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Bukoba Urban Water and Sewerage Authority (BUWASA)
Kitekele Street, Kashai Ward,
P.O. Box 81, Bukoba – Tanzania
Email: buwasabukoba@yahoo.com, **Fax: +255-28-2221588**

Environmental and Social Impacts Assessment for the Proposed Construction of Sewerage Sludge Disposal Facility in Bukoba Municipality in Kagera Region

Prepared by

Environmental BENCHMARK
Consulting Engineers
EBm
P. O. Box 77222 - Dar es Salaam
Tel : 0754 / 0784 / 0715 - 353954 & 022 2775058
E-mail: admin@environmentalbenchmark.com

Submitted to

National Environment Management Council (NEMC)
Regent Estate/Migombani, Plot No 29/30, P.O. Box 63154, Dar es Salaam
Tel: 255 (022)2774852; 2774889; Mobile – +255 713-608930;
Fax- 255 (022) 2774901; Email: dg@nemc.or.tz, Website: www.nemc.or.tz

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Proposed Construction of Sewerage Sludge Disposal Facility at Nyanga Village in Bukoba Municipality

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Declaration
This Environmental Impact Statement has been prepared by;

Name and Responsibility	Speciality	Signature
Eng. Venant Rwenyagira – EIA Team Leader with extensive experience in Environmental Engineering and Management	Civil-Environmental Engineer	
Mr. Huruma Kisaka- Sociologist for undertaking social impact assessment	Sociologist	
Eng. Sanjo Mgeta- undertaking environmental impacts assessment	Environental Engineer	
Eng. Patrick Cletus - Water Resources Engineer	Water Engineer	
Ms. Greven Msenga- Data collection and assessment of social impacts	Mass Communication expert	

EIS Circulation

1. LVEMP II/BUWASA 2 copies + electronic copy in 'pdf' format
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Executive Summary

Title and Location of the Project:

Proposed Construction of a Sewerage Sludge Disposal Facility in Nyanga Village in Bukoba Municipality in Kagera Region

Project Proponent:

Bukoba Urban Water and Sewerage Authority (BUWASA)
Kitekele Street, Kashai Ward,
P.O. Box 81, Bukoba – Tanzania
Email: buwasabukoba@yahoo.com, Fax: +255-28-2221588

Environmental Firm of Experts:

Environmental BENCHMARK,
Consulting Civil-Environmental Engineers,
P.O. Box 77222 Dar es Salaam,
Tel: 0784/0754/0715-353954 and 022 2775058
Email: admin@environmentalbenchmark.com
Contact Person: Eng. Venant E.K. Rwenyagira – Environmental Expert

Introduction

LVEMPII in collaboration with Bukoba Urban Water and Sanitation Authority identified poor sludge disposal as one of the areas responsible for pollution of Lake Victoria. Bukoba Municipality lacks a central sewerage system. Each building or a number of buildings have own on-site sanitation facilities which include extensive use of cesspits, soak-away pits, septic tanks and pit latrines. When most of these on-site sanitation facilities fill up, the following methods are normally applied;

- emptied manually to the nearby open pit which is later backfilled
- drained into the nearby storm water channel leading to the river which later drains into the lake (mainly during rainy season)
- Abandon the pit latrine and dig another hole nearby
- Use mechanical cesspit emptier followed by illegal and indiscriminate dumping in rivers or open land.

Such illegal practices lead into contamination of terrestrial and aquatic environment by human excreta with high risks of transmission of gastrointestinal infections. As a technical solution to these challenges a designated sludge disposal facility was proposed and the Ministry of Water (MoW) through LVEMP II commissioned M/s Environmental BENCHMARK, Consulting Civil-Environmental Engineers to carry out an Environmental and Social Impact Assessment for proposed Sludge Disposal Facility

Policies, Administrative and Legal Framework

National policies, legislations, administrative structures, international treaties and conventions relevant to the environment in relation to the project were collected and reviewed. Other Acts for professional conduct were also considered to make sure that such important aspects do not slip unnoticed. Administratively, the institutional and legal framework for environmental management is comprised of the National Environmental Advisory Committee, the Minister for Environment, Director of Environment, National Environment Management Council (NEMC), Sector Ministries, Regional Secretariat and Local Government Authorities.

Environmental and Social Baseline Conditions

The proposed project is envisaged to be constructed near Nyanga Village in Nyanga Ward in Bukoba Municipality in Kagera region. The municipality enjoy an average temperature of about 23^{o}C and an average rainfall of 2000mm per year. Bukoba town is situated on a flat, marshy plain surrounded by escarpments to the North, West and South while the Eastern side there is Lake Victoria. The altitude of the town lies between 1,150m to 1,300m above sea level.

The major soils in the hilly and plateau areas of the town include: well drained, dark, reddish, brown to clay over dark red to red which thick include humus top soils. Low lying parts are characterized by sandy clay over dark sand to sandy soils along the beach and Kanoni river banks. The vegetation of the town consists of both indigenous and exotic tree species.

According to 2012 Population and Housing Census, Bukoba Municipality has a population of 128,796, where 66, 275 are women and 62,521 are men with an average household size of 3.9 and the average sex ratio of 94. The major economic activities in the area include agriculture, commerce, fishing, industrial activities, financial activities like banking and tourism. Nyanga Ward, in particular, where the project will be implemented has the population of 3,129 where 1,571 are male and 1,558 are female.

Public utilities in the municipality include water supply and sanitation, electricity supply and energy sources; it receives reliable electricity from Uganda. The main source of energy for cooking for most of households is charcoal followed by firewood which is transported from the rural districts. The main source for lighting is electricity 44%, wick lamp 32% and hurricane lamp 22%. Bukoba lacks a central sewerage system; extensive use is made of cesspits, soakage pits, septic tanks and pit latrines. It also lacks an open surface drainage system for storm water and the Municipality uses its one vehicle and four tractors to collect the garbage of about 50% among 70% solid waste generated per day.

Design of a project and planned activities

The sludge disposal facility is designed on preliminary level to have inlet works comprising of the manhole and coarse screen, drying beds, connection/link between the ponds, anaerobic ponds, shallow lagoons, outlet structures, operations building, laboratory equipment, tools and equipment, access road, fence, landscaping and storm water collection channels. The planned activities include mobilization of the construction human resource, construction equipment and plant, construction materials; Setting out to demarcate rights of way for access road, work areas for the sludge disposal facility, clearing limits; clearing and grubbing to remove unsuitable soils,

construction of bypasses; Excavation to form areas meant for the basins or ponds, dykes for the sludge facility; placing of concrete or lining materials; contractor demobilization activities; and the actual work of sludge disposal facility, that is receiving sludge from private houses, institutional and commercial places through use of cess pit emptier/exhausters.

Analysis and project alternative

Number of possible proposals or alternatives for accomplishing the project objectives was considered. In principle, these were including an analysis of the location, timing, input and design alternative as well as the Do- Nothing option. It should, however, be noted that during scoping exercise the assessment on site location alternatives was limited to existing proposed project site where existing land use is mainly open sludge dumping and solid waste dumping site. The assessment was carried out and it was noted that the "Do-Nothing" option was dismissed due to the need and desirability of the proposed project both on environmental and health grounds.

Public participation process

Issues pertaining to construction of the sludge disposal facility project and its environmental and social consequences were discussed with the representative of the key stakeholders, interested institutions, and those around the project site. Key stakeholders were directly informed of the proposed development through a visit in their respective offices on 25th to 29th June 2012. Surrounding communities were sensitized to participate in the process through consultation meetings which were communicated to the communities through their Village Executive Officers. Actual meetings were held on 28th June 2012, at Nyanga ward to present and discuss the proposed development. The comment, opinion and concerns were received from various stakeholders including; Municipal Executive Director, Municipal Planner, Regional Manager-TANROADS, Environmental Consultant at BMC, Regional Manager-NHC KAGERA, Natural Resource Officer, Sub-Basin Water Officer, Municipal Health Officer, Municipal Engineer, Laboratory Manager, Municipal Environmental Management Officer and villagers during a public meeting in Nyanga ward.

Concerns from the Community and Stakeholders during consultation

The community in general perceives the project very well and had wishes to see the immediate implementation of the project, but with full involvement of residents of Nyanga village in terms of unskilled labour during project construction phase. Some of their views included;

- Most of the pit latrines are emptied to nearby pits while those residing closer to the rivers allow the faecal matter to drain into the river
- Sensitization of the communities is the most important aspect for the success of the project otherwise the habits of discharging wastewater into the storm water channels will never end.
- The area earmarked for sludge disposal is under the ownership of Bukoba Municipal Council but once construction of the sludge disposal facility is completed, BUWASA will take over the ownership.
- The earmarked area had no people living there; some few residential houses are located far away from the site.

