscape visual quality;

Negative impacts

i) Ground water pollution;
ii) Soil pollution;
iii) Noise levels;
iv) Air pollution;
v) Surface water pollution;
vi) Waste production;
vii) Damages to nearby properties and infrastructures;
viii) Impact on occupational and community health and safety.

6.3 IMPACT EVALUATION

Considering the information provided in the tables above, impact analysis and evaluation focused in the each significant impact (with major and moderate significance).

In the next sections, significant impacts (positive and negative) associated with each phase of the project are evaluated.

6.3.1 Potential Impacts During Mobilization Phase

POSITIVE IMPACTS

i) Local employment opportunities

During mobilization phase the project will create jobs to casual labourers who will be employed in sections of driving, security at the site, transportation of equipment and site clean-up.

ii) Opportunities for local traders

Creation of opportunities for local/small business like from the acquisition and / or mobilization of construction equipment and machinery.

NEGATIVE IMPACTS

The main adverse impact during mobilization phase will be associated with mobilization of construction equipment and machinery, including vehicles, bulldozers, excavators, concrete vibrators, generators etc.

All impacts expected to occur during mobilization and construction phases may be considered as cumulative impacts resulting from simultaneous constructions in the study area, since it is anticipated that the project will intersect the Infrastructure Upgrading in Unplanned Settlements Sub-projects under the DMDP,.

Nevertheless the potential cumulative negative impacts caused by simultaneous constructions, can be managed with coordination of schedules at the city level, and good construction management during implementation.

i) Landscape disturbance and loss of vegetation cover and habitats

Vegetation clearance in the mobilization phase will cause loss of vegetation cover and loss of species habitat in the Core Direct Area andImmediate Impact Area, and it will lead to landscape disturbance.

ii) Air pollution

Stockpiling of materials can cause air pollution by pollutant dispersion, if material storage is not carried out correctly in the Core Direct Area andImmediate Impact Area.

iii) Soil pollution

Stockpiling of materials during mobilization may cause soil pollution by accident spills.

iv) Surface water pollution

Stockpiling of materials and earthworks can lead to an increment of Suspended Solids (SS) in the surface waters.

6.3.2 Potential Impacts During Construction Phase

POSITIVE IMPACTS

i) Impact on local employment opportunities

Creation of temporary employment during construction is expected to increase income of the people around the project sites. The project will create temporary employment particularly for Site Engineers, Foremen, skilled and non-skilled labour.

The impacts can be summarized as follow:

- Creation of jobs for local people and thereby improving the quality of life for workers and their families; It is estimated a number of workers between 150 to 250.
- Creation of opportunities for the provision of services and supply of materials for small businesses;
- Transfer of skills to local workers and be able to apply them in future similar or related activities to promote socio-economies of their households.

NEGATIVE IMPACTS

i) Noise levels increment

Throughout the construction phase, the main impacts originated from noise levels and vibrations are caused by compressors and vibrators used to compact/ reinforce concrete together with the movement of vehicles and machinery allocated to rehabilitation/improvement works.

Certain levels of noise are unavoidable in the vicinity of rehabilitation/improvement sites and some elevation of background levels is normally acceptable for limited periods. Excessive noise, particularly when experienced continuously, outside normal working hours and on rest days, can be a nuisance to both workers and the public, and in extreme cases it may become a health hazard.

Nevertheless it is safe to say that the residual negative impact after implementation of mitigation measures is of minor significance.

ii) Air Pollution

Transportation and storage of aggregates and earth materials will likely result into dust pollution if preventive measures will not be undertaken. Potential emergence of odours can also occur in this phase, caused by the handling of contaminated storm water, both in the Core Direct Area and Immediate Impact Area.

Also, the excavation of soils during dry seasons is likely to result into emission of dust, hence creating nuisance to the adjacent residential, commercial and business premises. The emission of exhaust fumes from construction equipment and/or machinery is also likely to create air pollution.

iii) Surface Water pollution

The main expected impacts on surface water caused by the project construction activities are associated with the risk of contamination by occasional spills, earthworks leading to an increment of Suspended Solids (SS) and waste removal both in the Core Direct Area and Immediate Impact Area.

iv) Disruption of natural drainage network

Construction activities may disrupt the natural drainage network causing flooding situations in the Core Direct Area and Immediate Impact Area.

v) Waste production

During construction phase, several kinds of waste will be generated, including organic matters from vegetation clearance of the site, papers and households wastes from work camps and from the site, iron pieces and scraps from cutting and fixing of parts, waste oil from services and maintenance of vehicles and machinery, concrete and soil and rocks. Although the project is not expected to generate hazardous materials which are toxic to human beings and other living creatures, the wastes generated could affect the population and the surrounding ecosystems.

Appropriate mitigation measures and waste management plans need to be in place during rehabilitation/improvement to reduce the impact. With the mitigation measures in place, the residual impact is considered to be of minor significance.

vi) Loss of habitat, ecosystem and land use

During construction phase, movement of machinery and vehicles will increase dust particles in suspension, which may indirectly affect surrounding crops. The destruction of natural vegetation, mainly mangrove tress will occur during river training. Also, the impact created by the establishment of construction camps will result in habitat loss. These impacts occur in the Core Direct Area and Immediate Impact Area.

vii) Soil erosion

Soil erosion and sedimentation, especially in Kwa Shego (TE4), due to accumulation of excavated soils into the surroundings.

Some temporary dislocation of existing drainage systems is likely during construction and adverse environmental impacts may include ponding, a threat to public health and safety, and damage to adjacent property.

In the vicinity of existing watercourses and drainage ditches short-term increased rates of erosion and sedimentation may result from:

- Installation of temporary discharge points, particularly in areas of friable soils;
- Clearance of vegetation covers, particularly where undertaken during the wet season;
- Where cut and/or fill materials are prone to erosion, such as where excavations cross drainage channels; and,
- Loose and unconsolidated aggregate, fill and spoil heaps stored pending re-use.

viii) Destruction of flora and fauna disturbance

The establishment of construction camps and of other construction facilities will result in anthropogenic disturbance created by its operation. The impacts associated with this action will be felt particularly by animal species that depend on the affected habitats, which have smaller vital areas and / or which are more sensitive to anthropogenic disturbance.

Temporary access construction will be preceded by clearing activities, which will prolong disturbances caused by these on vegetation.

Movement of machinery and vehicles will increase dust particles in suspension, which may indirectly affect surrounding flora and provides increased exclusion effect on fauna community, particularly mammals, and enhances the occurrence of direct mortalities.

During the construction phase the disturbance caused by human presence, along with the noise resulting from construction activities will also increase the exclusion effect on the fauna community, namely mammals and birds.

These impacts will be felt in the Core Direct Area and Immediate Impact Area.

ix) Land take

The most significant negative environmental and social impact associated with storm water drainage project relate to the construction phase is land take for construction/rehabilitation surface water drains in Temeke Municipality and detention pond. Although the Project was designed to

minimize as much as possible the number of households to be affected will be provided in the Resettlement Action Plan report.

The land take will lead to loss of agricultural land and access to natural resources caused by the construction of the detention pond and involuntary resettlement.

x) Traffic accidents

During construction phase, there may be potential risk for increasing traffic accidents in the Area of Influence and along access roads as a result of frequent movement of construction vehicles/equipment, that can be caused by a poor management of traffic and vehicles associated with speeding.

xi) Disruption of service utilities

There may also be a potential risk for disruption of service utilities of water/power during works causing inconvenient to the population.

xii) Occupational and community health and safety

Throughout the construction phase there will be some concerns related to health to consider namely HIV/AIDS and other occupational health effects. The risk for HIV/AIDS pandemic and other social diseases is important to consider due to an expected increase of social interaction between workers and/or communities. It is also important to evaluate the risk for HIV/AIDS pandemic and other social diseases during the construction phase due to geographical characteristics of the Project area which can attribute to the influence of high infection rate and deters efforts to combat the disease. The risk of infection due to the interaction and behaviour of workers and local community may lead to death and subsequently loss of working force or creation of parentless children (orphans).

Transmission of diseases by birds and pests and contaminated water

In addition to HIV/AIDS, other diseases transmitted by birds and pests or via contaminated water are likely during construction. With regards to birds, bird droppings and nesting materials are capable of carry over 60 diseases and ecto-parasites transmittable to humans and animals. These diseases can be transmitted to the young, elderly and those living with autoimmune diseases. In the city of Dar es Salaam, the Indian Black crows are notorious for scavenging on waste and can spread water borne diseases to susceptible individuals.

Storm water management usually deals with the transmission and storage of water to different neighbourhood thus there is much concern about the proliferation of mosquito breeding habitat, during construction phase. However, it should be noted that detention pond for holding storm water runoffs usually does not produce mosquitoes in sufficient numbers to cause health risk problem.

Finally, the main effects on occupational health during the construction phase are wound/infections resulting from bite by animals feeding on storm water and waste along the project site; infections transmitted by house flies feeding on storm water and waste along the project site; skin and blood infections resulting from direct contact with the storm water; respiratory infections resulting from exposure to infected dust and; several injuries that may occur from construction activities such as cutting and hammering.

Accidents and Injuries

Health and safety effects can also be caused by poisoning and chemical burns resulting from contact with polluted storm water, injuries resulting from accidents at sites drains and rivers, injuries resulting from contact with sharp objects and from activities developed at the workplace, such as handling equipment.

The residual impact after implementation of the mitigation measures is minor. Hence, project proponent must put mitigation in place including providing clear instructions, safety measures, providence of safety gears and awareness training.

xiii) Impact on archaeological and cultural heritage

Construction works can directly or indirectly affect the proposed site if it happens to have an archaeological, historical, cultural or religious significance.

6.3.3 Potential Impacts During Operation Phase

POSITIVE IMPACTS

i) Improved quality of public health

The implementation of the project will contribute to the reduction of flooding during the rainy season and reduction of soil erosion by the improvement of drainage infrastructures. The rehabilitation of the storm water drains may also contribute the improvement of the visual appearance and aesthetics of the urban landscape of the city of Dar es Salaam, due to the waste removal.

Implementation of the project will contribute to the improvement of the quality of life of the population, with sustainable and efficient system of infrastructures development. This improvement will in some way, contribute to the fulfilment of DMDP objectives, with regard to the health of the populations.

The expected positive impacts can be summarised as follows:

- Reduction of flooding during the rainy season and consequently reducing water-related diseases such as malaria, cholera etc.;
- Expansion of local capacities in terms of infrastructures;
- Better housing facilities due to improvement of drainage infrastructure and water supply facilities.

ii) Improvement of landscape visual quality

There will be a permanent change in the visual setting of the landscape due to the presence of a better and improved infrastructure system in the Core Direct Area and Immediate Impact Area.

Considering the Infrastructure Upgrading in Unplanned Settlements Sub-projects under the DMDP occurring in the area of Il 3 intervention ant Kigilagila, it is expected this impact to be cumulative to the ones resulting for these sub-projects implementation leading to a global improvement of the visual appearance and aesthetics of the urban landscape of the city of Dar es Salaam.

NEGATIVE IMPACTS

i) Ground water pollution

During this phase there is the risk of groundwater contamination. Storm water, if not properly controlled and polluted, can infiltrate in the soils and consequently reach the ground water in the Core Direct Area and Immediate Impact Area.

ii) Surface Water Pollution

During this phase, the main impacts expected in surface waters are the risk of contamination. Storm water if not properly controlled can cause an increase in the water flows along the rivers discharge and consequently contaminate receiving water bodies through pollutants that may be contained in the storm water.

iii) Soil pollution

During this phase, there is the risk of soil contamination by illegal discharges. As mentioned above, storm water, if not properly controlled, can cause an increase of water flow along the river discharge and consequently, contaminate receiving water bodies and soils.

iv) Emergence of bad odours

There is a risk for emergence of odours due to the possible contamination of storm water if uncontrolled discharges of waste water and waste disposal in the channels occur.

v) Damages to nearby properties and infrastructures

The implementation of the Project, by the improvement of drainage structures will contribute to the reduction of flooding during the rainy season. Nevertheless if not properly controlled storm water can damage nearby properties and infrastructure.

vi) Transmission of diseases

The implementation of the Project, by the improvement of drainage structures will contribute to the reduction of flooding during the rainy season and consequently reduce water-related diseases such as malaria, cholera etc. However if poorly managed stagnation of rain waters may lead to birds and pets related diseases resulting in disease vectors with a potential to affect the health of people within the community.

vii) Risk of drowning for the population during heavy rains

Additionally, there is the risk of drowning for the population during heaving rains on the detention pond especially sensitive groups such as children and elderly.

viii) Waste

Waste Production of waste concrete, debris, iron and steel waste by surface water drainage infrastructures maintenance and neighbouring residents haphazardly disposing waste in drains.