- Wish number one was if the project was implemented immediately to serve the wards in the green zone
- Since these projects have never been implemented here, it is difficult to know the impacts of such projects
- Pilot boreholes for monitoring purposes should be established. This should be similar to drilled boreholes for water supply. Normally samples are taken, tested for establishing the baseline
- How is the local community going to benefit from this proposed project? Can the project consider to give us water supply
- For any development impacts should be there. If the contractor comes here with his people, at least there will be some benefits from employment and service oriented gains
- What plans do you have for solid waste like generation of biogas for the local community to get an alternative source of energy? This is an advise so that the project can be of benefit to the local communities
- The area earmarked for the project is there, you should not interfere with other peoples land
- In this village there are those who understand development and those who do not. It would be in good order if the land was well planned demarcating area for grazing, area for cultivation especially ground nuts (njugu)

Environmental Impacts

Environmental impacts anticipated in this project include landscape scarring especially at borrow sites, vegetation loss through clearance, soil erosion, poor air quality- emissions and dust, safety to workers during construction, noise pollution, solid and liquid waste generation, impacts on public health and safety from work camp operations, depletion and pollution of water sources, water and soil contamination, possible increase in traffic accidents during material hauling, poor safety of employees and neighbours from objectionable sludge, interference with existing solid waste dump, Deterioration of original land use, scenic and visual quality, spread of diseases (HIV/AIDs, STIs), socio-economic changes, disturbance to cultural and historical sites, generation of demobilization wastes, loss of employment and associated behaviour.

Environmental and Social Management Plan

The Environmental and Social Management Plan (ESMP) has been prepared to describe the legislative and administrative frameworks in Tanzania on Environmental Impact Assessment Management, implementation arrangements for the EMP, the environmental reporting arrangements and design consideration regarding environmental, health and safety and social impacts. In Tanzania the Environmental Assessment Framework is guided by two key national legislations namely; the Environmental Management Act (EMA) 2004 and the Environmental Impact Assessment and Audit Regulations, 2005.

Environmental Impact Assessment is under the Vice Presidents' office where the Minister of Environment falls. Therefore, for environmental impact assessment for construction of sludge disposal facility in Bukoba municipality will be under the Minister of Environment who will

approve the EIA and issuing the EIA certificate, and NEMC, who are responsible for arranging for EIAs, enforcement, compliance, review and monitoring of EIA.

At different stages of the project, the proponent will be assisted by an environmental expert, in overseeing that the Environmental and Social Management Plan takes shape in order to minimize the potential environmental impacts. For the proposed project to succeed and achieve its environmental objectives, it will require the support of the community and all institutions in the project area. LVEMP II appointee to deal with environmental management will cooperate with other experts in Bukoba municipality such as Municipal Land Planning Officer, Municipal Environmental Officer and Community Development Officer to provide the Regional Environmental Management Expert with environmental reports of the project implementation as part of the progress reports and annual environmental monitoring reports. The Regional Management Expert is the link person between the Region and the Director of Environment as well as the Director General of NEMC. The environmental teams at lower levels such as Village Environmental Committees and Ward Development Committees will be consulted on regular basis to register any complaints from the local communities and informing them on the project works.

Environmental and Social Monitoring Plan

The purpose of monitoring is to establish benchmarks so that the nature and magnitude of anticipated environmental impacts are continually assessed. Environmental audits are also usually carried out some few years after completion of the project. These audits assess the relevance, efficiency and impact of any mitigation measures administered. The regulatory authorities also have to see that the commitments made by project proponent through proposed mitigation measures are really put into practice and that is the essence of this Environmental and Social Monitoring Plan

Environmental Cost and Benefit Analysis

Attempts have been made to assign monetary value on impacts such as emissions, poor air quality, noise pollution, pollution of soils and ground water, etc, but it emerged that some of these impacts cannot be quantified in monetary terms. The fact that cost-benefit-analysis seeks to translate all relevant considerations into monetary terms makes the whole analysis complex. In cost –benefit analysis, both the cost of, say, putting a dripping pan under the leaking grader or a front-wheel loader to reduce ground water pollution and the benefits of doing so including saving the human lives and prevention of debilitating and painful cancer diseases from consuming carcinogenic substances, are presented in monetary terms.

Sludge disposal facility construction will improve quality of health from proper management of faecal matter that would otherwise be dumped haphazardly and drain into rivers where others may become in contact with, improve water quality in rivers and subsequent reservoir downstream- Lake Victoria, Increase fish catch from depleted nutrients which support the growth of water hyacinth and algae; which are detrimental to the life of fish and other aquatic life. Also government coffers will equally benefit from statutory contributions made by the contractor for his employees; sales from construction materials will have value added tax that goes to the government.

In overall, the construction of sludge disposal facility project will have great benefits economically and environmentally compared to current sanitation where the Municipality has no central sewer system. Therefore the benefits to be realised from the proposed project surpass the envisaged capital investments, environmental and social.

Decommissioning

Decommissioning is the final phase in the life cycle of the project after design, construction, and operation for the targeted design period. Most often, it is a process involving operations such as dismantling and demolition of structures, and management of resulting demolished materials. As long as the residences in Bukoba municipality are on continuous expansion especially by replacement of small and old housing or building structures by big and modern ones with modern sanitation facilities and more development is coming rapidly, there will always be a need for even a better wastewater management system. Therefore decommissioning of the proposed project should be thought in terms of upgrading the treatment and sludge disposal facilities from the present status to the next higher stage depending on the demand at that time.

Summary and Conclusion

LVEMP II in collaboration with Bukoba Municipality proposes to construct the sludge disposal facility in Nyanga village located in Bukoba municipality. Before implementing the project LVEMP II through its environmental experts, has prepared this environmental impact statement presenting the likely impacts of the project and mitigation measures through consultation with the respective communities and stakeholders. This report offers an objective assessment on the concern that were raised during the scoping phase as well as those noticed during the detailed assessment in the project area based on technical expertise that lies within Environmental BENCHMARK. The report also identifies project activities which will result into a number of impacts including loss of vegetation through clearance, soil erosion from disturbed surfaces, disturbance to borrow sites, poor air quality, generation of solid wastes, possible water contamination from machinery, emissions from sludge hauling vehicles, noise and vibration from construction activities, potential for accidents to both local communities and employees, contamination from spills, spread of communicable diseases from migrant labour and local communities, etc.

Based on the input from the stakeholders and experience of the consultants, mitigation measures to minimize these impacts have been proposed and presented in this EIS. These include minimum vegetation to cover only those areas to receive permanent works, application of erosion control measures, engagement and sensitization of the communities against HIV/AIDS, close monitoring of facilities in terms of effluent monitoring from the maturation pond before discharging it to water receiving bodies, sound maintenance of all construction equipment to minimize emissions and spills and reinstatement/landscaping of project areas on completion of the construction, etc.,

This EIS has presented management and monitoring plans which are meant to show that all the mitigation are acted upon and there is an outside “eye” which follows up the mitigation actions

in terms of frequency, responsibility, what to monitor (parameter) and target levels to be attained. Provided the project is operated with due attention to the mitigation measures outlined, the project is likely to have positive impact on health among members of local communities and other socio economic benefits from employments as well as a positive impact on both the bio-physical and socio-economic environment of the area including and proper management of water resources such as Lake Victoria. This will in turn boost health and the national economy.

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Acknowledgements

A number of individuals have made this Environmental Impact Statement possible through their commitment in terms of time and effort.

LVEMP II is grateful to all those who contributed in terms of time and effort to this ESIA study in particular the wards and village authorities especially village leaders, Wards Executive Officers and Wards Chancellors from Nyanga ward on their tireless effort in conveying the intentions of the Sludge Disposal Facility project to respective community members and consistently cooperating with consultants during their working visit around the project site.

LVEMP II gives special appreciation to all Members of Staff from different Government Institutions, Private Companies, Non-Government Organisations, who at different stages of the Environmental Impact Assessment were involved in supplying relevant information to the assessment team.

Lastly, LVEMP II owes profound gratitude to the whole ESIA Consultant's Team for making this final Environmental Impact Statement reach the final presentation it has.

Acronyms and Abbreviation

BMC	Bukoba Municipal Council
BOD_5	Biochemical Oxygen Demand
BOQ	Bills of Quantities
BUWASA	Bukoba Urban Water and Sanitation Authority
CAP 191	Chapter 191 as used in the legislations reference for Environmental Management Act No. 20 of 2004
CITES	Convention of International Trade in Endangered Species
CO	Carbon dioxide
CRB	Contractors Registration Board
CRO	Community Relations Officer
DANIDA	Danish International Development Agency
dB (A)	Decibels in scale A
DoE	Director of Environment
EA	Environmental Assessment
EAC	East African Community
EIA	Environmental Impact Assessment
EIRR	Economic Internal Rate of Return
EIS	Environmental Impact Statement
ELO	Environmental Liaison Officer
EMA	Environmental Management Act
EMP	Environmental Management Plan
ERB	Engineers Registration Board
ESCBA	Environmental and Social Cost Benefit Analysis
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
EWURA	Energy and Water Utilities Authority
GDP	Gross domestic Product
GEF	Global Environmental Facility
GEO	General Economic Objectives
HIV/AIDs	Human Immunodeficiency Virus/ Acquired Immunodeficiency Syndrome
JICA	Japan International Cooperation Agency
LVB	Lake Victoria Basin
LVBC	Lake Victoria Basin Commission
LVEMP I	Lake Victoria Environmental Management Project I
LVEMP II	Lake Victoria Environmental Management Project II
MACC	Municipal Aids Control Coordinator
MARPOL	Marine Pollution from ships
MEAs	Multilateral Environmental Agreements
MEO	Municipal Environmental Officer
MKUKUTA	Swahili short form for National Strategy for Growth and Reduction of Poverty

MLPO	Municipal Land Planning Officer
MoW	Ministry of Water
NE	North-East
NEMC	National Environment Management Council
NGO	Non-governmental Organisation
NHC	National Housing Corporation
NORAD	Norwegian Agency for Development Cooperation
NPCTs	National Project Coordination Teams
NSGRP	National Strategy for Growth and Reduction of Poverty
NPV	Net Present Value
OSHA	Occupational Safety and Health Authority
PDO	Project Development Objectives
PEDP	Primary Education Development Plan
PM	Particulate Matter
PMO	Prime Minister's Office
PMOLARG	Prime Minister's Office Local Administration and Regional Government
PPE	Personal Protective Equipment
RPCTs	Regional Project Coordination Teams
SE	South-East
SEA	Strategic Environmental Assessment
SEU	Safety and Environmental Unit
SO_x	Sulphur Oxides
STDs	Sexual Transmitted Diseases
STIs	Sexual Transmitted Infections
TANROADS	Tanzania National Roads Agency
TOR	Terms of Reference
Tsh	Tanzania Shillings
UNEP	United Nations Environmental Programme
USD	United States Dollars ($)
UTI	Urinary Tract Infection
VP	Vice President
WEO	Ward Executive Officer

1. Introduction

1.1 Background of the Project

Lake Victoria is the second largest freshwater Lake in the world with a surface area of about 68,000 km^2 shared in the proportions of 6%, 43% and 51% by Kenya, Uganda and Tanzania respectively. Its catchment area is about 197,500 km^2, extending to Republics of Rwanda and Burundi as well, with a population of more than 30 million people living in the basin. Lake Victoria is the largest inland water and fishery sanctuary in East Africa, with an estimate annual fish catch of about 750,000 metric tonnes and an inland water transport linkage for the three East African states. Furthermore, the lake is a major reservoir and source of water for domestic, industrial, hydropower production and commercial purposes. The lake also is a repository for both treated and untreated wastes generated from various activities in the basin, some of which can alternatively be reused for valuable activities such as agriculture.

Over the years, the lake has suffered from an ever increasing pollution from expansion of development activities and population growth in the basin.

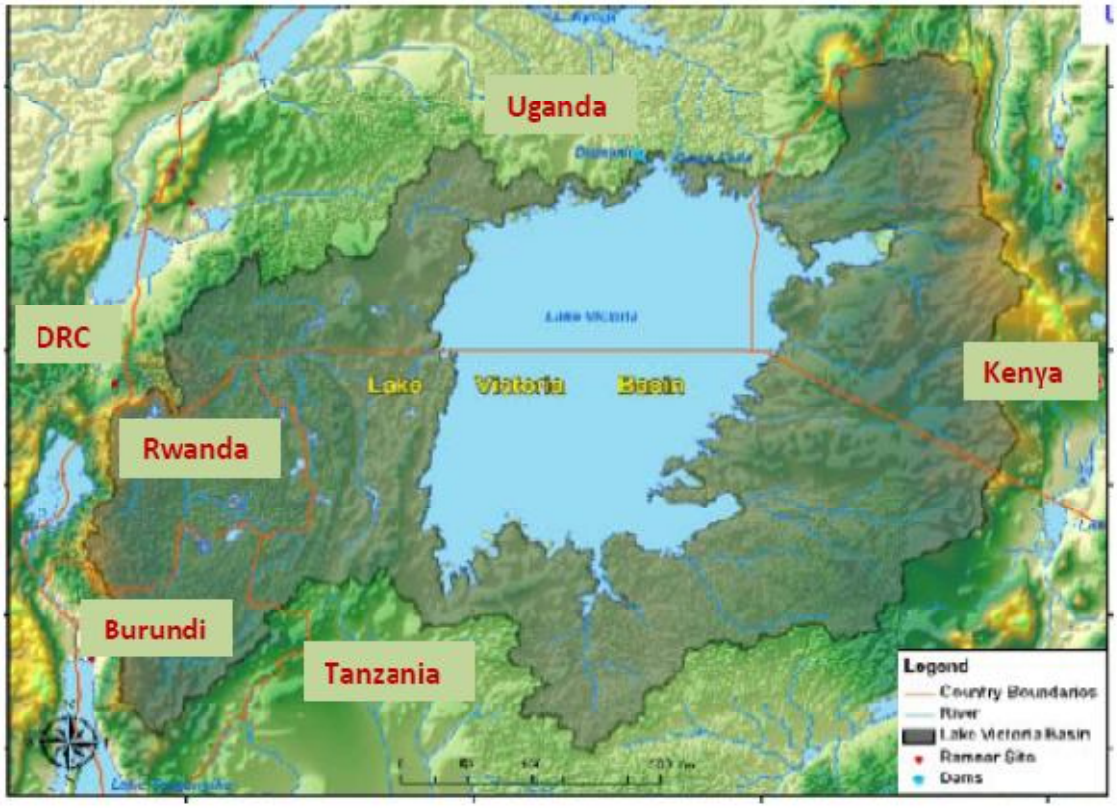

Figure 1: Lake Victoria Basin

As part of many initiatives to control further deterioration of the Lake, LVEMP I activities were planned and implemented around Lake Victoria basin. The first phase ended in December 2005. Later in 2009, Lake Victoria Environmental Management Project Phase Two (LVEMP II) was initiated which is somewhat a compliment and an upscale of LVEMP I Works, with an implementation period of eight (8) years (2009-2013 and 2014-2017). Again, this second phase is equally a regional initiative and a multi-sectoral approach on the management of the Lake Victoria Basin implemented in the five East African Community (EAC) Partner States of Burundi, Kenya, Rwanda, Tanzania and Uganda. Lake Victoria Basin Commission (LVBC)

coordinates the project regionally through the Regional Project Coordination Team (RPCT) based in Kisumu, Kenya. The Ministry of Water is the focal point ministry on the Tanzanian side. In Tanzania the project became effective on 20th August 2009, covering a total of 23 districts in the regions of Mara, Shinyanga, Mwanza and Kagera. The project is funded by the World Bank, Global Environmental Facility (GEF), Swedish International Development Agency (SIDA), Government of Tanzania and Communities.

LVEMP II objectives and key outputs targets at reducing pollution into the lake by reducing discharge of untreated effluent from municipal waste by supporting public investments, including:

i. rehabilitating and improving selected wastewater treatment facilities to reduce discharge of untreated effluents into the Lake,
ii. connecting primary treated effluent discharge to constructed/restored wetlands; and
iii. providing on-site sanitation facilities.

In meeting the above objectives, LVEMPII in collaboration with Bukoba Urban Water and Sanitation Authority identified poor sludge disposal as one of the areas responsible for pollution of the lake. Bukoba municipality lacks a central sewerage system. Each building or a number of buildings in the municipality have own on-site sanitation facilities which include extensive use of cesspits, soak-away pits, septic tanks and pit latrines. When most of these on-site sanitation facilities fill up, the following methods are normally applied;

- emptied manually to the nearby open pit which is later backfilled,
- drained into the nearby storm water channel leading to the river which later drains into the lake (mainly during rainy season),
- Abandon the pit latrine and dig another pit nearby
- Use mechanical cesspit emptier followed by illegal and indiscriminate dumping in rivers or open land.

Such illegal practices lead into contamination of terrestrial and aquatic environment by human excreta with high risks of transmission of gastrointestinal infections. As a technical solution to these challenges, a designated sludge disposal facility was proposed and Ministry of Water (MoW) through LVEMP II commissioned the Consulting Engineers to carry out a detailed engineering design and supervision of construction of sludge disposal facility for Bukoba Municipality.

According to the requirements of Environmental Management Act (EMA) Cap 191 of 2004, Environmental Impact Assessment is mandatory for projects of this nature since they are likely to have the potential of causing significant impacts on the environment. Further to this requirement, the Environmental Impact Assessment and Audit Regulations of 2005 classify the proposed activities under the mandatory list of EIA.

In recognition of the above requirements, the Ministry of Water (MoW) through LVEMP II commissioned M/s Environmental BENCHMARK, Consulting Civil-Environmental Engineers to carry out an Environmental and Social Impact Assessment for proposed construction of the sludge disposal facility for Bukoba Municipality.

In line with the Environmental Impact Assessment and Audit Regulations 2005, Part III – Regulation 5, the Project Brief was prepared to facilitate registration of the project. NEMC's screening decision indicated that the Environmental Impact Assessment is required. In response to this decision, the scoping exercise was carried out and the Scoping Report was then prepared and submitted to NEMC, towards the approval of the project, the EIS is hereby prepared

presenting all the requirements as stipulated under the Environmental Impact Assessment and Audit Regulations, 2005-GN No 349 of 2005.

1.2 Project Objectives

The overall objective of LVEMP II is to contribute to achieve the vision of the EAC of "creating a prosperous population living in a healthy and sustainable managed environment and providing equitable opportunities and benefits".

The project development/global environmental objectives are to:

- Improve collaborative management of the trans-boundary natural resources of LVB for the shared benefits of the EAC Partner States; and
- Reduce environmental stress in targeted pollution hotspots and selected degraded sub-catchments to improve the livelihoods of communities, who depend on the natural resources of LVB. These objectives are to be archived through implementing the following project components.

Strengthening institutional capacity for managing shared water and fisheries resources

This component will focus on strengthening the existing institutions to improve the cooperative management of shared transboundary natural resources of the LVB, and hence contribute to the achievement of the first PDO/GEO. Its objectives are to:

- Improve the effectiveness of key regional and national institutions, through harmonization of national policies, legislation, and standards;
- Develop options for long-term mechanisms for financing natural resources management interventions; and
- Develop regional frameworks for the management of key transboundary natural resources, water and fisheries.