TABLE 34

IMPACT EVALUATION IN THE MOBILIZATION PHASE

Impact	Type of impact						Significance
	Nature	Effect	Extent	Duration	Likelihood	Magnitude	
Local employment opportunities	Positive	Direct/ Cumulative	Regional/ Local	Short term	Definite	Medium	Moderate
Opportunities for local traders	Positive	Direct/ Cumulative	Regional/ Local	Short term	Likely	Medium	Moderate
Landscape disturbance and loss of vegetation cover and habitats.	Negative	Direct/ Cumulative	On site	Short term	Likely	Medium	Moderate
Air pollution	Negative	Direct/ Cumulative	On site	Short term	Likely	Medium	Moderate
Soil pollution	Negative	Direct/ Cumulative	On site	Short term	Likely	Low	Minor
Surface water pollution	Negative	Direct/ Cumulative	On site/Local	Short term	Likely	Low	Minor

(PROCESL/COWI, 2014)

TABLE 35

IMPACT EVALUATION IN THE CONSTRUCTION PHASE

Impact	Type of impact						Significance
	Nature	Effect	Extent	Duration	Likelihood	Magnitude	
Impact on local employment opportunities	Positive	Direct	Regional/ Local	Short term	Definite	Medium	Moderate
Noise levels increment	Negative	Direct/ Cumulative	On site/Local	Short term	Likely	Medium	Moderate

Impact	Type of impact						Significance
	Nature	Effect	Extent	Duration	Likelihood	Magnitude	
Air pollution	Nrgative	Direct	Local	Short Term	Likely	Medium	Moderate
Surface water pollution	Negative	Direct/ Cumulative	On site/Local	Short term	Likely	Low	Minor
Disruption of natural drainage network	Negative	Direct/ Cumulative	On site/Local	Temporary	Likely	High	Major
Waste production	Negative	Direct/ Cumulative	On site	Short term	Definite	Medium	Moderate
Loss of habitats, ecosystem and land use	Negative	Direct/ Cumulative	On site	Short term	Likely	Medium	Moderate
Soil Erosion	Negative	Direct/ Cumulative	On site	Short term	Likely	Medium	Moderate
Anthropogenic disturbance on fauna and flora	Negative	Direct (Flora) Indirect (Fauna) and Cumulative	On site/Local	Short term (Flora) Temporary (Fauna)	Likely	Medium (Fauna)	Moderate
Land take	Negative	Direct/ Cumulative	On site	Short term	Definite	High	Major
Traffic accidents	Negative	Direct/ Indirect/Cumulative	Local	Temporary	Likely	Low/ Medium	Minor Moderate
Disruption of service utilities	Negative	Direct/ Cumulative	On site	Temporary	Likely	Medium	Moderate
Impact on occupational and community health and safety	Negative	Indirect/ Cumulative	Local	Short term	Likely	Medium	Moderate
Transmission of diseases by birds and pests. Transmission of diseases by contaminated water.	Negative	Direct/ Indirect/Cumulative	On site	Temporary	Likely	Low/ Medium	Minor Moderate
Accidents and injuries originated by construction activities such	Negative	Direct/	On site	Temporary	Likely	Low/	Minor

Impact	Type of impact						Significance
	Nature	Effect	Extent	Duration	Likelihood	Magnitude	
as cutting and hammering.		Cumulative				Medium	Moderate
Impact on archaeological and cultural heritage	Negative	Direct/ Indirect/Cumulative	On site	Temporary	Unlikely	Low	Minor

(PROCESL/COWI, 2014)

TABLE 36

IMPACT EVALUATION IN THE OPERATION PHASE

Impact	Type of impact						Significance
	Nature	Effect	Extent	Duration	Likelihood	Magnitude	
Improved quality of public health	Positive	Indirect	Local	Long term	Definite	High	Major
Improvement landscape visual quality.	Positive	Direct/ Cumulative	Local	Long term	Definite	High	Major
Ground water pollution	Negative	Indirect	On site/Local	Long term	Likely	Medium	Moderate
Surface water pollution	Negative	Indirect	On site/Local	Long term	Likely	Medium	Moderate
Soil pollution	Negative	Indirect	On site/Local	Long term	Likely	Medium	Moderate
Emergence of bad odours	Negative	Indirect	On site/ local	Temporary	Likely	Low	Minor
Damages to nearby properties and infrastructures	Negative	Indirect	On site/ local	Temporary	Likely	Medium	Moderate
Transmission of Diseases	Negative	Indirect	On site/ local	Temporary	Likely	Medium	Moderate
Risk of drowning for the population during heavy rains	Negative	Indirect	On site	Temporary	Likely	High	Major

Impact	Type of impact						Significance
	Nature	Effect	Extent	Duration	Likelihood	Magnitude	
Waste	Negative	Direct/ Cumulative	On site	Temporary	Likely	Medium	Moderate

(PROCESL/COWI, 2014)

6.4 PROJECT ALTERNATIVES

In the development of feasibility studies, designs and analysis of options, there was an effort towards the minimization of the environmental impacts identified, with greater emphasis on the resettlement of populations. The EIA and design team, have worked together and in an integrated way adopting, as far as possible, the necessary minimization measures to mitigate the impact on households.

To achieve a technical, environmental and social sustainable drainage design for the improvement of the drainage system in Temeke Municipality it were conducted several study analyses under the preparation of three (3) reports that allowed to conclude about preferred options under which the final project design was prepared.

The reports are as follows:

"Part 3 - Gerenzani Creek basin interventions (Temeke/Serengeti/Keko drains)" (September 2013)

In this report two alternatives were considered:

- Alternative 1: considered the enlargement/extension/alteration of the existing drainage infrastructures maintaining the current location/layout (except for the Temeke drain). This solution considered the maintenance of the natural river track (although significantly artificialized) and as it was strongly constrained along some sections. The intervention required the demolition of some existing buildings and the resettlement of the concerning dwellers along both the Keko and the Serengeti drains;

- Alternative 2: Flood protection works were designed to prevent or mitigate flooding on built areas where lives would be at risk or/ and damage to properties would be serious. To protect the referred areas from inundations different solutions were proposed:

  - To construct protective flood embankments around the area at risk. Given the characteristics of the study area, a densely occupied zone with a significant number of houses invading the natural stream bed, this solutions was impracticable;

  - To enlarge/ deep the existing channels/ streams to the dimensions that would contain the design flood. As for the previous situation there was no enough space for this type

of solution without considering the demolition of some houses. This solution corresponded to the described Alternative 1;

- Constructing a flood relief channel/ infrastructure outside the current path, to take the surplus flood water. This solution was adopted in the Alternative 2 for a significant section of Serengeti Drain, avoiding the more conditioned area, which existing infrastructures should be maintained;

- To redevelop the involved area, demolishing all the buildings located on flooding areas. This solution, the most drastic one, was explicitly discouraged by World Bank who preferred the maximum reduction of resettlement.

Considering the two presented alternatives, an analysis of Technical aspects was undertaken:

- Improvement of drainage capacity: Both solutions were designed to deal with the objective of increasing the drainage infrastructure response capacity to one in five years recurrence period rain event. Thus they were equivalent on this particular aspect. However the existence of two different partial "drainage paths" – Alternative 2 – provided a better solution for the resolution of the problem since allowed spreading the surplus flood for higher periods of return into two different areas and was a better option to resolve an eventual blockage of one of the "waterways".

- Short-term effectiveness and permanence of drainage: Involving Alternative 1 the partial or total cut/ interruption of the existing infrastructures involves direct works on them or their replacement using the same available path, the permanence of the drainage function was clearly better guaranteed with the Alternative 2 which can be completely implemented without any significant impact on the existing system.

- The short-term effectiveness of the Alternative 2 was anticipated to be easier to guarantee than the Alternative 1, since a less significant relocation/ resettlement of people was involved;

- Implementability – As previously referred the specific construction works of Alternative 2 didn't require, as much as it was possible to identify, the need of availability of land/ properties to be acquired and/ or of house demolitions and people resettlement, since almost all the path of the proposed "relief channel" overlaps with existing public roads/ paths. Thus the implementability of this solution was anticipated to be higher.

The difficulties of working in narrow/conditioned areas/ paths as necessary for Alternative 1, lead to the conclusion that Alternative 2 was preferable.

With respect to economic aspects, alternatives were considered equivalent in what respects the construction costs, and favorable for the Alternative 2 if considered other indirect costs such as resettlement.

Considering environmental issues, both solutions maintain the existing natural stream sections, not altering the people contact and the vicinity with it.

Nevertheless, construction works would be more "invasive" to the people living in the area of intervention considering the Alternative 1. The Alternative 2 would partially interrupt the car traffic on some roads/ paths, although wide enough to guarantee one way functioning.

The need of demolishing some more houses for implementing the Alternative 1 constituted a strong social negative impact.

In the sequence it Alternative 2 was selected and considered a partial "relief channel" in parallel with the existing drainage system, presenting better technical and environmental/ social aspects since the associated costs may be considered equivalent.

"Part 3 – Gerenzani Creek Basin Interventions - Temeke/ Serengeti/ Keko Drains - 3.0 - Definition and Comparison of Solutions to Adopt" (November 2013)

In this report, a comparative assessment between four alternatives was performed:

- Alternative 1: Inclusion of a detention pond on the upstream section of the Serengeti Drain as well as a relief drain on Keko area together with several selected interventions along the watercourse to widen and/or improve the river to meet the necessary hydraulic requirements;

- Alternative 2: No inclusion of the detention pond on the upstream section of the Serengeti Drain but including the relief drain on Keko area and several selected interventions along the watercourse to widen and/or improve the river to meet the necessary hydraulic requirements;

- Alternative 3: Inclusion of a detention pond on the upstream section of the Serengeti Drain and no inclusion of the relief drain on Keko area, but to construct several

selected interventions along the watercourse to widen and/or improve the river to meet the necessary hydraulic requirements;

- Alternative 4: No inclusion of a detention pond on the upstream section of the Serengeti Drain neither the relief drain on Keko area, but to construct selected interventions along the watercourse to widen and/or improve the river to meet the necessary hydraulic requirements.

The analyses of the report lead to the following conclusions:

The alternatives which considered the inclusion of a detention pond (1 and 3) proved to be less expensive, in terms of construction costs, than the ones without a detention pond (2 and 4). However, the cost difference was not significant, with the inclusion of the detention pond saving only between 4 and 6% of the construction cost.

The inclusion or not of a detention pond also had a very little impact on resettlement needs, with no additional properties being demolished if the Sub-projects adopted the relief drain, and only one extra property demolished if the Sub-projects did not included the relief drain. This could in part be due to the existing area where the detention pond was proposed to be located already acting as a natural flood regulator. Local knowledge suggested that the area ponds during the rainy season, with the downstream outflow restricted by Nelson Mandela Road and the existing road crossing culvert.

The option to implement the relief drain revealed that it was more expensive in terms of build cost, increasing construction costs by around 18 to 20%. However, it delivered a significant benefit in terms of a lower number of properties to be resettled.

In summary, these Sub-projects had apparently low sensitivity to the inclusion (or not) of a detention pond, mainly on downstream sections, where the contributions from some tributaries decreases the relative importance of the flood attenuation on detention pond. But, in the upstream sections (1 to 4) of Serengeti Drain the influence of the detention pond was relevant, mainly in some stretches where the construction works could face some challenges, such as the crossing of the school downstream Nelson Mandela Road. Moreover, should this area be subject to significant future development, removing the existing water detention benefit of the area, the downstream impact could be significant.

For the relief drain the project sensitivity was high. The inclusion of the drain could reduce property and people impact, with 28/29 buildings (depending on option combination) avoiding demolition as a consequence of including the relief drain.

"Part 4 – Yombo River Basin Interventions - Kigilagila/ Minazi Mirefu/ Kiwalani areas and Mpogo River - 4.0 - Definition and Comparison of Solutions to Adopt (November 2013)

The comparative assessment was undertaken in this report between following two alternatives:

- Alternative 1: Inclusion of a detention pond on the upstream section of the Mpogo River and implementation of selected interventions along the watercourse to widen and/or improve the river to meet the necessary hydraulic requirements.
- Alternative 2: No inclusion of a detention pond on the upstream section of the Mpogo River but to implement selected interventions along the watercourse to widen and/or improve the river to meet the necessary hydraulic requirements.

The analysis conducted in the Report concluded that Alternative 1 offered the best option both in terms of lowest construction cost and through reduced impact on people and property.

Whilst the accuracy of the cost estimate was limited by the lack of a detailed topographic survey model from which to extract precise quantities, the cost differential between the options was close to a factor of 10. This not only clearly emphasised the fact that Alternative 1 was significantly cheaper than Alternative 2, even allowing for revised costing as more detail becomes available, but it also indicated just how significant the inclusion of a detention pond is on this Sub-projects.

Similarly, the extent of channel widening required toaccommodate the peak flow without the throttling effect of the detention pond, resulted in a large disparity on the second significant comparator, with 40 more properties requiring demolition. This was almost five times that required to accommodate Alternative 1.

This Sub-projects had such high sensitivity to the inclusion (or not) of a detention pond that further dialogue with stakeholders was recommended to try and secure the necessary permissions to site a detention pond at the location proposed.