Point sources pollution control and prevention

The main objective of this component is to reduce within the lake and littoral zone environmental stresses, through the implementation of mitigation and prevention measures, thus contributing to the achievement of the second PDO/GEO. It will finance investments aimed at reducing point sources of pollution in priority hotspots, identified during LVEMP I. These investments will complement on-going activities supported by other Bank-funded projects in water and sanitation. There are three sub-components:

- Rehabilitation of wastewater treatment facilities;
- Promotion of cleaner production technologies; and
- Pollution risk management and safety of navigation.

Watershed management

This component seeks to reduce environmental stresses from the lake basin, through the implementation of non-point sources pollution mitigation and prevention measures. The reduction of the non-point sources of pollution (sediment loads, nutrients, and agro-chemicals); by scaling up successful models of watershed management practices piloted under LVEMP I will improve water use efficiency, and generate positive downstream externalities. The project will support community-driven investments in rehabilitating selected priority degraded sub catchments of Lake Victoria, including the catchment of River Simiyu (11,577 Km^2) in Tanzania. There are two sub-components:

- Natural resources conservation and livelihoods improvement; and

- Community capacity building and participation.

Project coordination and management

This component will provide resources necessary for the effective coordination and communication, and monitoring and evaluation of the project activities. At regional level, these tasks will be carried out by the LVBC, while at the national level they will be the responsibility of the National Project Coordination Teams (NPCTs). This component has two sub-components:

- Project coordination and communication and
- Monitoring and evaluation.

1.3 Purpose of the Environmental and Social Impact Assessment

According to the First Schedule of the Environmental Impact Assessment and Audit Regulations, 2005 made under sections 82(1) and 230 (2) (h) and (q) of the Environmental Management Act No. 20 of 2004 (CAP. 191), the proposed project directly falls under the list of projects requiring EIA and therefore the full Environmental Impact Assessment is mandatory.

The proposed project falls under class 20 (c) Municipal Sewage as shown on the project development table below.

20. Waste treatment and disposal *(a) Toxic and Hazardous waste* (i) Construction of Incineration plants (ii) Construction of recovery plant (off-site) (iii) Construction of waste water treatment plant (off-site) (iv) Construction of secure land fills facility (v) Construction of storage facility (off - site) *(b) Municipal Solid Waste*
(i) Construction of incineration plant (ii) Construction of composting plant (iii) Construction of recovery/re-cycling plant (iv) Construction of Municipal Solid Waste landfill facility *(c) Municipal Sewage* (i) Construction of waste water treatment plant (ii) Construction of marine out fall (iii) Night soil collection transport and treatment. (iv) Construction of sewage system

Table 1: Extract from the First Schedule of the EIA and Audit Regulations 2005

The principal objectives of the ESIA study are to identify and investigate in detail the most significant environmental and social impacts likely to emanate from the design, construction and use of the sludge disposal facility project.

The ESIA study is also required to propose measures for mitigating negative impacts, enhancement measures for positive impacts and prepare an environmental and social management and monitoring plans.

Another purpose of the ESIA study was to address socio-economic issues related with the implementation of the project and provide mitigation plans to prevent or minimize adverse environmental and social impacts arising from the development of the sludge disposal facility.

The study is also aimed at ascertaining and updating the socio-economic implications likely to result from the proposed project including:

- Improving the understanding of the identification, assessment and analysis of potential effects of the sludge disposal facility on communities along the project area
- Identifying local communities concerns and mitigation measures to optimize the positive impacts and minimize the negative impacts
- Identifying contentious issues
- Identifying whether there will be a need for relocation and compensation
- Effecting and creating a sense of local participation and ownership in the project design, construction and operation process and
- Identifying institutional capacities to implement HIV/AIDS education and information in the project area.

1.4 Scope of the Environmental Impact Assessment

The scope of the environmental impact assessment study as amplified from the Terms of Reference submitted to NEMC earlier under the scoping process may be presented in the summary form as follows:

- An environmental impact assessment to take into account environmental, social, cultural, economic, and legal considerations,
- Identification of the anticipated environmental impacts of the sludge disposal activities and the scale of the impacts including the extent of vegetation clearance, disturbances to cultural sites, materials to be used, and social impacts
- identification and analysis of alternatives to the proposed project;
- propose mitigation measures to be taken during and after the implementation of the project; and development of an environmental management plan with mechanisms for monitoring and evaluating the compliance and environmental performance which shall include the cost of mitigation measures and the time frame of implementing the measures
- Fulfilment of the legal requirements with a view of obtaining an EIA certificate which is a condition for project implementation.

1.5 Presentation of the Environmental Impact Assessment

Based on the Consultants' experience in preparation of the EIS, this statement has been presented in the format suggested in Environmental Impact Assessment and Audit Regulations (2005), section18 (2). Amplification of the document is also expected after the review process to be undertaken by NEMC and other relevant sector ministries. Therefore the presentation has the following headings;

- Cover page with title of the project, location, project proponent, Consultant contact addresses, Name and contact particulars of the EIS Reviewer (NEMC), and finally the corresponding date of submission
- Executive summary;
- Acknowledgement;
- Acronyms;
- Introduction;

- Project background and description;
- Policy, administrative and legal framework;
- Baseline or existing conditions;
- Stakeholders Consultation and Public Participation Process;
- Assessment of impacts and identification of alternatives;
- Impacts management or environmental mitigation measures;
- Environmental and social management plan;
- Environmental and social monitoring plan;
- Resource evaluation or cost benefit analysis;
- Decommissioning;
- Summary and conclusions
- References;
- Appendices

1.6 Methodologies Used in the ESIA Study

Various methods were used to accomplish the ESIA study; these include a thorough review of Environmental Management Act CAP 191 of 2004 and Environmental Impact Assessment and Audit Regulation of 2005. Other methods were public consultation meetings where the communities in the project area mainly residents of Nyanga village were sensitized to participate in the process through consultation meeting which was earlier communicated to the communities. Again during this ESIA study phase, through WEOs another set of notification letter and invitation to attend consultation meeting was served to communities to participate in consultation meeting which was held on 28th June 2012, refer to Annex III for invitation letter.

The baseline information was mainly captured and compiled to suit the ESIA requirements from the regional level and municipal profile as well as development plans. On the other hand, data for biological environment were gathered by employing various methods including review of existing relevant research documents, key stakeholders consultation especially local authority and physical site visits.

The principal stages used in carrying out and accomplishing this ESIA study were project scoping, field studies, public participation and project impact assessment as stipulated in the Operative National ESIA Guidelines (2003). Scoping was done through consultation with various relevant stakeholders, reviewing various reports, studies and literature relevant to the environment and wastewater management projects developments in Bukoba Municipality. Additional information to augment the data obtained from project scoping was acquired through field studies. Public participation was done through broad consultations that involved public meeting and focus group discussions, with municipal and ward officials and village leaders. The major concerns raised by the public have been addressed in this ESIA report and their minutes are appended as Annex VI.

The Social Impact Assessment study was intended to ascertain the socio-economic and socio-impact implications likely to result from the proposed sludge disposal facility project, highlighting key elements thereof. The methodology adopted for the study entailed:

- Identification of key informants (comprising government officials, professionals, business people, community leaders, and CBO's) and soliciting their views and comments;
- Identification of ward and village that is nearby the proposed sludge disposal facility site; Thereafter, a purposeful selection of respondents was done. The sample included adult men, women, youth, traders, and local government leaders.
- Selection of representative sample of stakeholders composed of local leaders, men, women and youth from Nyanga village
- Conducting Meeting, and Consultations with key informers and Local Authorities leaders, traders, and all interested and affected stakeholders along the influence of the roads. The list of consulted stakeholders is given in Annex IV and V.

The main issues that were discussed in the meetings included among others, the following:
Effects of the proposed project on socio economic activities such as income generating activities and Employment, on pupils, noise and haul material transportation; social services; gender, HIV/AIDS; wastewater management at the site including close monitoring of the facility; existing solid waste disposal in the proposed project site; minutes from the public meetings are attached as Annex VI.

Project impact assessment
The potential impacts of the proposed sludge disposal facility development were identified by superimposing project elements onto the existing social and environmental natural conditions. A Checklist method was used to identify the impacts and recommended mitigation measures.

The assessment was undertaken in very cordial interactions with the stakeholders. In this process social and environmental impacts were evaluated for various alternatives. The impacts were compared with the situation of implementing the project and that of not implementing the project (i.e. do-nothing alternative). It was envisaged that this integrated approach provided an "optimum basis" for effective incorporation of reasonable and affordable mitigation measures and remedial actions. The fundamental social considerations influencing the design of the project were taken into account. Among others, the assessment entailed the followings:

(a) Collection of Baseline Data
After defining the scope of ESIA study for the project, the collection of baseline data was conducted. These data enlightened on whether and where more detailed information on environmental conditions at the development site and its surroundings are needed.
For the purpose of this study, the Rapid Assessment Methodology for collection of socio-economic data was adopted. The approach used extensively the qualitative as well as quantitative data collection methods. Qualitative method was used to determine the perspectives and the opinions of the interested and affected parties, while the quantitative data was equally important to provide statistical estimates on the quantitative situation of socio-economic life of people in the project areas, (health, education and HIV/AIDS prevalence rates, etc).

The sample of the study consisted mainly of village and ward executive officer, members of committees on social services and environmental protection and the members from the general public who were supposed to be potential affected persons or interested parties. All respondents were selected through convenience sampling techniques. Both primary and

secondary data were collected. Primary data were collected by observations and consultations. Consultation with key informants in sludge disposal facility project area was done in order to obtain additional socio-economic data and information. The data and information so collected was meant to update and supplement those collected during previous studies.

Secondary data was obtained from various relevant sources of information such as municipal profile and ward and village reports, education and health reports and many other official and non-official documents.
Field surveys and investigations were done along the proposed project site and within the project's sphere of influence. The surveys and investigations covered project site features and attributes with respect to environmental and socio-economic aspects.

(b) Review of policies, legal and institutional framework
This enhanced the review of national policies, legislation and institutional arrangement for social and environmental management in Tanzania to ascertain the optimal management of impacts.

(c) Identifying socio-economic impacts:
This was undertaken by compiling a candidate list of key impacts such as vegetation loss, nuisance from fresh sludge foul smell, contamination of effluent receiving bodies mainly Kyamato River, social and cultural systems, health, education services etc;

(d) Predicting social economic impacts:
The Social Economic impacts were identified and their magnitude and nature was predicted. For the predicted impacts, causes and effects as well as their secondary and synergistic consequences for the environment and local community were specified.

(e) Determining impacts significance:
The key activity was to evaluate the significance of impacts, that is, judgment about which impacts identified in the study are considered important and therefore need to be mitigated.

(f) Identifying mitigation and management options:
This basically involved analyzing and making decision on what mitigation measures to be taken against the identified and predicted impacts. Wide ranges of measures have been proposed to prevent, reduce, remedy or compensate for each of the adverse impacts evaluated as significant.

(g) Socio-economic evaluation:
Examination of the economic implications of social and environmental impacts and their solutions is a fundamental aspect of environmental impact study since it helps in formulating recommendations that are realistic and practical. Similarly, the economic value of environmental damage resulting from not taking any environmental actions, or economic benefits of introducing environmental management measures were taken into account.

2. Proposed Project Description

2.1 Project Location

The proposed Sludge Disposal Facility project is envisaged to be constructed in Nyanga Village in Nyanga Ward in Bukoba Municipality in Kagera region one of the administrative regions in Tanzania. Bukoba Municipality is one of the eight local authorities in Kagera region. Bukoba Municipality is not only the administrative and commercial capital of Bukoba district and Kagera region as a whole, but is also a "gateway" linking to other towns of Great Lakes countries of Uganda, Kenya, Rwanda and Burundi by virtue of its strategic location. Bukoba Municipality lies between latitudes 1°6'0" to 1°8'42" south of the equator and as longitude 31°16´12" to 31°18'54" East of Greenwich. It is bordered by Lake Victoria on the east and Bukoba District on the south, west and north. The location of the proposed project is shown in the national and regional administrative maps presented below.

Figure 2: Administrative map showing the region where the project will be implemented

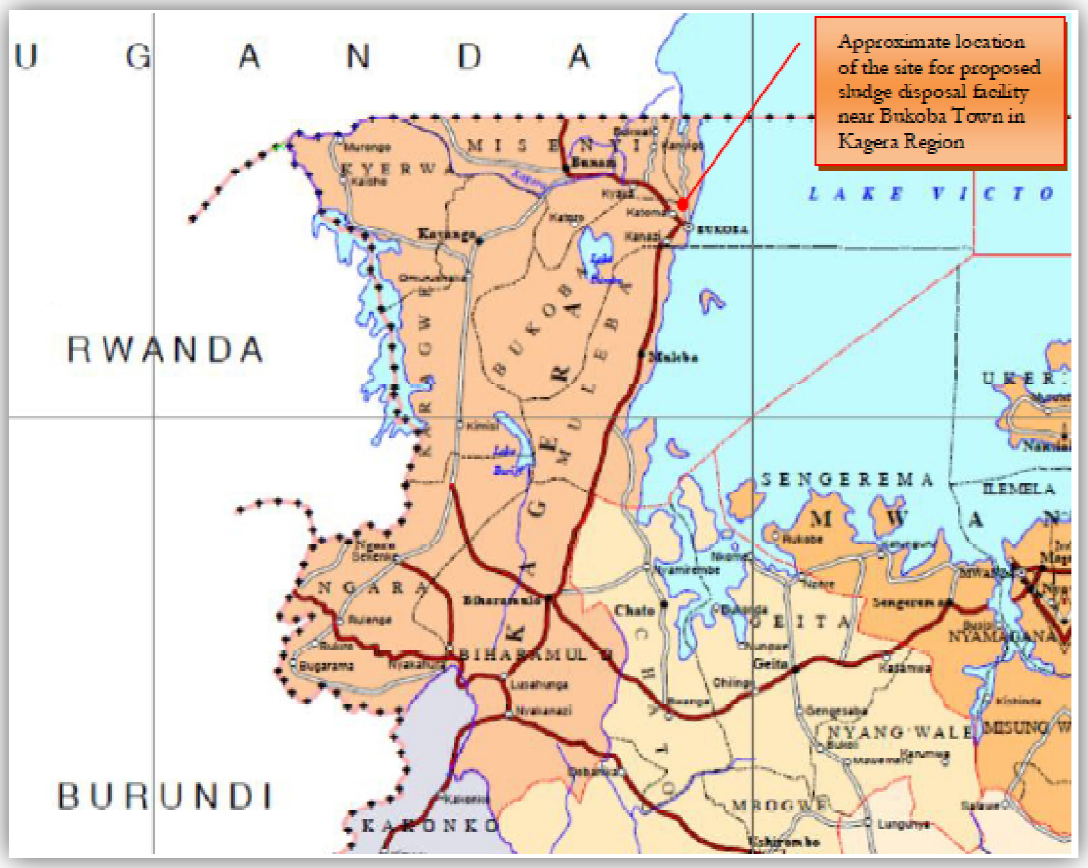

Figure 3: Kagera Region map showing the location for the proposed construction of Bukoba Sludge disposal facility

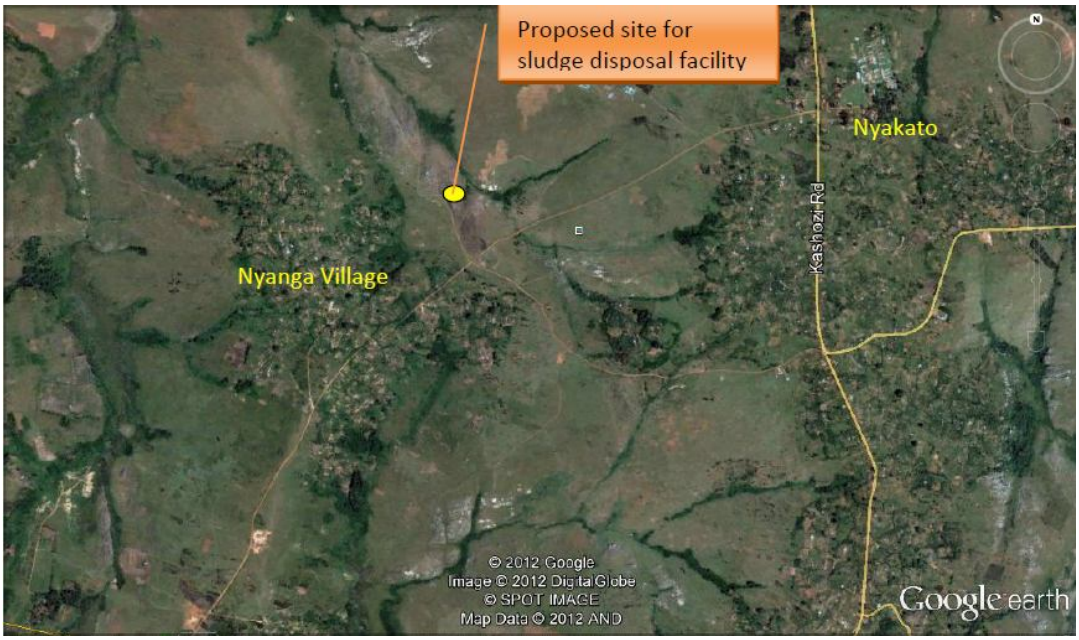

Figure 4: Satellite image showing the approximate location of the proposed sludge disposal facility near Nyanga Village in Nyanga Ward

Accessibility to Nyanga project site, where the sludge disposal facility will be installed can be reached by branching off from Bukoba-Mutukula trunk road at Kyakairabwa, and then you follow the gravel road that joins the Kashozi Road passing through Nyanga Village as shown on figure 4 above. Alternatively the same site can be reached by branching off from Kashozi Road at a location commonly known as Nyakato (Nyakato Secondary School) and then you follow the gravel road that joins Kashozi road to Bukoba – Mutukula trunk road.

2.2 Proposed Project Activities

Since the proposed project includes Environmental and Social Impact Assessment, the project activities will be assumed to follow the project routines whereby there are pre-construction activities, construction activities and finally operations and maintenance activities.

2.2.1 Mobilization Phase

This stage will involve mobilization of the construction human resource, construction equipment and plant, construction materials and erection of temporary worker's camp. At this stage, wastes (solid, liquid and gaseous) will be generated from construction of camps. The staff camp like any other domestic place will generate, garbage, packaging, sacks, papers, cardboard boxes, plastic, wood crates, bottles, glass, metal cans and the like. Such wastes will need to be segregated for recycling or incinerating at designated project sites.