Taking into account the conclusions of the previous reports was possible to develop the analysis of the preferred alternatives and proceed with the preliminary design. The analysis of the preferred

alternatives, at this stage, considered only the "*Project implementation*" and the alternative "*Do Nothing*" under the development of the three (3) following reports:

- "Part 3 – Gerenzani Creek basin interventions (Temeke/Serengeti/Keko drains) 3.1– Preferred Option Analysis 3.2 – Preliminary Design" (March 2014)
- "Part 5 – Construction of Kwa Shego Valley drain - 5.1– Preferred Option Analysis - 5.2 – Preliminary Design" (March 2014)
- "Part 4 – Yombo River Basin Interventions (Kigilagila/Minazi Mirefu/Kiwalani areas and Mpogo River) - 4.1– Preferred Option Analysis; 4.2 - Preliminary Design" (March 2013)

In all three (3) reports was concluded that the "*Project implementation*" was a better option than the "*Do Nothing*" one. The alternative "*Do Nothing*" considers that the storm water drainage in Temeke Municipality will not be improved at all which is already resulting into environmental health hazards to the local residents, especially the vulnerable poor section of the community living in unplanned settlements. The flooding events will also continue to damage the existing infrastructure and utilities. In general, apart from creating health problems among the local community the flooding events will continue to create damage the individual properties, hence perpetuating poverty in the area.

As a result of the previews analysis the "*Project implementation*" was considered to be the best alterative option and considers the interventions presented in chapter 2.0.

CHAPTER 7.0: MITIGATION MEASURES

7.1 MOBILIZATION PHASE

Enhancement Measures

i) ***Local employment opportunities*** **-** Give employment priority to the local residents;

ii) ***Opportunities for local traders*** **-** Give opportunities to local/small businesses regarding the purchase of materials and trade with contractor;

Mitigation Measures

i) Landscape disturbance and loss of vegetation cover and habitats

- Proceed to the immediate replacement of the soils removed in the opening trenches;
- Ensure cleanliness and proper maintenance of ditches and all river extensions;
- A layer of topsoil should be stored in order to replace it at the closure of opened trenches.

ii) Air pollution

- Burning of vegetation is not allowed for site clean-up;
- The excavation, handling and transport of erodible materials should be avoided in windy conditions;
- Moderate speeds must be adopted when crossing inhabited or sensitive areas;
- Vehicles carrying fine materials / particulate type must be covered during transportation;
- Wet work areas at a rate that does not cause erosion or runoff;
- The contractor must ensure the regular cleaning of access roads and unpaved areas to avoid the accumulation of dust either by wind or by the movement of vehicles and equipment related to the construction.

iii) Soil Pollution

- Assure proper and secure stockpiling of materials during mobilization activities to avoid accidental spills; and
- Assure regular inspection of the stockpiled materials.

iv) Surface water pollution

- All mobilization activities that could endanger the water quality of receiving rivers should be avoided and controlled through site planning of mobilization activities and the preparation of a site procedures protocol;
- Prevent the stockpiling of materials on natural drainage lines and ditches;
- The deliberate disposal of wastes and other materials during mobilization must be forbidden, even temporarily, in the banks and beds of water lines as well as in the areas of high infiltration.

7.2 CONSTRUCTION PHASE

Enhancement Measures

i) Local employment opportunities

- Local employment opportunities will be enhanced by giving employment priority to the local residents;

Mitigation Measures

i) Noise levels increment

- Noise sources shall be relocated to less sensitive areas to take advantage of distance;
- Reduce project traffic routing through community areas wherever possible;
- Develop a mechanism to record and respond to complaints;
- Noise emissions shall comply with applicable laws in force in the country; and
- Limit works to daylight hours. Stop noisy construction during the night hours (18.00 – 6.00).

ii) Air Pollution

- Burning of vegetation is not allowed for site clean-up;
- The excavation, handling and transport of erodible materials should be avoided in windy conditions;
- Moderate speeds must be adopted when crossing inhabited or sensitive areas;

- Vehicles carrying fine materials / particulate type must be covered during transportation;
- Wet work areas at a rate that does not cause erosion or runoff; and
- The contractor must ensure the regular cleaning of access roads and unpaved areas to avoid the accumulation of dust either by wind or by the movement of vehicles and equipment related to the construction.

iii) Surface Water pollution

- All construction activities that could endanger the water quality of receiving rivers should be avoided and controlled through site planning of construction activities and the preparation of a site procedures protocol;
- Ensure awareness of city dwellers to avoid waste disposal and contaminated effluents in the storm water drainage system;
- Natural flow regimes must be maintained;
- Should be not permit the flow of muddy water or perform uncontrolled discharges from the work areas (including washing) for the adjacent water courses and/or water bodies;
- The water containing pollutants such as cement, concrete, lime, chemicals and fuels must be discharged into a temporal tank for a later removal from the site;
- Contaminated water should in no way be discharged into municipal sewer system;
- Prevent the accumulation of soil on natural drainage lines, ditches;
- The deliberate disposal of wastes must be forbidden, even temporarily, in the banks and beds of water lines as well as in the areas of high infiltration.

iv) Disruption of natural drainage network

- Natural flow regimes must be maintained meaning, whenever necessary, alternative and temporary drainage must be implemented;
- The sedimentation of rivers and streams for construction materials should be minimized.

v) Soil erosion and sedimentation

- Site clearance will only be undertaken when immediately required to permit adherence to the approved Programme of Work. The maximum permitted elapsed time between site clearance and the initiation of construction will be 5 days. The Contractor will adopt a site

clearance procedure that separates topsoil and stores it under appropriate conditions for reuse as instructed by the Engineer.

- The Contractor will take all reasonable measures, including the use of settling ponds, to protect cleared sites and open excavations from erosion due to rainfall and avoid discharge of suspended sediment to watercourses and drainage ditches.
- All temporary discharge points shall be located, designed and constructed in a manner that will minimise soil erosion in the receiving channels.
- The on-site storage of excessive quantities of unwanted spoil and aggregate materials will be avoided. Where storage is necessary, the Contractor will ensure that stockpiled soils are located at sites that do not permit direct runoff into watercourses;
- Construction materials will only be procured from licensed extraction sites.

vi) Waste production

- All wastes produced, including construction and demolition debris, must be collected by licensed private/municipal service providers;
- Solid wastes must be categorized according to their physical characteristics e.g. paper, plastic, and metals;
- For work camps and office waste, there should be four bins: paper materials; organic materials; glass wastes; and plastic materials. The contractor is to oversee this process and collect these in a secure area at the contractor's camp site.
- Construction sites and temporary warehouses should be cleaned to prevent indiscriminate fires, burial or abandonment of waste;
- During construction contractor has option of sorting waste and have scrap metal, wood and plastic bottles sold to local petty traders who collect them.
- Dar es Salaam City will be subcontracted to dispose the wastes, thus all waste are to be dumped at the current official dump which is at Pugu, and not to be taken to any transfer station. If the official dump changes during the course of the project implementation, the municipal will specify where the official dump is.

vii) Loss of habitat, ecosystem and land use

- Proceed to re-vegetation of affected areas with some indigenous species to prevent erosion and to provide a useful after-use of the affected land, as the use of species consistent with agricultural, recreational or leisure uses.

viii) Destruction of flora and fauna disturbance

- The removal of vegetation shall be avoided whenever possible and the exposed areas shall be restored as soon as possible;
- Construction camps and material parks shall not be located in sensitive locations;
- Limit the removal of vegetation to the minimum necessary;
- The removal of topsoil should precede any construction work, and must be preserved and put back after construction to allow rapid growth of vegetation. This operation should take place in dry season.

ix) Land take

- All grievances related to land and properties must be reported to the authorities for conflict resolution;
- All PAPs should be paid compensation according to RAP and RPF framework as well as the laws of the country;
- Establish dispute resolution committees;
- Educate the affected people about legal resolution mechanism.

x) Traffic accidents

- Construction of physical barrier such as road humps to reduce speed;
- Prohibit construction of new roads unless it is absolutely necessary;
- Access to the construction site and work areas should be done using existing roads;
- Place appropriate traffic signs along access roads;
- Impose speed limits at sites and intervention adjacent areas;
- Make arrangements for traffic diversions in terms of Traffic Management Plan.
- Comply with all applicable laws regarding safety and road transport.

xi) Disruption of service utilities

- Perform a preliminary survey on the location of existing infrastructures that may be damaged by construction activities of the storm water drainage system;

- The interruption of services (water, telephone, electricity etc..) should be minimized through a careful planning, close supervision and a continuous community information program;
- The interruption of services must be notified to the community beforehand;
- The need for temporary site drainage during the construction phase should be considered;
- Notify in advance the competent authorities about the interruption of roads, water supply or energy.

xii) Impacts on occupational and community health and safety

- The space provided for each worker, and in total, should be adequate for safe execution of all activities, including transport and interim of materials and products;
- Workers must be informed about STDs, HIV and AIDS to raise awareness. Information can be disseminated through education promotion materials such as leaflets, placards, shirts, arts, etc.
- Inform workers about the risks of flooding during major rainstorms;
- Provide First Aid kit at each work camp and other working facilities;
- Formulate and implement appropriate emergency procedures (such as spill and fire response);
- Provide appropriate Personnel Protective Equipment (PPE);
- Provide sanitary and safety facilities;
- Provide health education and training;
- Implement community sensitization programs on the risk for public health and safety caused by obstruction and destruction of storm water drains, the pollution of storm water and the risk associated with the detention pond flooding;
- Install equipment, where feasible, to enable routine service, such as lubrication, without removal of the guarding devices or mechanisms;
- Exposure to hand-arm vibration from equipment must comply with the limits for vibration and action values that are provided by the American Conference of Governmental Industrial Hygienists (ACGIH) and exposure levels should be checked on the basis of daily exposure time and data provided by equipment manufacturers;

- For the safety of the workers a cofferdam it must be done for the works realized on the river bed;
- The works realized on the river bed must be done in the dry season.

xiii) Impacts on archaeological and cultural heritage

- The discovery of any tombs, archaeological or cultural elements previously unidentified during the clean-up must be notified to the authority immediately. Construction works must be stopped to allow site investigation and approval process through the *division of antiquity* which functions under the Ministry of Natural Resources and Tourism. The Project construction must be done with appropriate respect for sites of cultural and religious significance.

7.3 OPERATION PHASE

Enhancement Measures

i) Improved quality of public health

- Implement community sensitization programs on the risk for public health and safety caused by obstruction and destruction of storm water drains, the pollution of storm water and the risk associated with the detention pond flooding;
- Promote introduction of improved pit latrines in unplanned settlements and introduce construction of sewerage systems; and
- Promote education and awareness campaigns on solid waste management.

ii) Improvement of landscape visual quality

- Promote introduction of improved pit latrines in unplanned settlements and introduce construction of sewerage systems; and
- Promote education and awareness campaigns on solid waste management.

Mitigation Measures

i) Ground water pollution

- Cleaning out clogged outlet and drainage system in the detention pond;

- Ensure awareness of city dwellers to avoid waste disposal and contaminated effluents in the storm water drainage system;
- Assure regular inspection of the storm water drainage; and
- Assure clearing of all components of the storm water drainage system.

ii) Surface water pollution

- Ensure awareness of city dwellers to avoid waste disposal and contaminated effluents in the storm water drainage system;
- Assure clearing of all components of the storm water drainage system;
- Assure regular inspection of the storm water drainage;
- The removal and properly disposal of the accumulated sediments in the detention pond;
- Removal of eventual unwanted vegetation especially on embankment (when applicable) in the detention pond;
- Cleaning out clogged outlet and drainage system in the detention pond.

iii) Soil pollution

- Assure clearance of all components of the storm water drainage system; and
- Assure regular inspection of the storm water drainage.

iv) Emergence of bad odours

- Cleaning out clogged outlet and drainage system in the detention pond;
- Assure clearing of all components of the storm water drainage system;
- Assure regular inspection of the storm water drainage

v) Damages to nearby properties and infrastructures

- Assure regular inspection of the storm water drainage; and
- Efficient control of storm water.

vi) Transmission of diseases

- Assure clearing of all components of the storm water drainage system;

- Assure regular inspection of the storm water drainage; and
- Implement community sensitization programs on the risk for public health and safety caused by obstruction and destruction of storm water drains and the risk associated with the detention pond flooding.

vii) Risk of drowning for the population during heavy rains

- Attach of warning signs, barriers, and other precautions on all areas of potential risk.
- Implement community sensitization programs on safety measures to be taken.

viii) Illegal connections and dumping of waste

- Periodic cleaning of open drainage channels will be executed by Temeke Municipal Council in collaboration with the local communities. The Temeke Municipal Council shall enforce by-laws to discourage people and local industries against throwing solid and liquid wastes and discharging sewage wastes into drainage channels. This should also go in parallel with education and awareness campaigns on proper solid wastes management;
- All waste produced during maintenance works must be collected by licenced private/municipal service providers.

CHAPTER 8.0: ENVIRONMENTAL MANAGEMENT PLAN

The proposed Environmental Management Plan (EMP) is a plan for monitoring and managing the impacts during mobilization, construction and operation phases of the project. This EMP is a document which encompasses all major environmental and social impacts associated with the Sub-project construction and its alternative mitigation measures. The EMP addresses specific issues to be managed at the construction site and ensures that commitments made during the planning phase are incorporated into all project phases, presenting the implementation responsibilities during mobilization, construction and operation phases. The EMP for this project is presented below.

TABLE 37

EMP IMPLEMENTATION IN THE MOBILIZATION PHASE

	Potential Impacts		Enhancement Measures	Responsibilities for implementation	Cost	Time frame
1.	Local employment opportunities		Give employment priority to the local residents	Contractor supervised by Resident Engineer/IMC	646,150 per day	Before the commencement of the works
2.	Opportunities for local traders		Give opportunities to local/small businesses regarding the purchase of materials and trade with contractor v	Contractor supervised by Resident Engineer/IMC	-	During mobilization period
	Potential Impacts		**Mitigation Measures**	**Responsibilities for implementation**	**Cost**	**Time frame**
	Landscape disturbance and loss of vegetation cover and habitats	Vegetation clearance	Proceed to the immediate replacement of the soils removed in the opening trenches.	Contractor supervised by Resident Engineer/TMC	12,650,000	During mobilization period
			Ensure cleanliness and proper maintenance of ditches and all river extensions.			
			A layer of topsoil should be stored in order to replace it at the closure of opened trenches.			
3.	Air pollution	Stockpiling of materials can cause air pollution by pollutant dispersion.	Burning of vegetation is not allowed for site clean-up.	Contractor supervised by Resident Engineer	Included in item No. 2 above	
			The excavation, handling and transport of erodible materials should be avoided in windy conditions.			
			Moderate speeds must be adopted when crossing inhabited or sensitive areas.			
			Vehicles carrying fine materials / particulate type must be covered during transportation.			
			Wet work areas at a rate that does not cause erosion or runoff.			

			The contractor must ensure the regular cleaning of access roads and unpaved areas to avoid the accumulation of dust either by wind or by the movement of vehicles and equipment related to the construction.			
4.	Soil pollution	Stockpiling of materials can cause soil pollution by accidental spills.	Assure proper and secure stockpiling of materials during mobilization activities to avoid accidental spills.	Contractor supervised by Resident Engineer		
			Assure regular inspection of the stockpiled materials.			
5.	Surface water pollution	Stockpiling of materials and earthworks can lead to an increment of Suspended Solids (SS) in the surface waters.	All mobilization activities that could endanger the water quality of receiving rivers should be avoided and controlled through site planning of mobilization activities and the preparation of a site procedures protocol;	Contractor supervised by Resident Engineer	Included in item 2 above	
			Prevent the stockpiling of materials on natural drainage lines and ditches;			
			The deliberate disposal of wastes and other materials during mobilization must be forbidden, even temporarily, in the banks and beds of water lines as well as in the areas of high infiltration.			

(PROCESL/COWI, 2014)

TABLE 38

EMP IMPLEMENTATION IN THE CONSTRUCTION PHASE

	Potential Impacts	Enhancement Measures	Responsibilities for implementation	Cost	Time frame
6.	Local employment opportunities	Local employment opportunities will be enhanced by giving employment priority to the local residents.	Contractor supervised by Resident Engineer	646,150 per day	Before the commencement of the works
	Potential Impacts	**Mitigation Measures**	**Responsibilities for implementation**	**Cost**	**Time frame**
7.	Transport and storage of	Burning of vegetation is not allowed for site clean-up.	Contractor supervised	---	During

	Air pollution	aggregates and earth materials may produce dust. Movement of machinery and vehicles will increase dust particles in suspension, which may indirectly affect surrounding crops.		by Resident Engineer		construction period
			The excavation, handling and transport of erodible materials should be avoided in windy conditions.		---	During earthmoving activities
			Moderate speeds must be adopted when crossing inhabited or sensitive areas.		---	During construction period
			Vehicles carrying fine materials / particulate type must be covered during transportation.		2,350,662	During transportation of materials
			Wet work areas at a rate that does not cause erosion or runoff.			
			The contractor must ensure the regular cleaning of access roads and unpaved areas to avoid the accumulation of dust either by wind or by the movement of vehicles and equipment related to the construction.			During construction period
		Emergence of odours can also occur in this phase, caused by the handling of contaminated storm water.	Bad odour can be eliminated by cleaning the trenches and ensuring no existence of stagnant water.	Contractor supervised by Resident Engineer	Included in item No. 2 above	During construction period
8.	Increasing noise levels and vibration	Movement of machinery and vehicles may increase noise levels and vibrations which can affect the people and fauna.	Noise sources shall be relocated to less sensitive areas to take advantage of distance.	Contractor supervised by Resident Engineer	---	During construction period
			Reduce project traffic routing through community areas wherever possible.	Contractor supervised by Resident Engineer	---	
			Develop a mechanism to record and respond to complaints.		4,000,000 from provisional sum	Before commencement of works and during construction period
			Noise emissions shall comply with applicable laws in force in the country.			During construction period
			Limit works to daylight hours. Stop noisy construction during the night hours (18.00 – 6.00).	Contractor supervised by Resident Engineer		
9.	Surface and groundwater	Construction activities can cause contamination of	Fuelling of machinery and vehicles should be done in concrete	Contractor supervised	---	During fuelling of machinery and

	pollution	surface and groundwater by occasional spills and contaminated water handling. Stockpiling of materials and earthworks can lead to an increment of Suspended Solids (SS) in the surface waters.	floors previously identified within the site.	by Resident Engineer		vehicles
			All construction activities that could endanger the water should be avoided and controlled, though site planning of construction activities and the preparation of a site procedures protocol.	Contractor supervised by Resident Engineer	---	Before commencement of works and during construction period
			It should not be permitted to flow muddy water or perform uncontrolled discharges from the work areas (including washing) for the adjacent water courses and/or water bodies.	Contractor supervised by Resident Engineer	---	During construction period
			The water containing pollutants such as cement, concrete, lime, chemicals and fuels must be discharged into a temporal tank for a later removal from the site.	Contractor supervised by Resident Engineer	---	
			Contaminated water should in no way be discharged into municipal sewer system.	Contractor supervised by Resident Engineer	---	
			The deliberate disposal of wastes is forbidden, even temporarily, in the banks and beds of water lines as well as in the areas of high infiltration.	Contractor supervised by Resident Engineer	---	
			Fuels, oils, cement and other materials must be handled properly to avoid spills, like concrete floors.	Contractor supervised by Resident Engineer	---	
			Reduce the exposure time of material capable to be dragged in rainfall event.	Contractor supervised by Resident Engineer	---	
			The maintenance of equipment and vehicles should be done on concrete ground /floor to avoid soil and underground pollution.	Contractor supervised by Resident Engineer	---	
			Ensure awareness of city dwellers to avoid waste disposal and contaminated effluents in the storm water drainage systems.	Contractor supervised by Resident Engineer	6,000,000 capacity building	During construction period
			Prevent the accumulation of soil on natural drainage lines, ditches.	Contractor supervised by Resident Engineer		
	Disruption of natural	Activities in the streams	Natural flow regimes must be maintained meaning, whenever	Contractor supervised	---	During

	drainage network	and channels	necessary, alternative and temporary drainage must be implemented.	by Resident Engineer		construction period
10.			The sedimentation of streams for construction materials should be minimized by cleaning.	Contractor supervised by Resident Engineer	Kwa Shego 11,97000 Mpogo 17,015,400 Serengeti 8,507,700	
11.	Soil erosion and sedimentation	Construction works associated with earthworks and site clearance may lead to siltation	Site clearance will only be undertaken when immediately required to permit adherence to the approved Programme of Work. The maximum permitted elapsed time between site clearance and the initiation of construction will be 5 days. The Contractor will adopt a site clearance procedure that separates topsoil and stores it under appropriate conditions for reuse as instructed by the Engineer.	Contractor supervised by Resident Engineer	Included in item 10 above	During construction period
			The Contractor will take all reasonable measures, including the use of settling ponds, to protect cleared sites and open excavations from erosion due to rainfall and avoid discharge of suspended sediment to watercourses and drainage ditches.			
			All temporary discharge points shall be located, designed and constructed in a manner that will minimise soil erosion in the receiving channels.			
			Construction materials will only be procured from licensed extraction sites.			
			The on-site storage of excessive quantities of unwanted spoil and aggregate materials will be avoided. Where storage is necessary, the Contractor will ensure that stockpiled soils are located at sites that do not permit direct runoff into watercourses.			

12.	Waste production.	Mismanagement of waste	All wastes produced, including construction and demolition debris, must be collected by licensed private/municipal service providers.	Contractor supervised by Resident Engineer	49,800,000 Environmental protection & waste disposal	During construction period
			Solid wastes must be categorized according to their physical characteristics e.g. paper, plastic, and metals.	Contractor supervised by Resident Engineer		
			For work camps and office waste, there should be four bins: paper materials; organic materials; glass wastes; and plastic materials; The contractor is to oversee this process and collect these in a secure area at the contractor's camp site.	Contractor supervised by Resident Engineer		
			Construction sites and temporary warehouses should be cleaned to prevent indiscriminate fires, burial or abandonment of waste.	Contractor supervised by Resident Engineer		
			During construction contractor has option of sorting waste and have scrap metal, wood and plastic bottles sold to local petty traders who collect them.	Contractor supervised by Resident Engineer		
			Dar es Salaam City will be subcontracted to dispose the wastes, thus all waste are to be dumped at the current official dump which is at Pugu, and not to be taken to any transfer station. If the official dump changes during the course of the project implementation, the municipal will specify where the official dump is.			
	Change of land use, habitats and ecosystems	The clearing involves the loss of habitats in the intervention area, changing the ecosystem and land uses.	The removal of vegetation shall be avoided whenever possible and the exposed areas shall be restored as soon as possible.	Contractor supervised by Resident Engineer	Included in item 2 above	During construction period
			Proceed to re-vegetation of affected areas with some indigenous species to prevent erosion and to provide a useful after-use of the affected land, as the use of species consistent with agricultural, recreational or leisure uses.	Contractor supervised by Resident Engineer		After construction works
		Vegetation loss and changes on fauna habitats.	Limit the removal of vegetation to the minimum necessary.	Contractor supervised by Resident Engineer		During construction period
			The removal of topsoil should precede any construction work,	Contractor supervised		Before construction

13.		Increment of dust particles in suspension, which may indirectly affect flora. Exclusion effect on fauna particularly mammals, and enhances the occurrence of direct mortalities.	and must be preserved and put back after construction to allow rapid growth of vegetation. This operation should take place in dry season.	by Resident Engineer		works and in the dry season
		Habitat loss subsequent from the implementation of the facilities and other anthropogenic disturbance created by its operations.	Construction camps and material parks shall not be located in sensitive locations.	Contractor supervised by Resident Engineer		Before construction works
14.	Land take and involuntary resettlement	Affection of households and properties.	All grievances related to land and properties must be reported to the authorities for conflict resolution.	PMO-RALG/TMC	2,477,979,067.61	Before commencement of works
			All PAPs should be paid compensation according to laws of the country.			
			Establish dispute resolution committees.			
			Educate the affected people about legal resolution mechanism.			
15.	HIV/AIDS	Expected increment of social interaction between workers and/or communities may lead to a risk for HIV/AIDS pandemic and other social diseases.	Workers must be informed about STDs, HIV and AIDS to raise awareness. Information can be disseminated through education promotion materials such as leaflets, placards, shirts, arts, etc.	PMO-RALG/Contractor/DLAs	55,800,000	Before commencement of works
16.	Increase traffic and accidents	Risk for an increment of traffic and accidents in the Project area and along access roads.	Place appropriate traffic signs along access roads.	Contractor supervised by Resident Engineer	8,164,800 Ancillary works	Before commencement of works and during construction phase
			Impose speed limits at sites and intervention adjacent areas.			
			Comply with all applicable laws regarding safety and road transport.			
			Prohibit construction of new roads unless it is absolutely			

			necessary.			
			Access to the construction site and work areas should be done using existing roads.			
			Construction of physical barrier such as road humps to reduce speed.			
			Make arrangements for traffic diversions in terms of Traffic Management Plan.	Contractor supervised by Resident Engineer		Before commencement of works and during construction phase
17.	Water borne diseases	Transmission of diseases by birds and pests. Transmission of diseases by contaminated water.	Inform workers about the risks of flooding during major rainstorms.	PMO-RALG/Contractor/DLAs	Included in item 9 above	Before commencement of works and during construction phase
			Implement community sensitization programs on the risk for public health and safety caused by obstruction and destruction of storm water drains, the pollution of storm water and the risk associated with the detention pond flooding.			
18.	Accidental injuries	Accidents and injuries originated by construction activities such as cutting and hammering.	The space provided for each worker, and in total, should be adequate for safe execution of all activities, including transport and interim of materials and products.	Contractor supervised by Resident Engineer	5,000,000 form provisional sum	Before commencement of works and during construction phase
			Provide First Aid kit at each work camp and other working facilities.			
			Formulate and implement appropriate emergency procedures (such as spill and fire response).			Before commencement of works
			Provide appropriate Personnel Protective Equipment (PPE).			Before commencement of works and during construction phase whenever needed
			Provide sanitary and safety facilities.			
			Install equipment where feasible to enable routine service such as lubrication without removal of the guarding devices or mechanisms.			