All project activities are supposed to be carried out within the boundaries of the identified project site of about 4ha without disturbing or obstructing the nearby road that extends to sites for construction materials such as burn bricks, stones/hardcore and building sand. In order to ensure this, the project Contractor will have to fence off the entire site perimeter with chain link fence or any other suitable material as it will be determined during project implementation. In case of diversion access road to be passed away from the site, the contractor has to ensure that the signage is put in place to direct other users of the road.

Also, as required, the Contractor will hire labour and erect necessary temporary facilities to cater for offices and storage yards within the construction site or outside the site as it may be agreed and permitted by the Bukoba Municipality Authorities. Mobilization phase will also involve purchase and stockpiling of the materials such as aggregates, sand, cement, timber and reinforcing steel. Other construction equipment such as front wheel loader, grader and possibly a roller or compactor shall be mobilised to the site of works as need arises.

2.2.2 Construction phase of the project

Upon completion of preliminary activities involving erection of site offices, storage facilities and services (water, temporary wastewater facilities and electricity) as required, the actual construction work of sludge disposal facility will start which will involve;

- Setting out to demarcate rights of way for access road, work areas for the sludge disposal facility, clearing limits. Bypasses and protective fences or barricades should all be in place before construction begins
- Sites preparation –clearing and grubbing to remove unsuitable soils, construction of bypasses and possible modification of existing drainage structures
- Excavation to form areas meant for the basins or ponds , dikes for the sludge facility
- Placing of concrete or lining materials to prevent waste water seepage into ground thus contaminating the ground water. Piping and valve installation

Various wastes, ranging from solid to liquid and gaseous materials will be generated. The staff camp like any other domestic place will generate wastes in form of garbage, packaging, sacks, papers, cardboard boxes, plastic, wood crates, bottles, glass, metal cans and the like. Such wastes will need to be segregated for recycling or incinerating at site. However, burning or incineration should be done with great care excluding materials with poisonous emissions.

2.2.3 Contractor's Demobilization Phase

Contractors' demobilization phase will involve clearing all the site activities in terms of tiding up of all sites facilities and demobilization of all construction equipment. Disposal of any remaining unwanted material will also be carried out during this contractor's demobilization phase.

However, various wastes will be generated during this stage of which the same methods used to manage waste for previous phases will apply. These will include solid wastes from packaging materials, wood and steel crates, cardboard, wrapping materials, boxes, cement bags and sacks, drums, cans and chemical containers and any other unused materials. Along with this, upgrading for damaged areas will be carried out before commissioning the project.

On the other hand wastewater will also be generated from work camps, and runoffs crossing hydrocarbon contaminated areas. As this wastewater can cause detrimental effects to the surrounding environment, conventional wastewater treatment systems such as septic tank and soak away pit will be employed to ensure safe and proper onsite disposal of waste water. After the project completion, temporary workers especially unskilled ones will have to go back to other places or former areas where they were working before construction of the sludge disposal started.

Upon completion of contractor's obligations, the structures will be handed over to the Project Proponent, BUWASA, for the operation phase.

2.2.4 Operation Phase

Once construction of sludge disposal facility is completed, the actual purpose of the facility will start, that is receiving sludge from private houses, institutional and commercial places through use of cess pit emptier/exhausters.

2.3 Project Preliminary Design

The sludge disposal facility is designed to serve six wards which are Nyanga, Ijuganyondo, Buhembe, Rwamishenye, Kagondo and Kibeta. The projected sludge load for the year 2032 is 36m^3 per day from the 2032 projected population of 52,214 from these wards. The facility is designed to have the following structures which are described in the Preliminary facility detail design report.

1. Inlet works comprising of the manhole and coarse screen
2. Drying beds
3. Connection/link between the ponds
4. Anaerobic ponds
5. Shallow lagoons
6. Outlet structures
7. Operations building

8. Laboratory equipment
9. Tools and equipment
10. Access road fence, landscaping and storm water collection channels

The schematic layout of these structures is presented on figure 5 below

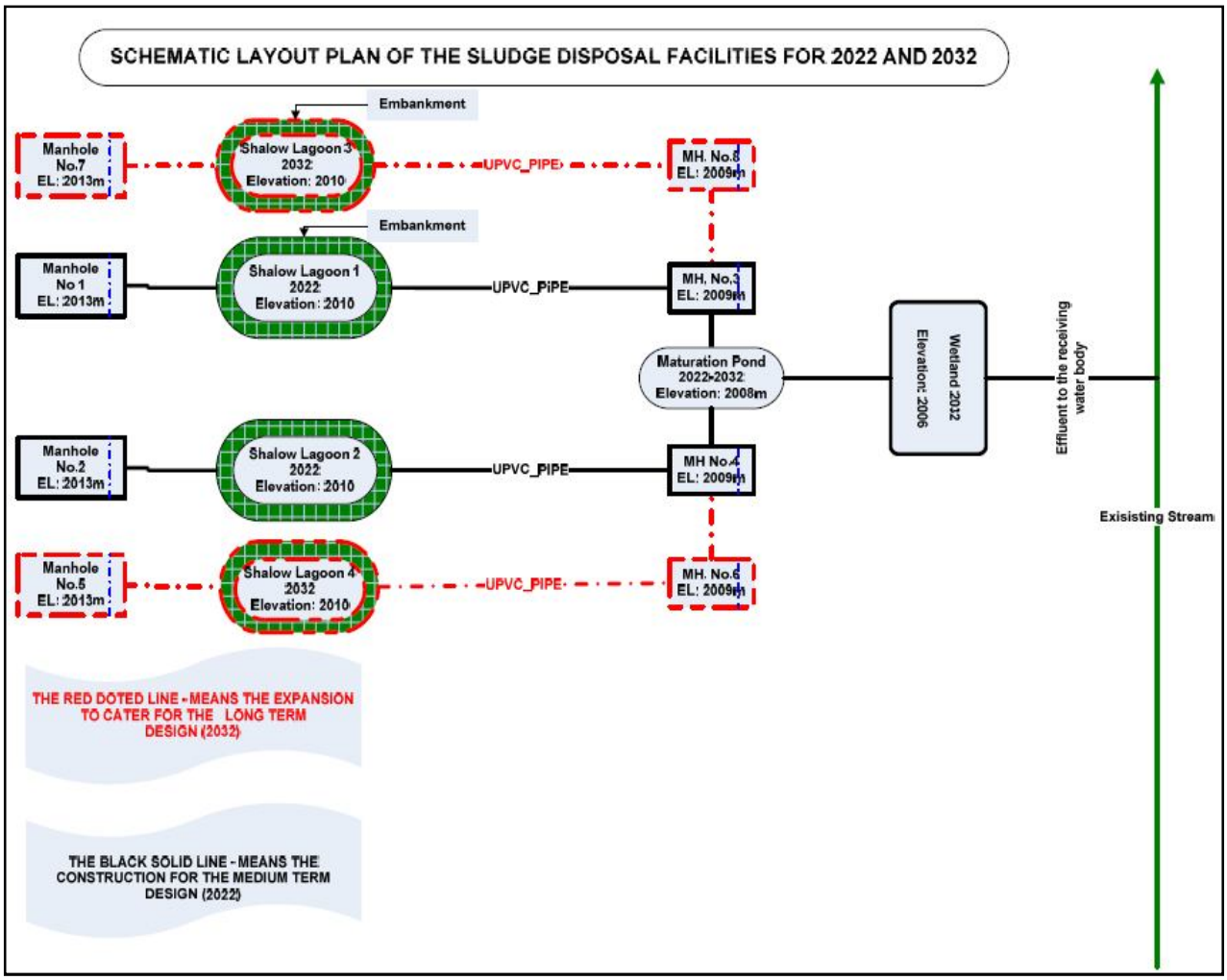

Figure 5: Schematic layout drawing of the proposed sludge disposal facility

2.3.1 Site plan of the proposed sludge disposal facility

The site plan comprises of the access road from the main road that links Nyakato ward and Nyanga ward. The road is existing as an earth road therefore it requires construction of new gravel layers to be able to serve the project and other road users.