			Exposure to hand-arm vibration from equipment must comply with the limits for vibration and action values that are provided by the ACGIH and exposure levels should be checked on the basis of daily exposure time and data provided by equipment manufacturers.		---	During construction phase
			Provide health education and training.		Included in item 9 above	Before commencement of works
19.	Disruption of utility services and communication routes	Potential risk for disruption of service utilities of water and power that causes inconvenient to the population. Disruption of communication route.	Perform a preliminary survey on the location of existing infrastructures that may be damaged by construction activities of the storm water drainage system.	Contractor supervised by Resident Engineer in collaboration with public services utility authorities	322,614,695	During construction phase
						Before commencement of works
			The interruption of services (water, telephone, electricity etc.) should be minimized, through a careful planning, close supervision and a continuous community information program.			During construction phase
			The interruption of services must be notified to the community beforehand.	Contractor supervised by Resident Engineer		During construction phase
			The need for temporary site drainage during the construction phase should be considered.			
			Make arrangements for traffic diversions in the terms of a Traffic Management Plan.			Before commencement of works
20.	Disruption of historical, archaeological, cultural and or religion site	Construction works can directly or indirectly affect the proposed site if it happens to have an archaeological, historical, cultural or religious significance	The discovery of any tombs, archaeological or cultural elements previously unidentified during the clean-up must be notified to the authority immediately (if any). The construction work must be stopped to allow site investigation and approval process.	Contractor supervised by Resident Engineer	Included in item 19 above	During construction phase
			The construction of the proposed project must be done with appropriate respect for sites of cultural and religious significance.			

(PROCESL/COWI, 2014)

TABLE 39
EMP IMPLEMENTATION IN OPERATION PHASE

	Potential Impacts		Enhancement Measures	Responsibilities for implementation	Cost	Time frame
21.	Improved quality of public health		Implement community sensitization programs on the risks for public health and safety caused by obstruction and destruction of storm water drains, the pollution of storm water and the risk associated with the detention pond flooding.	TMC	Included in item 9 above	At the beginning of the operation phase
			Promote introduction of improved pit latrines in unplanned settlements and introduce construction of sewerage systems.	TMC		At the beginning of the operation phase
			Promote education and awareness campaigns on solid waste management.	TMC		Periodically
22.	Improvement of landscape visual quality		Promote introduction of improved pit latrines in unplanned settlements and introduce construction of sewerage systems.	TMC	Part of municipal budget	At the beginning of the operation phase
			Promote education and awareness campaigns on solid waste management.	TMC	Included on item 9 above	Periodically
	Potential Impacts		**Mitigation Measures**	**Responsibilities for implementation**	**Cost**	**Time frame**
23.	Destruction of properties due to uncontrolled storm water	Damages to nearby properties and infrastructures may occur due to not	Assure clearing of all components of the storm water drainage system. Assure regular inspection of the storm water drainage system.	DMDP/PMO-RALG/DLAs	Included in item 9 & 10 above	Annually

	Potential Impacts	Enhancement Measures	Responsibilities for implementation	Cost	Time frame
21.	Improved quality of public health	Implement community sensitization programs on the risks for public health and safety caused by obstruction and destruction of storm water drains, the pollution of storm water and the risk associated with the detention pond flooding.	TMC	Included in item 9 above	At the beginning of the operation phase
		Promote introduction of improved pit latrines in unplanned settlements and introduce construction of sewerage systems.	TMC		At the beginning of the operation phase
		Promote education and awareness campaigns on solid waste management.	TMC		Periodically
22.	Improvement of landscape visual quality	Promote introduction of improved pit latrines in unplanned settlements and introduce construction of sewerage systems.	TMC	Part of municipal budget	At the beginning of the operation phase
		Promote education and awareness campaigns on solid waste management.	TMC	Included on item 9 above	Periodically

	Potential Impacts		Mitigation Measures	Responsibilities for implementation	Cost	Time frame
		properly controlled storm water which may affect the population. Diseases may affect the population due to rain waters stagnation.	Implement community sensitization programs on the risk for public health and safety caused by obstruction and destruction off storm water drains, the pollution of storm water and the risk associated with the detention pond.			Commissioning period
			Attachment of warnings, barriers, and other precautions on all areas of potential risk.			

	Potential Impacts		Enhancement Measures	Responsibilities for implementation	Cost	Time frame
21.	Improved quality of public health		Implement community sensitization programs on the risks for public health and safety caused by obstruction and destruction of storm water drains, the pollution of storm water and the risk associated with the detention pond flooding.	TMC	Included in item 9 above	At the beginning of the operation phase
			Promote introduction of improved pit latrines in unplanned settlements and introduce construction of sewerage systems.	TMC		At the beginning of the operation phase
			Promote education and awareness campaigns on solid waste management.	TMC		Periodically
22.	Improvement of landscape visual quality		Promote introduction of improved pit latrines in unplanned settlements and introduce construction of sewerage systems.	TMC	Part of municipal budget	At the beginning of the operation phase
			Promote education and awareness campaigns on solid waste management.	TMC	Included on item 9 above	Periodically
	Potential Impacts		**Mitigation Measures**	**Responsibilities for implementation**	**Cost**	**Time frame**
24.	Surface and groundwater contamination	Risk of surface and ground water contamination by illegal discharges.	Ensure awareness of city dwellers to avoid waste disposal and contaminated effluents in the storm water drainage system.		Included in item 9 & 10 above	Commissioning period
			Assure clearing of all components of the storm water drainage system.			Annually
			Assure regular inspection of the storm water drainage system.			
			Removal of eventual unwanted vegetation especially on embankment in the detention pond.			Annually

	Potential Impacts		Enhancement Measures	Responsibilities for implementation	Cost	Time frame
21.	Improved quality of public health		Implement community sensitization programs on the risks for public health and safety caused by obstruction and destruction of storm water drains, the pollution of storm water and the risk associated with the detention pond flooding.	TMC	Included in item 9 above	At the beginning of the operation phase
			Promote introduction of improved pit latrines in unplanned settlements and introduce construction of sewerage systems.	TMC		At the beginning of the operation phase
			Promote education and awareness campaigns on solid waste management.	TMC		Periodically
22.	Improvement of landscape visual quality		Promote introduction of improved pit latrines in unplanned settlements and introduce construction of sewerage systems.	TMC	Part of municipal budget	At the beginning of the operation phase
			Promote education and awareness campaigns on solid waste management.	TMC	Included on item 9 above	Periodically
	Potential Impacts		**Mitigation Measures**	**Responsibilities for implementation**	**Cost**	**Time frame**
			Cleaning out clogged outlet and drainage system in the detention pond.			Annually
	Soil contamination and landscape disturbance	Risk of soil contamination by contaminated water infiltration by illegal discharges.	Assure clearing of all components of the storm water drainage system. Assure regular inspection of the storm water drainage system.		Included in item 10 above	Annually
		Illegal discharge of solid and liquid wastes to the channels	The Temeke Municipal Council shall enforce by-laws to discourage people and local industries against throwing solid and liquid wastes and discharging sewage wastes into drainage channels. This should		Included in item 9 above	

	Potential Impacts		Enhancement Measures	Responsibilities for implementation	Cost	Time frame
21.	Improved quality of public health		Implement community sensitization programs on the risks for public health and safety caused by obstruction and destruction of storm water drains, the pollution of storm water and the risk associated with the detention pond flooding.	TMC	Included in item 9 above	At the beginning of the operation phase
			Promote introduction of improved pit latrines in unplanned settlements and introduce construction of sewerage systems.	TMC		At the beginning of the operation phase
			Promote education and awareness campaigns on solid waste management.	TMC		Periodically
22.	Improvement of landscape visual quality		Promote introduction of improved pit latrines in unplanned settlements and introduce construction of sewerage systems.	TMC	Part of municipal budget	At the beginning of the operation phase
			Promote education and awareness campaigns on solid waste management.	TMC	Included on item 9 above	Periodically
	Potential Impacts		**Mitigation Measures**	**Responsibilities for implementation**	**Cost**	**Time frame**
			also go in parallel with education and awareness campaigns on proper solid wastes management.			
	Risk of drowning for the population during heavy rains		Attach of warning signs, barriers, and other precautions on all areas of potential risk. Implement community sensitization programs on safety measures to be taken.	DLAs	Part of municipal budget	Annually

(PROCESL/COWI, 2014)

CHAPTER 9.0: ENVIRONMENTAL MONITORING PLAN

Environmental Monitoring Framework for the Surface Water Drainage System in Temeke Municipality outlines the responsibilities of DMDP/PMO-RALG, NEMC and the Contractor to monitor the environmental and social mitigation measures of the Sub-project and to ensure it is constructed and operated in a manner that is compliant with Tanzanian's Government regulations and EIA/EMP commitments.

A monitoring regime will be established, prioritising the elements that must be in place prior to construction to allow a baseline to be established against which changes during construction and operation can be assessed. Some of the necessary monitoring aspects can be included in the on-going activities of government agencies already active in the project area. Some will be the responsibility of the contractors and some should be carried out by other responsible parties for development and operation of the project or organisations appointed by them. The monitoring programme also establishes effective feedback mechanisms so that the performance and effectiveness of the various elements of the EMP can be evaluated and, if necessary, corrective actions can be implemented. The table below outlined some major elements of the Monitoring plan for the Temeke Surface Water Drainage System project.

TABLE 40

MOBILIZATION MONITORING PLAN FRAMEWORK

Impact	Mitigation measure	Indicator/ Parameters to be measured	Location	Procedure	Verification	Duration	Objective	Responsibility	Cost estimate (USD)
Air pollution	• Vehicles carrying fine materials / particulate type must be covered during transportation; • Moderate speeds must be adopted when crossing inhabited or sensitive areas.	Dust	Storage sites and locations where earth movements are carried	Visual observations, through supervision	Reporting	Punctual unannounced inspections during working hours	Assure compliance with legal requirements	Environmental Consultant in collaboration with Resident Engineer	1,500
	• Regular cleaning of access roads and unpaved areas to avoid the accumulation of dust either by wind or by the movement of vehicles and equipment.	Air quality Complaints	Construction site and/or surroundings	Visual observations	Reporting forms and keeping records (complaints)	During earthworks	Assure compliance with legal requirements. Response to complaints.	Environmental Consultant in collaboration with Resident Engineer	1,500
Water pollution	• Prevent the accumulation of soil on natural drainage lines, ditches and ensure cleanliness and proper maintenance of ditches and all river extensions.	Water quality standards	Water reserves and resources Sewage disposal sites	Water sampling Laboratory testing Keeping records	Reporting	One sample	Prevention of water pollution	Environmental Consultant in collaboration with Resident Engineer	2,000

(PROCESL/COWI, 2014)

TABLE 41

CONSTRUCTION MONITORING PLAN FRAMEWORK

Impact	Mitigation measure	Indicator/ Parameters to be measured	Location	Procedure	Verification	Duration	Objective	Responsibility	Cost estimate (USD)
Soil pollution	• Limit soil works within construction areas unless it is absolutely necessary; • Proceed to the immediate replacement of the soils removed in the opening trenches; • The stacking of topsoil should be kept in areas previously disturbed or plowed, clearly marked and accessible by vehicles; • The stacks must be appropriately protected against soil erosion from wind and water currents, including rainfall. • Fuelling of machinery and vehicles as well as equipment maintenance should be done in concrete floors previously identified within the site.	Top-soil storage Evidence of erosion	Storage sites and where earth movements are carried	Visual observations, through supervision	Reporting	Punctual unannounced inspections during working hours	Preservation of soil, water and air pollution	Environmental Consultant in collaboration with Resident Engineer	*1,000
		Oil spill marks	Equipment maintenance facilities and fuelling	Visual observations	Reporting	Periodic	Preservation of soil Prevention of water pollution	Environmental Consultant in collaboration with Resident Engineer	

Impact	Mitigation measure	Indicator/ Parameters to be measured	Location	Procedure	Verification	Duration	Objective	Responsibility	Cost estimate (USD)
Noise levels increment	• Noise sources shall be relocated to less sensitive areas to take advantage of distance; • Noise emissions shall comply with applicable laws in force in the country; • Limit works to daylight hours. Stop noisy construction during the night hours (18.00 – 6.00).	Noise levels Complaints	Construction site	Measurement of noise levels on equipment and machinery	Reporting forms and keeping records (complaints)	Periodic. Dependent of work stage and complaints	Assure compliance with legal requirements. Response to complaints.	Environmental Consultant in collaboration with Resident Engineer	*1,500
Air pollution	• The excavation, handling and transport of erodible materials should be avoided in windy conditions; • Vehicles carrying fine materials must be covered during transportation; • Regular cleaning of access roads and unpaved areas.	Air quality Complaints	Construction site and/or surroundings	Visual observations Reporting forms and keeping records (complaints)	Reporting forms and keeping records (complaints)	During earthworks and works in dry season	Assure compliance with legal requirements. Response to complaints.	Environmental Consultant in collaboration with Resident Engineer	*1,000
Water pollution	• Should not be permitted the flow of muddy water or perform uncontrolled discharges from the work areas (including washing) for the adjacent water courses and/or water bodies; • All construction activities that could endanger the water quality of receiving rivers should be	Water quality standards	Water reserves and resources Sewage disposal sites	Water sampling Laboratory testing Keeping records	Reporting	Monthly testing for TSS, DO, conductivity and pH (using portable equipment) Monthly	Prevention of water pollution	Environmental Consultant in collaboration with Resident Engineer	---

Impact	Mitigation measure	Indicator/ Parameters to be measured	Location	Procedure	Verification	Duration	Objective	Responsibility	Cost estimate (USD)
	avoided and controlled through site planning of construction activities and the preparation of a site procedures protocol; • The water containing pollutants such as cement, concrete, lime, chemicals and fuels must be discharged into a temporal tank for a later removal from the site.					testing other parameters			
Waste production	• The deliberate disposal of wastes must be forbidden in the banks and beds of water lines; • All wastes produced must be collected by licensed private/municipal service providers; • All wastes produced must be collected and disposed in appropriate manner; • Construction sites and temporary warehouses should be cleaned to prevent indiscriminate fires, burial or abandonment of waste.	Quantities and types of waste produced	Construction sites and temporary warehouses	Visual observations Counting the quantity of waste produced and stored	Reporting Keeping records of time, dates and quantity of waste produced and stored	Monthly	Control waste production and management	Environmental Consultant in collaboration with Resident Engineer	*2,000
Impacts on cultural heritage	• The discovery of any tombs, archaeological or cultural elements previously unidentified during the clean-up must be	Accidental discovery of culturally significant artefact	Excavation sites	Visual observations	Reporting	During excavation	Preservation of cultural heritage	Environmental Consultant in collaboration with Resident	*2,000

Impact	Mitigation measure	Indicator/ Parameters to be measured	Location	Procedure	Verification	Duration	Objective	Responsibility	Cost estimate (USD)
	notified to the authority immediately (if any); • Construction works must be stopped to allow site investigation and approval process; • The Project construction must be done with appropriate respect for sites of cultural and religious significance.	or site						Engineer	
Disruption of services	• The interruption of services (water, telephone, electricity etc..) should be minimized through a careful planning, close supervision and a continuous community information program; • The interruption of services must be notified to the community beforehand; • The need for temporary site drainage during the construction phase should be considered; • Notify in advance the competent authorities about the interruption of roads, water supply or energy.	Relocation of utilities Complaints	Construction site Adjacent communes	Visual observations	Reporting forms and keeping records (complaints)	Once during construction phase	Minimize the disruption of service interruption	Environmental Consultant in collaboration with Resident Engineer	195,524

(PROCESL/COWI, 2014)

TABLE 42

OPERATION MONITORING PLAN FRAMEWORK

Impact	Mitigation measure	Indicator	Location	Procedure	Verification	Duration	Objective	Responsibility	Cost estimate (USD)
Water pollution	• Awareness of city dwellers to avoid waste disposal and contaminated effluents in the storm water drainage system.	Water quality standards	Storm water drainage system	Water sampling Laboratory testing	Monthly reporting	Monthly	Prevention of water pollution	DMDP/PMO-RALG/TMC	5,000
landscape disturbance	• Maintenance of vegetation (cutting and planting).	Vegetation	Re-vegetated areas	Inspection	Reporting	Periodic	Prevention of soil erosion Protection of Fauna and Flora	DMDP/PMO-RALG/TMC	*800
Disruption of natural drainage network	• Clearing of all components of the storm water drainage system including cleaning out clogged outlet and drainage system.	Cleaning Evidence	Detention pond	Inspection	Reporting	After each heavy storm events	Evaluation of the operation	DMDP/PMO-RALG/TMC	*2,500
	• Removal and properly disposal of the accumulated sediments in the detention pond.	Sediments presence	Detention pond	Removal and properly disposal of the accumulated sediments	Reporting	After a heavy storm event or every two years	Ensure the efficient operation of detention pond	DMDP/PMO-RALG/TMC	

Impact	Mitigation measure	Indicator	Location	Procedure	Verification	Duration	Objective	Responsibility	Cost estimate (USD)
	• Removal of eventual unwanted vegetation especially on embankment (when applicable) in the detention pond.	Vegetation presence	Detention pond	Removal of eventual unwanted vegetation especially on embankment	Reporting	Periodic	Ensure the efficient operation of detention pond	DMDP/PMO-RALG/TMC	

(PROCESL/COWI, 2014)

CHAPTER 10.0: COST BENEFIT ANALYSES

10.1 DEFINING NVP AND IRR

OBJECTIVE AND METHODOLOGY

The objective of the economic feasibility assessment is to establish a Cost-benefit analysis (CBA) and estimate the profit of the Sub-projects for society by render comparable all the costs and benefits of the sub-project.

The approach adopted to perform the Cost-benefit analysis (CBA) of the sub-project comprises four steps:

1. Risk analysis;
2. Benefits valuation;
3. Economic efficiency;
4. Sensitivity analysis.

Risk analysis

The risk associated to a flood event is analysed as a function of hazard and vulnerability wherein:

- Hazard corresponds to the intensity and recurrency of flooding (and it's presented through the estimated flooded area for each rainfall event and the correspondent annual probability of an event not exceeding – exceedance probability);
- Vulnerability expresses the combination of the relevant elements (population and assets associated with a certain flood intensity and recurrency) with their susceptibility to damage (fragility) and resilience (denoted as the ability to return to pre-disaster conditions). Vulnerability is presented through the combination of damage ratio and the amount of exposure per period of return.

Benefits

The benefits of the Sub-projects arise due to the savings in terms of avoided costs and correspond to the risk reduction introduced by the Sub-projects.

Only the following non-monetary benefits were valuated:

- Increase in land price;

- Prevention of physical damages to properties;
- Direct assistance/care costs;
- Loss of income/wages/goods;
- Cleanliness/restoration costs.

The Cost-benefit analysis didn't account for non-monetizable benefits (for example health benefits), and non-quantifiable benefits (for instance civil pride and happiness) due to estimation problems.

The establishment of a loss-frequency relation, for the cases with and without sub-project, enables to calculate expected damages per period of return and the annual expected extent of damages.

Based on the loss and loss reduction estimates, net benefits (the difference between damages and reduced damages) can be calculated.

Economic efficiency

The economic efficiency of the sub-project is based on the calculation of the net present value (NPV), benefit/costs ratio (B/C), and interest rate of return (IRR).

Sensitivity analysis

Sensitivity analysis is conducted using the following sensitivity checks:

1. Increasing costs ad-hoc by 30%;
2. Decreasing benefits referent to changes in land value by 30%.
3. Decreasing property exposure by 25%;
4. Combining all previous scenarios in one unique scenario.

COST OF CONSTRUCTION

The following table summarises the construction costs of the Proposed Surface Water Drainage System Sub-projects in Temeke Municipality. The estimated costs are presented excluding the costs of demolition of houses and people resettlement as a sub total base construction cost with the supervision construction and contingency in grand total.

Contingencies and other costs, with a rate between 20-25% of the total construction costs, include the environmental management and mitigation measures.

TABLE 43

CONSTRUCTION COSTS

Item	Unit	TE2 - Serengeti Drain		
		Quantity	Rate	Cost (1,000 USD)
General and preparatory works including riverbed cleaning	-			400.00
Construction of detention pond	unit	1	720000	720.00
Installation of 2 concrete pipes under Nelson Mandela Road, 1,200 mm dia.	m	48	3000	144.00
Enlargement of rectangular open channel D2.0m; B3.0m	m	58	800	46.40
Lay and supply of underground concrete rectangular frame D1.3 m; B3.0 m	m	126	1500	189.00
Enlargement of rectangular open channel D2.0m; B4.0m	m	76	920	69.92
Enlargement of rectangular open channel D2.5m; B4.0m	m	705	1050	740.25
Lay and supply of underground concrete rectangular frame D2.5 m; B2.5 m	m	436	2000	872.00
Lay and supply of underground concrete rectangular frame D2.5 m; B3.0 m	m	636	2200	1399.20
Lay and supply of underground concrete rectangular frame D2.5 m; B2.5 m	m	254	2000	508.00
Construction of rectangular open channel D2.5m; B2.5m	m	56	850	47.60
Enlargement of rectangular open channel D2.5m; B5.0m	m	23	1200	27.60
Enlargement of rectangular open channel D2.5m; B10.0m	m	880	1900	1672.00
Lay and supply of underground concrete rectangular frame D3.0 m; B7.0 m	m	151	3200	483.20
Enlargement of culvert to D2.50m; B10.00m	units	2	20000	40.00
Enlargement of culvert under Bandari Road to D2.50m; B6.00m	units	1	135000	135.00
Construction of manholes	unit	13	1500	19.50
Construction of diversion manholes	unit	1	600	0.60
Inlets	m	Eventual	300	0.00
Lateral drainage	m	700	300	210.00
Diversion of existing water supply pipe	unit	1	10000	10.00
Diversion of existing gas supply pipe	unit	Eventual	5000	5.00
Construction of pedestrian crossings	unit	3	2000	6.00
Others	-			200.00
SUB TOTAL BASE COST				**7,945.27**
Supervision Cost (5%)				397.26
Physical Contingencies (7.5%)				625.69

Price Contingencies (7.5%)				672.62
GRAND TOTAL COST				**9,640.84**
Item	**Unit**	**TE3 - Temeke Drain**		
		Quantity	**Rate**	**Cost (1,000 USD)**
General and Preparatory works	-			50.00
Lay and supply of underground concrete pipe 1,200 mm dia.	m	926	940	870.44
Construction of manholes	unit	20	1500	30.00
Road drainage	m	160	300	48.00
Construction of final outlet	unit	1	2000	2.00
Others/ contigency works	-			25.00
SUB TOTAL BASE COST				**1,025.44**
Supervision Cost (5%)				51,27
Physical Contingencies (7.5%)				80,75
Price Contingencies (7.5%)				86,81
GRAND TOTAL COST				**1,244.28**
Item	**Unit**	**TE4 - Kwa Shego**		
		Quantity	**Rate**	**Cost (1,000 USD)**
Preparatory works	-			115.00
Enlargement of rectangular open channel D0.75m; B0.75m	m	94	225	21.15
Lay and supply of underground concrete rectangular frame D0.75 m; B0.75 m	m	129	620	79.98
Lay and supply of underground concrete rectangular frame D1.25 m; B1.25 m	m	82	925	75.85
Lay and supply of underground concrete rectangular frame D1.5 m; B2.0 m	m	128	1200	153.60
Lay and supply of underground concrete rectangular frame D1.75 m; B2.0 m	m	122	1250	152.50
Enlargement of rectangular open channel D2.0m; B2.0m	m	130	650	84.50
Enlargement of rectangular open channel D2.0m; B2.5m	m	216	710	153.36
Enlargement of rectangular open channel D2.0m; B3.0m	m	212	775	164.30
Lay and supply of underground concrete rectangular frame D2.0 m; B3.0 m	m	295	1700	501.50
Lay and supply of underground concrete rectangular frame D2.25 m; B3.0 m	m	546	1850	1,010.10
Lay and supply of underground concrete rectangular frame D2.25 m; B4.0 m	m	113	2050	231.65

Lay and supply of underground concrete rectangular frame D2.25 m; B4.5 m	m	169	2250	380.25
Lay and supply of underground concrete rectangular frame D2.25 m; B5.0 m	m	71	2350	166.85
Lay and supply of underground concrete rectangular frame D2.25 m; B5.5 m	m	142	2400	340.80
Enlargement of rectangular open channel D2.5m; B5.5m	m	155	1 250	193.75
Enlargement of rectangular open channel D2.5m; B6.0m	m	331	1 325	438.58
Enlargement of rectangular open channel D2.5m; B7.0m	m	210	1450	304.50
Construction of manholes	unit	63	500	31.50
Road drainage	m	550	300	165.00
Construction of final outlet	unit	1	2000	2.00
Others/ contigency works	-			230.00
TOTAL COST				**4,996.72**

Item	**Unit**	**TE8 - Mpogo River**		
		Quantity	**Rate**	**Cost (1,000 USD)**
General and Preparatory works including riverbed clearance (collection of garbage/ obstacle and vegetation cut).	-			270.00
Construction of detention pond	unit	1	1911992	1911.99
Construction of trapezoidal open channel D1.25m; B5.00m	m	1026	950	974.70
Construction of marginal concrete walls	m	2200	700	1540.00
Enlargement of bridge section to 1.25m depth and 6.00m width	unit	2	36000	72.00
Enlargement of bridge section to 1.25m depth and 8.00m width and road reshape and tie up	unit	1	48000	48.00
Enlargement of bridge section to 2.00m depth and 20.00m width	unit	1	180000	180.00
Construction of pedestrian crossings	unit	4	3000	12.00
Construction of vehicular crossings	unit	3	27000	81.00
Lateral drainage	m	220	700	154.00
Others	-			130.00
SUB TOTAL BASE COST				**5,373.69**
Supervision Cost (5%)				268.68
Physical Contingencies (7.5%)				423.18
Price Contingencies (7.5%)				454.92
GRAND TOTAL COST				**6,520.47**

Item	**Unit**	**TE9 - Keko Drain**

		Quantity	Rate	Cost (1,000 USD)
General and Preparatory works	-			50.00
Enlargement of rectangular open channel D1.25m; B3.0m	m	500	600	300.00
Enlargement of rectangular open channel D1.50m; B5.0m	m	184	900	165.60
Enlargement of rectangular open channel D1.50m; B7.0m	m	239	1150	274.85
Lateral drainage	m	200	600	120.00
Construction of pedestrian crossings	unit	2	2000	4.00
Construction of vehicular crossings	unit	5	5000	25.00
Others	-			45.00
SUB TOTAL BASE COST				**1,051.95**
Supervision Cost (5%)				52.60
Physical Contingencies (7.5%)				82.84
Price Contingencies (7.5%)				89.05
GRAND TOTAL COST				**1,276.44**

(PROCESL/COWI, 2014)

NVP AND IRR

The economic efficiency of the sub-project is based on the calculation of the Net Present Value (NPV), Benefit/Costs ratio (B/C), and Interest Rate of Return (IRR).