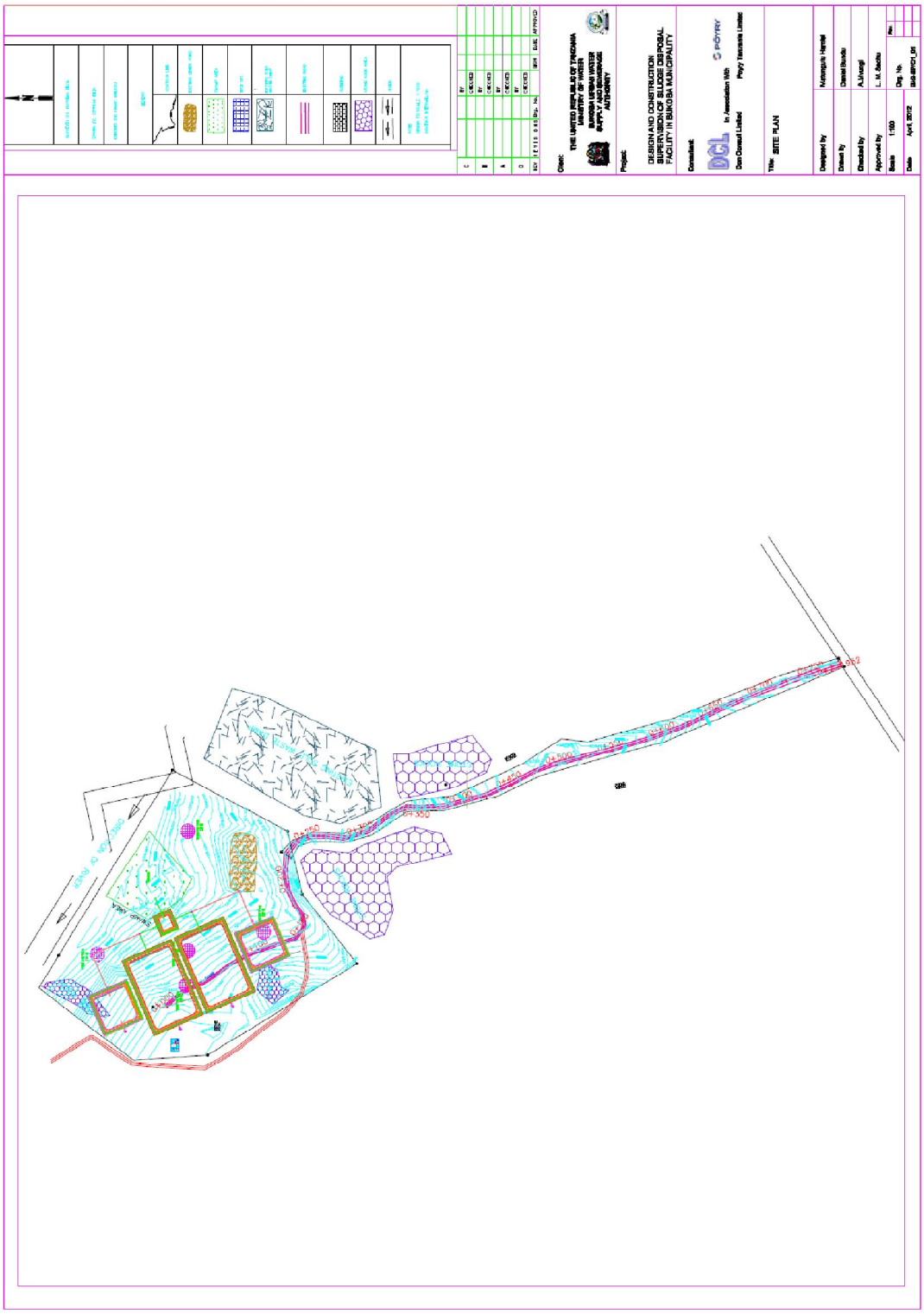

Figure 6: Site plan of the facility showing the access road, other nearby facilities and the position of the lagoons and the maturation pond

2.3.2 Shallow Lagoon and Maturation Pond Plan

Due to influent flow characteristics, a combination of two parallel cells of shallow lagoon and a maturation pond is ruled out. The shallow lagoons are proposed to be used in an alternating manner of six (6) months each, in such a way, that whenever cell-1 is duty, cell-2 shall act as a

sludge drying bed and vice versa. Therefore the system proposed for the facility is presented below

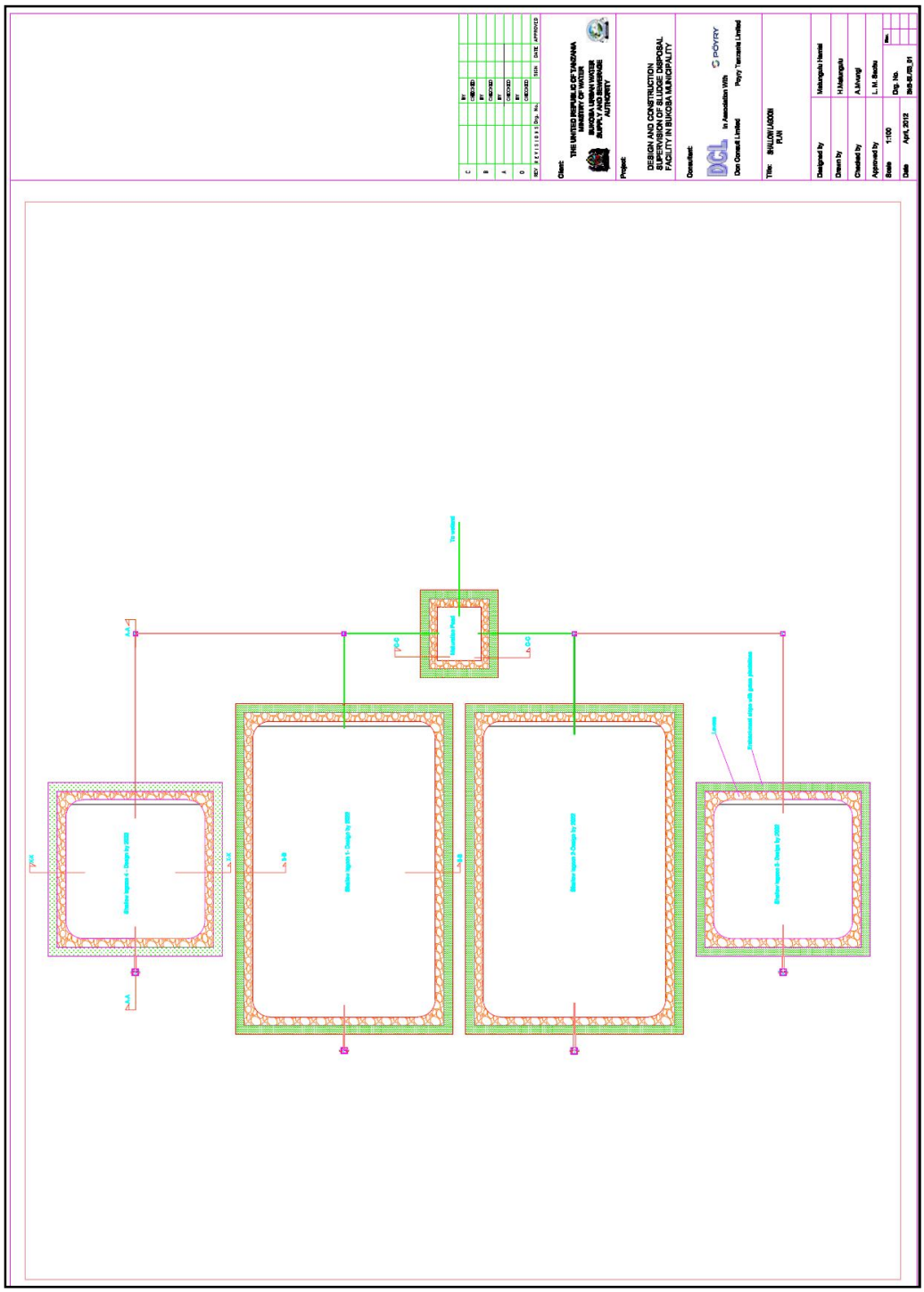

Figure 7: Layout plan of the lagoons and maturation pond

2.3.3 Shallow lagoons Sections

The shallow lagoons are proposed to have the following characteristics

i. A specific volumetric sludge loading of 23m3/day – Phase I (up to year 2022)
ii. A specific volumetric sludge loading of 36m3/day – Phase II (up to year 2032)
iii. Retention/dislodging period six (6) months equivalent to 180 days.
iv. Shape of ponds is Trapezoidal
v. Depth of each pond is 2.0metres
vi. Slope is 3:1