To discount future values is used a 12% discount rate and it's assumed that the Sub-projects will have a 25 years lifetime with a construction period of 2 years. The investment costs of the Sub-projects are considered to be equally divided by the first two years. It's assumed that there would be no protection against flooding in the first two years and thus no benefits before the structure is finished.

The estimated annual benefits of the sub-project will increase due to assumed increases in exposure by 1 % annually as expected increases in exposed population and assets are accounted for. Thus, the benefits in terms of avoided damages to the exposed assets are increasing over time from year 3 to year 27 as more assets and population are put at risk.

TABLE 44

CALCULATION OF NET PRESENT VALUE OF THE PROJECT

Sub-Project TE2 - Maintenance of Serengeti open drain from Serengeti breweries and the adjoining Keko drain						
Year	**Costs**	**Benefits**	**Net Benefits**	**Discounted costs**	**Discounted benefits**	**Discounted net Benefits**
1	3,871	0	-3,871	3,456	0	-3,456
2	3,871	0	-3,871	3,086	0	-3,086
3	77	829	752	55	590	535
4	77	837	760	49	532	483
5	77	846	768	44	480	436
6	77	854	777	39	433	394
7	77	863	785	35	390	355
8	77	871	794	31	352	321
9	77	880	803	28	317	289
10	77	889	812	25	286	261
11	77	898	820	22	258	236
12	77	907	829	20	233	213
13	77	916	838	18	210	192
14	77	925	848	16	189	173
15	77	934	857	14	171	157
16	77	944	866	13	154	141
17	77	953	876	11	139	128
18	77	963	885	10	125	115
19	77	972	895	9	113	104
20	77	982	905	8	102	94
21	77	992	914	7	92	85
22	77	1,002	924	6	83	76
23	77	1,012	934	6	75	69
24	77	1,022	944	5	67	62
25	77	1,032	955	5	61	56
26	77	1,042	965	4	55	51
27	77	1,053	975	4	49	46
NPV						**-1,470**

Sub-project TE3 - Maintenance of Temeke underground drain from Miburuhani primary school						
Year	**Costs**	**Benefits**	**Net Benefits**	**Discounted costs**	**Discounted benefits**	**Discounted net benefits**

1	501	0	-501	447	0	-447
2	501	0	-501	399	0	-399
3	77	146	69	55	104	49
4	77	148	70	49	94	45
5	77	149	72	44	85	41
6	77	151	73	39	76	37
7	77	152	75	35	69	34
8	77	154	76	31	62	31
9	77	155	78	28	56	28
10	77	157	79	25	50	26
11	77	158	81	22	45	23
12	77	160	82	20	41	21
13	77	161	84	18	37	19
14	77	163	86	16	33	18
15	77	165	87	14	30	16
16	77	166	89	13	27	14
17	77	168	91	11	24	13
18	77	170	92	10	22	12
19	77	171	94	9	20	11
20	77	173	96	8	18	10
21	77	175	97	7	16	9
22	77	177	99	6	15	8
23	77	178	101	6	13	7
24	77	180	103	5	12	7
25	77	182	104	5	11	6
26	77	184	106	4	10	6
27	77	186	108	4	9	5
NPV						**-351**

Sub-project TE4 - Kwa Shego Valley drain						
Year	**Costs**	**Benefits**	**Net Benefits**	**Discounted costs**	**Discounted benefits**	**Discounted net Benefits**
1	2,475	0	-2,475	2,210	0	-2,210
2	2,475	0	-2,475	1,973	0	-1,973
3	50	954	905	35	679	644
4	50	964	914	31	612	581
5	50	973	924	28	552	524

6	50	983	934	25	498	473
7	50	993	943	22	449	427
8	50	1,003	953	20	405	385
9	50	1,013	963	18	365	347
10	50	1,023	974	16	329	313
11	50	1,033	984	14	297	283
12	50	1,044	994	13	268	255
13	50	1,054	1,005	11	242	230
14	50	1,065	1,015	10	218	208
15	50	1,075	1,026	9	196	187
16	50	1,086	1,036	8	177	169
17	50	1,097	1,047	7	160	153
18	50	1,108	1,058	6	144	138
19	50	1,119	1,069	6	130	124
20	50	1,130	1,081	5	117	112
21	50	1,141	1,092	5	106	101
22	50	1,153	1,103	4	95	91
23	50	1,164	1,115	4	86	82
24	50	1,176	1,126	3	77	74
25	50	1,188	1,138	3	70	67
26	50	1,200	1,150	3	63	60
27	50	1,212	1,162	2	57	54
NPV						**1,901**

Sub-Project TE8 - Mpogo drain						
Year	**Costs**	**Benefits**	**Net benefits**	**Discounted costs**	**Discounted benefits**	**Discounted net Benefits**
1	2,587	0	-2,587	2,310	0	-2,310
2	2,587	0	-2,587	2,062	0	-2,062
3	5	993	988	3	707	704
4	5	1,003	998	3	637	634
5	5	1,013	1,008	3	575	572
6	5	1,023	1,018	2	518	516
7	5	1,033	1,029	2	467	465
8	5	1,044	1,039	2	422	420
9	5	1,054	1,049	2	380	378
10	5	1,065	1,060	2	343	341
11	5	1,075	1,071	1	309	308

12	5	1,086	1,081	1	279	278
13	5	1,097	1,092	1	251	250
14	5	1,108	1,103	1	227	226
15	5	1,119	1,114	1	204	204
16	5	1,130	1,126	1	184	184
17	5	1,142	1,137	1	166	166
18	5	1,153	1,148	1	150	149
19	5	1,165	1,160	1	135	135
20	5	1,176	1,171	0	122	121
21	5	1,188	1,183	0	110	110
22	5	1,200	1,195	0	99	99
23	5	1,212	1,207	0	89	89
24	5	1,224	1,219	0	81	80
25	5	1,236	1,231	0	73	72
26	5	1,249	1,244	0	66	65
27	5	1,261	1,256	0	59	59
NPV						**2,253**

Sub-project TE9 - Keko drain						
Year	**Costs**	**Benefits**	**Net Benefits**	**Discounted costs**	**Discounted benefits**	**Discounted net Benefits**
1	479	0	-479	427	0	-427
2	479	0	-479	381	0	-381
3	77	587	509	55	418	363
4	77	593	515	49	377	327
5	77	599	521	44	340	296
6	77	605	527	39	306	267
7	77	611	533	35	276	241
8	77	617	539	31	249	218
9	77	623	545	28	225	197
10	77	629	552	25	203	178
11	77	635	558	22	183	160
12	77	642	564	20	165	145
13	77	648	571	18	149	131
14	77	655	577	16	134	118
15	77	661	584	14	121	107
16	77	668	590	13	109	96

17	77	674	597	11	98	87
18	77	681	604	10	89	79
19	77	688	611	9	80	71
20	77	695	618	8	72	64
21	77	702	624	7	65	58
22	77	709	631	6	59	52
23	77	716	639	6	53	47
24	77	723	646	5	48	43
25	77	730	653	5	43	38
26	77	738	660	4	39	35
27	77	745	668	4	35	31
NPV						**2,639**

(PROCESL/COWI, 2014)

10.2 RESULTS OF COST BENEFIT ANALYSIS (CBA)

The previous efficiency calculations establish the basis for the sensitivity analysis: NPV, B/C ratio and IRR. There are a number of uncertainty factors relating to data, future changes and also concerning the appropriate discount rate to use. Thus, it is important to conduct sensitivity analysis to check the effects on results (see table below).

TE2 Serengeti and TE3 Temeke sub-projects present a negative social return in all scenarios.

The estimated IRR for TE4 intervention ranges from approximately 9 to 18%.

TE8 Mpogo sub-project presents a positive social return in all scenarios except in the extreme scenario were NPV would only be positive with an interest rate inferior to 10,2%.

For the TE9 Keko sub-project a range of positive NPV amounts was computed for the different scenarios, thus even for the worst scenario there would still be a positive social return on this sub-project.

TABLE 45

SENSITIVITY ANALYSIS

	Baseline Scenario	Costs ↗ 30%	Land Benefits ↘ 30%	Property Exposure ↘ 25%	Extreme Scenario
	(0)	(1)	(2)	(3)	(1)+(2)+(3)
Sub-project TE2 - Maintenance of Serengeti open drain from Serengeti breweries and the adjoining Keko drain					
NPV (millions USD)	-1,470	-3,577	-2,101	-2,322	-5,061
B/C (No.)	0.8	0.6	0.7	0.7	0.4
IRR (%)	9.0%	6.0%	7.5%	7.0%	2.8%
Sub-project TE3 - Maintenance of Temeke underground drain from Miburuhani primary school					
NPV (millions USD)	-351	-750	-511	-461	-1,020
B/C (No.)	0.7	0.6	0.6	0.7	0.4
IRR (%)	6.3%	1.5%	3.0%	4.1%	---
Sub-project TE4 - Kwa Shego Valley drain					
NPV (millions USD)	1,9	0,6	1,6	0,6	-1,1
B/C (No.)	1,4	1,1	1,4	1,1	0,8
IRR (%)	17,5%	13,3%	16,7%	13,7%	9,3%
Sub-project TE8 - Mpogo drain					
NPV (millions USD)	2,253	932.2	1,840.0	948.6	-784.6
B/C (No.)	1.5	1.2	1.4	1.2	0.9
IRR (%)	18.2%	14.1%	17.1%	14.7%	10.2%
Sub-project TE9 - Keko drain					
NPV (millions USD)	2,639	2,251	2,544	1,746	1,263
B/C (No.)	3.0	2.3	3.0	2.4	1.8
IRR (%)	44.7%	34.5%	43.6%	34.7%	25.3%

(PROCESL/COWI, 2014)

CHAPTER 11.0: DECOMISSIONING

The Sub-projects in Temeke are expected to be a permanent feature not to be decommissioned but rather to be regularly maintained as the need for surface water drainage is essential to prevent flooding events. The infrastructure will continue to have a passive influence on the environment and will be benign, so will not degrade or pollute the environment.

However, if the unlikely happens, it is to consider that decommissioning of drainage structures comprises dismantling, shipment and final disposal of materials as well as site cleaning and rehabilitation. The site shall be left in safe and environmentally acceptable conditions.

Under these circumstances, it will be necessary to hire workers for structures removal. Decommissioning activities will also result into generation of wastes from obsolete materials and unwanted materials. Mechanisms of identifying, collecting and disposal shall be in place to ensure all wastes have been collected, removed and right disposed of. Areas disturbed by removal of structures shall be re-vegetated with grass and appropriate tree species.

It is also important that PMO-RALG through the life span of the project establishes a monitoring programme for the environment and the findings of these studies be included in the audit reports that would feed into a decommissioning plan, in necessary**.**

CHAPTER 12.0: SUMMARY AND CONCLUSIONS

The actual surface water system in Temeke Municipality is already resulting into environmental health hazards to the local residents, especially the vulnerable poor section of the community living in unplanned settlements. The problem of frequent flooding events will also continue to damage the existing infrastructure and utilities, hence perpetuating poverty in the area, if protective measures are not taken.

The proposed Surface Water Drainage System Sub-projects in Temeke Municipality aims at improving the current drainage system in the municipality providing a better welfare for the population.

Although this Sub-project might have some potential negative impacts as mentioned in the present Environmental Impact Assessment (EIA) Report, such as land acquisition and/or involuntary resettlement nevertheless, it is considered that it will have more significant positive impacts, truly important for the municipality.

This project will create temporary employment, will provide opportunities to local businesses, will create better facilities for those who will be relocated in terms of drainage, water supply, housing, etc. and, far more important, it will bring local and regional benefits as a result of the upgrading of the storm Water Drainage System with a significant improvement in the quality of public health.

Furthermore, the project implementation will also contribute to the reduction of soil erosion, as well as the visual and aesthetic appearance of the urban landscape of Temeke Municipality.

If the mitigation measures recommended in this EIA Report are implemented, there will be no environmental constrains to the Sub-Projects implementation as it is designed and envisaged to occur since long-term benefits of project implementation outweigh the generally short-term adverse impacts associated with mobilization, construction and operation phases, all of which can be mitigated satisfactorily.

Finally, to achieve the objectives set by the Sub-project it is recommended to implement the management actions described in the Environmental Management Plan (EMP) as well as mitigate measures proposed along the EIA Report.

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CHAPTER 14.0: APPENDIX

14.1 TERMS OF REFERENCE

14.1.1 Introduction

These Terms of Reference (TOR) outline the scope of work to be carried out in preparation of the Environmental Impact Assessment (EIA) and an Environmental Management Plan (EMP) for Temeke Municipality interventions.

14.1.2 Objectives

The main objective of undertaking Environmental Impact Assessment for the Proposed Surface Water Drainage System Sub-projects in Temeke Municipality under the Dar es Salaam Metropolitan Development Project (DMDP) is to provide baseline data/information and to determine the likely potential environmental impacts associated with the project and provide mitigation measures prior to implementation of the proposed project.

Project activities are included in the mandatory list of the projects that are required to develop full EIA by the Environmental Management Act No. 20 of 2004. Part IV of EIA regulations G.N. 349 of 2005 provides the general objectives for carrying out EIA, among others list comprises the following:

- To ensure that environmental considerations are explicitly addressed and incorporated into the development decision making process;
- To anticipate and avoid, minimize or offset the adverse significant biophysical, social and relevant effects of development proposal;
- To protect the productivity and capacity of natural ecosystems and ecological processes which maintain their functions;
- To promote development that is sustainable and optimizes resource use and management opportunities.

Specifically the consultant shall:

1. Carry out the Environmental and Social Assessment works;
2. Prepare the Environmental Management Plan;
3. Prepare final reports of Environmental Impact Assessment and Environmental Management Plan as per World Bank and NEMC standards;

4. At all times to meet the Lead Consultant's requirement regarding programme of work, report submission and completion of tender documents assigned on;
5. Carry out necessary environmental works related to the project as instructed by the Lead Consultant.

14.1.3 EIA Requirements

Regulations and guidelines that will govern the conduct of the assessment of the study will include the following: (i) National laws and/or regulations on environmental assessment; (ii) Regional, provincial or communal environmental assessment regulations; and World Bank Operational Policy 4.01: "Environmental Assessment" and other pertinent environmental/social safeguard policies, e.g., resettlement; and (iii) Relevant international environmental agreements/conventions to which the country is a party.

14.1.4 Scope of work

The consultant shall carry out all necessary tasks provided in this ToR. In cases, where information deficiencies need to be identified and resolved or specialized field studies performed to assess impacts, the consultant should define such particular tasks in more detail for the contracting agency's review and approval.

The consultant's tasks shall include but not necessarily limited to the following:

- Identify, evaluate and mitigate the significant environmental impacts (positive and negative);
- Identify key social issues relevant to the project objectives, and specify the project's social development outcomes;
- Determine magnitude of adverse environmental and social impacts and identify safeguards instruments as per the World Bank's Operational Policies, Country Laws and Regulations;
- Assess the impacts on any cultural resources to ensure that the investment designs meet the guidelines set out in the Bank's OP 4.11 Physical Cultural Resources;
- Predict and assess in quantitative terms as far as possible, the impact from changes brought about by the project on the baseline environmental conditions;
- Establish the mitigation measures that are necessary to avoid, minimize or offset predicted adverse impact and, where appropriate incorporate these into the Environmental Management Plan (EMP);

- Identify key stakeholders who are directly affected and carry out stakeholder analysis to determine their role in achieving social development outcomes;
- Inform, consult and carry out dialogues with stakeholders on matters regarding the project design alternatives, implementation of environmental and social mitigation measures, and provide specific recommendations on project design that may require adjustments in project design;
- Provide an environmental and socio-economic profile of the population and available infrastructure facilities for services and community resources;
- Assess the capacity of the implementing agencies and mechanisms for implementing safeguard instruments, and recommend capacity building;
- Develop monitoring and evaluation mechanism to assess effectiveness of mitigation measures including, resettlement outcomes during and after project implementation;
- Prepare a RAP.

The EMP will be a compilation of information gathered through Environmental Impact Assessments (ESIAs) carried out for all sub-projects to be implemented through Component 1(a) of the DMDP. The EMP will be carried out in accordance with the World Bank's Operational Policy for Environmental Assessment (OP 4.01). The Environmental Management Plan to be prepared by the Consultant under the assignment includes: (1) Environmental Overview Report for the DLA; (2) Environmental Management Plans for each sub-project proposed by the DLA, to be an integral part of the consolidated final DLA sub-projects investment proposal document and; (3) the Environmental Impact Assessment Section prepared for the DLA for incorporation in the Overall Operational Manual for the DMDP. An executive summary synthesizing the process and incorporating the findings from the above reports will also need to be prepared.

14.1.5 Report Layout

Provide an EIA report that is concise and limited to significant environmental and social issues. The main text should focus on findings, conclusions and recommended actions, supported by summaries of the data collected and citations for any references used in interpreting those data. The EIA report should provide the following (i) Executive Summary; (ii) Introduction; (iii) Project Description; (iv) Relevant Policy, legal and institutional framework; (v) Environmental and socio-economic baseline conditions; (vi) Stakeholder identification and methods of participation; (vii) Impact identification and assessment of alternatives; (viii) Mitigation and enhancement measures; (ix) Environmental Management Plan; (x) Cost Benefit Analysis; (xi) Decommissioning; (xii) Summary and conclusions; and (xiii) References.

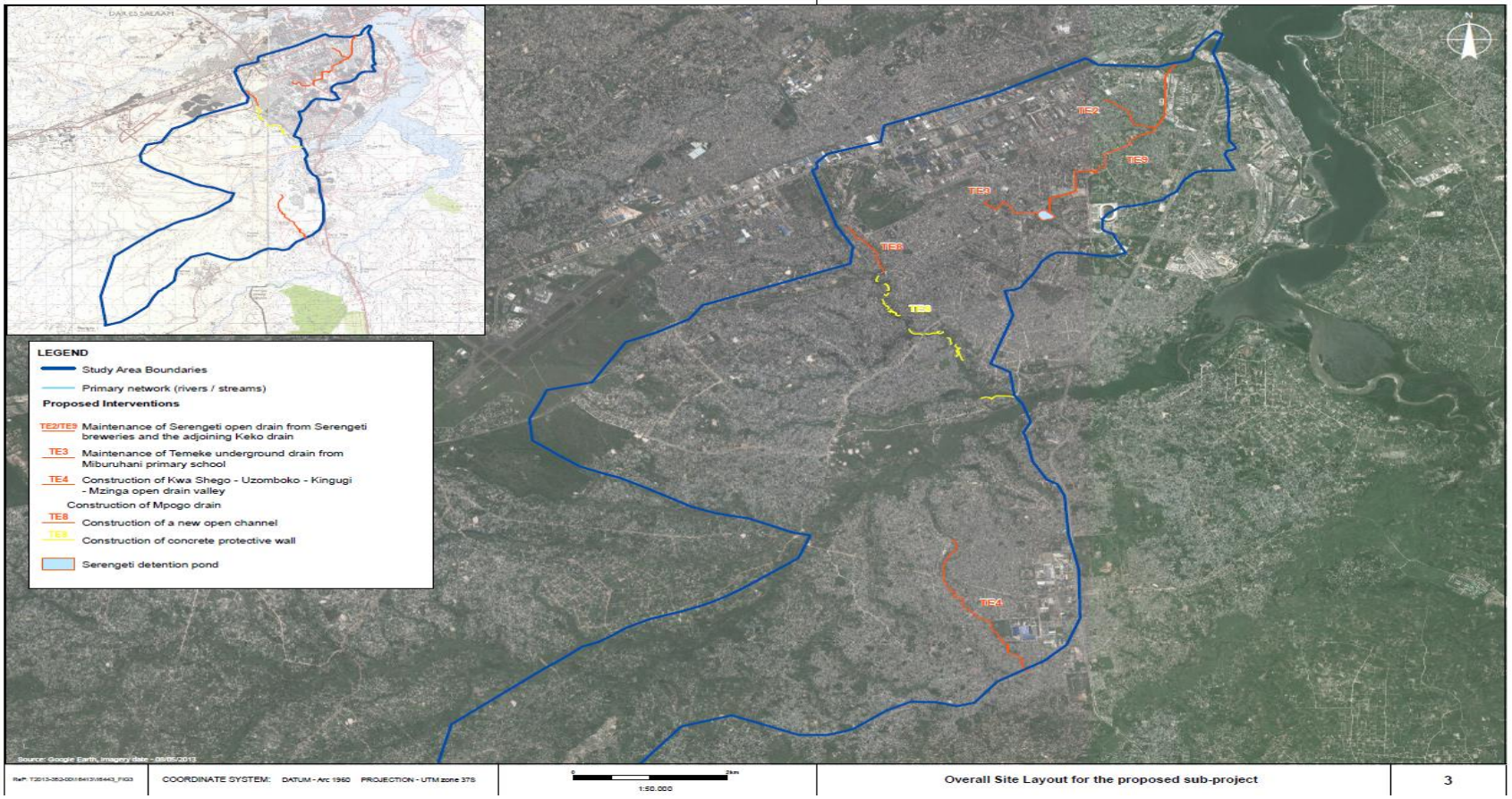
14.1.6 Consultant Qualifications and Experience

The individual consultant for conducting the assignment should have the following qualifications: (1) At least MSc. in Environmental Management, Environmental Planning or related field; (2) Sound knowledge of social aspects; (3) a proven ability for undertaking environmental and social assessments; (4) Proven skills for communication and working with the community; (5) Demonstrated understanding, knowledge and experience from undertaking environmental and social assessments; (6) Knowledge and experience on World Bank Environmental and Social Safeguard Policies; (7) At least 5 year experience of conduct similar assignments; (8) Registered by the National Environment Management Council in accordance to the EIA and Audit Regulations of 2005.

14.2 SUMMARY OF STAKEHOLDERS VIEWS AND CONCERNS

14.3 SIGNATURES OF STAKEHOLDERS COLSULTED

14.4 PROJECT LAYOUT



14.5ADOPTED SOLUTIONS

14.6 LOCATION AND DEFINITION OF PROPOSED INTERVENTIONS – TEMEKE COUNCIL

14.7RESETTLMENT SUMMARY

Drain	Intervention	Ahs	Ward	Acquired building/structure	Acquired Land	Crops value	Allowances				Total Cost
							Accommodation	Transport	Loss of profit	Disturbance	TZS
Temeke	TE2, TE4, TE8 & TE9	20	Chang'ombe	-	-	5,231,958	-	-	-	418,557	5,650,514.84
		3	Miburani	-	-	534,272	-	-	-	42,742	577,013.55
		65	Keko	378,614,768.00	86,296,900.00	10,056,153.82	55,080,000.00	2,400,000.00	-	38,394,505.16	570,842,326.98
		90	Sandali	239,901,984	85,516,500	30,972,665	45,540,000	3,300,000	-	26,989,486	432,220,634.55
		21	Kilakala	111,693,190.00	26,465,400.00	2,230,442.56	18,540,000.00	1,200,000.00	-	11,231,122.60	171,360,155.16
		32	Tandika	279,486,555.50	71,160,400.00	3,387,464.08	47,880,000.00	3,000,000.00	4,708,800.00	28,322,753.57	437,945,973.14
		9	Makangarawe	11,443,320.00	7,934,200.00	983,378.02	1,800,000.00	300,000.00	1,922,400.00	1,578,471.84	25,961,769.87
		39	Azimio	139,754,022.00	56,013,200.00	6,593,339.68	23,400,000.00	1,800,000.00	1,036,800.00	16,093,117.11	244,690,478.80
		9	Buza	2,025,660.00	5,080,000.00	2,623,261.56	-	-	-	762,449.53	10,491,371.09
		83	Charambe	357,626,612.00	101,849,520.00	5,348,052.33	63,360,000.00	1,800,000.00	-	36,486,329.58	566,470,513.90
		33	Kiburugwa	20,829,416.00	45,106,800.00	3,811,698.33	3,780,000.00	300,000.00	14,104,800.00	5,637,179.57	93,569,893.89
Total		**404.00**	-	**1,541,375,527.10**	**485,422,920.00**	**71,772,685.61**	**259,380,000.00**	**14,100,000.00**	**21,772,800.00**	**165,956,713.07**	**2,559,780,645.78**