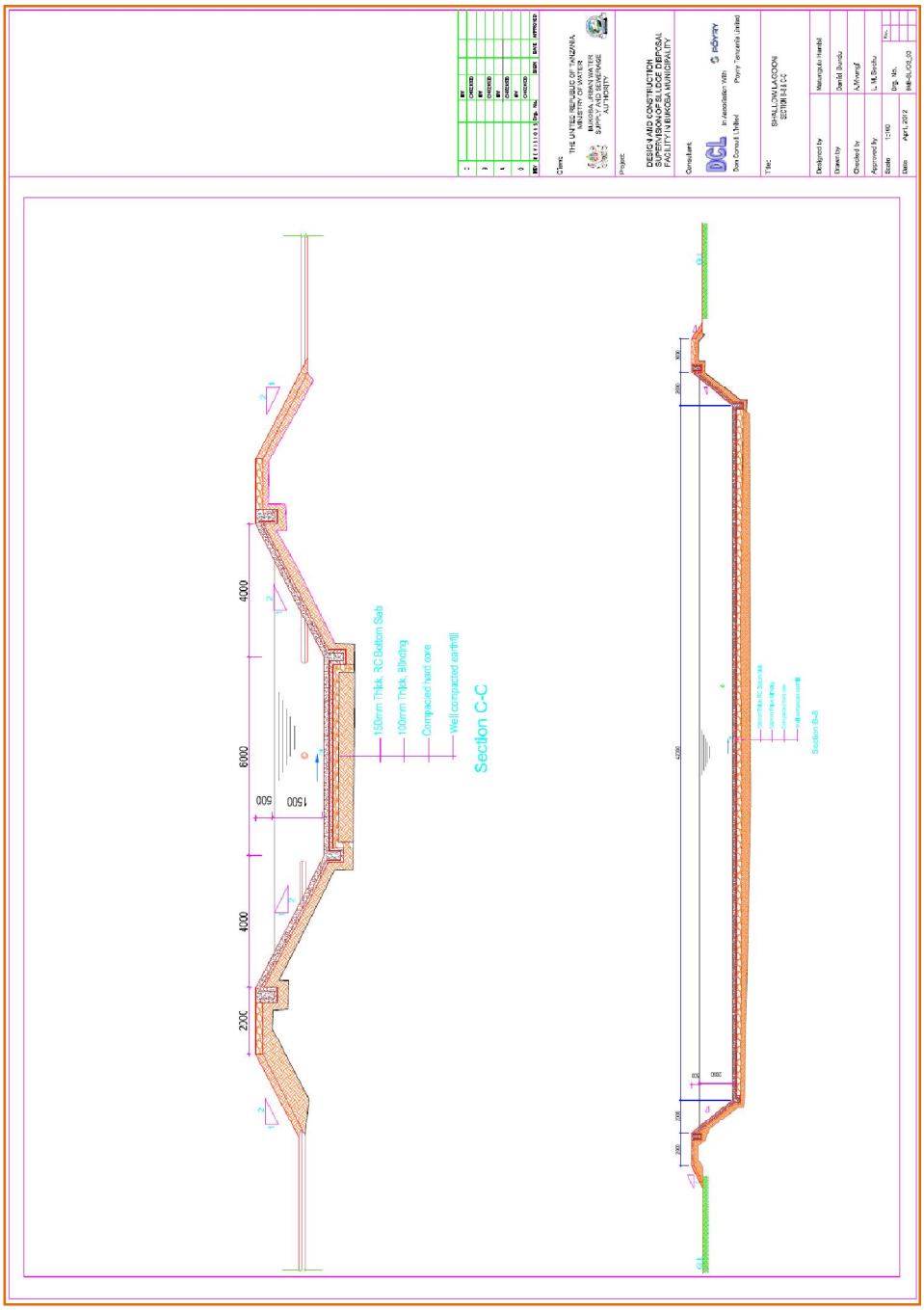

Figure 8: Sectional details of the shallow lagoon

2.3.4 Operations Building

The operations building will comprise of the workshop, laboratory for analysis of collected samples, store, office and kitchen. The building will not be provided with resting/sleeping rooms as all the working staff will be in rotation shifts.

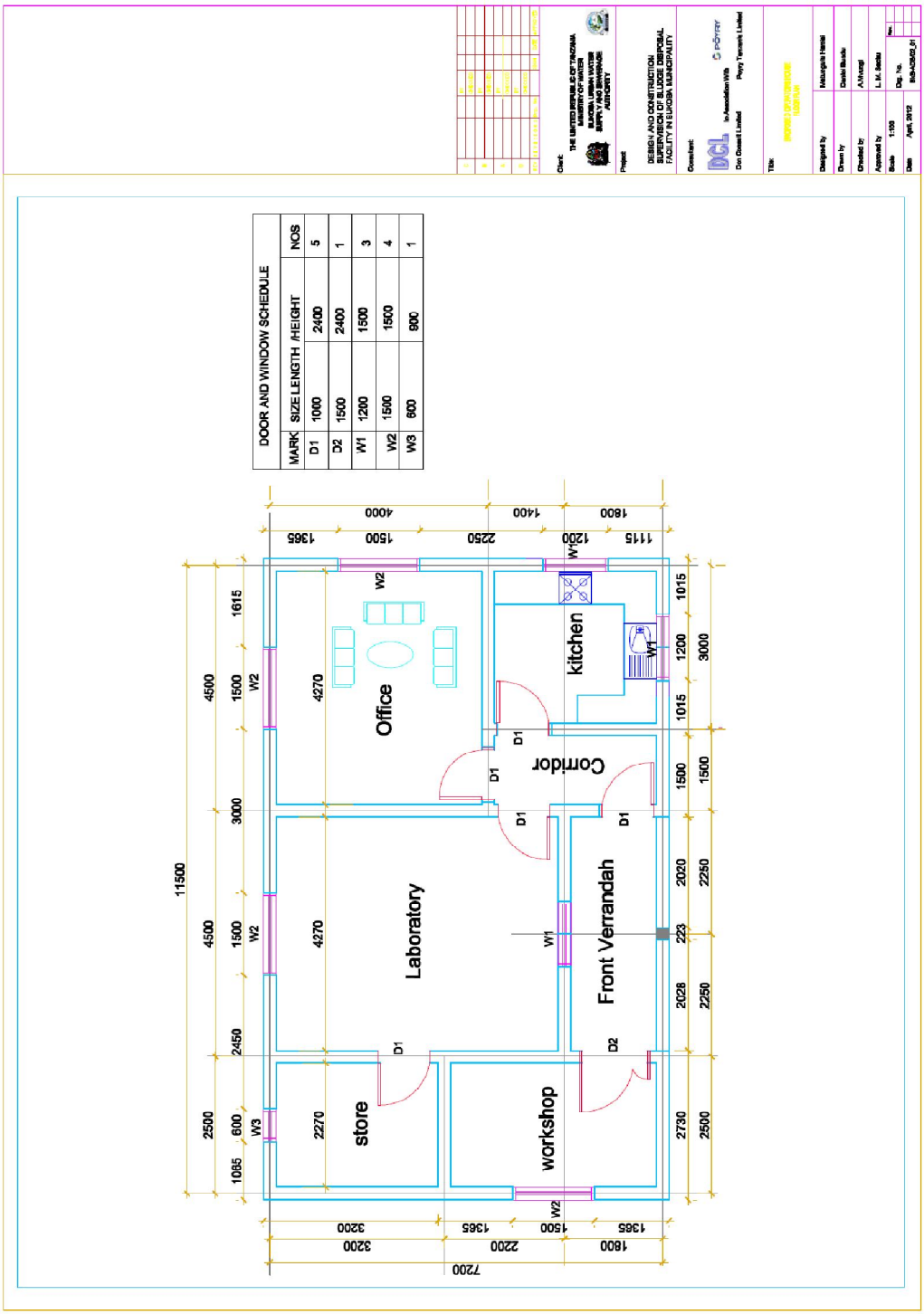

Figure 9: Operations Building Plan

2.4 Project Requirements

The project is going to require various locally available materials at different phases of the project implementation. Such locally available materials include aggregates, gravel or crushed stone, building sand and water.

2.4.1 Mobilization phase materials

Site Preparation – during site preparation different materials like manpower and site clearance equipments will be required, preparation of the site for proposed sludge disposal facility will automatically result into removal of existing few exotic trees and other vegetation around the site. These practices remove protective plants cover over the existing ground. The sites proposed for sludge drying beds will equally be cleared of vegetation. These activities will result into generation of wastes like tree debris and other solid wastes like plastics all of which will be collected and disposed off in designated waste disposal site near the proposed site. Decomposable materials may be buried; plastics and other recyclable materials will be collected and sent out for recycling in Bukoba town.

2.4.2 Construction Phase Materials and Equipment

Since most of the structures will be mainly of plain or reinforced concrete structure, the main construction materials will be aggregates, cement, sand, reinforcing steel and water. Other requirements such as timber, formwork materials such a marine plywood, etc, will also be required as included in the table below. Borrow materials to be used for construction will be collected from the identified borrow areas such as those used for road construction or new ones opened on agreement with the municipal authorities. Once these borrow pits are no longer in use, they will be backfilled with the spoil or these pits may be turned into water storage points for livestock on agreement with the respective local communities. Steep edges of these borrow pits will be smoothened with gentle slopes to avoid posing risks to children and livestock. The estimate of construction materials for the proposed project is shown on the table below.

Table 2: Estimated quantities of construction materials

Construction Materials/ Equipments	Estimated Quantity
Stones /Aggregates	1,000 tons
Cement	85 tons
Sand	2,000 tons
Reinforcing steel/bars, binding wire etc	75 tons
Water	150 m^3 per day
Nails	300 kg
Formwork (Marine Plywood)	1,500 sq. m
Timber	1,000 m^3
Roofing material (Industrial troughs)	50 sq m

Aggregates for Works

Aggregates or crushed stones for project works are likely to be obtained from a nearby source from the project area. Such volumes can be obtained and transported by trucks from established crusher plants. Since most of the crusher plants are owned by others and the contractor goes to these sites to procure materials then no off site investments will be required.

Gravel

Gravel will equally be obtained from borrow sites, most of which may be off-site. In such situations the off-site investments will be in form of establishment of a borrow site. Since front wheel loaders and bulldozers will be based at these borrow sites, and then there might be some off-site investment in terms of storage for fuel to run the equipment involved in haulage of gravel for access road layers and sludge facility embankments.

Water for works

Water in terms of large volumes will also be required for works. Water is expected to be drawn from the nearby rivers that meet construction water standards. Since Bukoba is a gifted land in terms of rain, most of the rivers have sufficient water for works. In most rivers likely to be source of water for works, offsite investments may be in form of installation of intakes required at locations where water for works will be drawn.

2.4.3 Temporary pit latrines for work staff and Treatment

There is currently no on-site sanitation facility but during construction of the sludge disposal facility, temporary improved pit latrines or septic tank will be constructed complete with the privacy walls for use by the construction staff. Therefore any waste water generated as the result of the proposed works will be drained to the septic tanks or improved pit latrines. Also waste water from the toilets will be linked to the nearby septic tanks or pit latrines.

2.4.4 Demobilization Material wastes

Upon completion of construction activities, all construction waste materials such plastics, glass and metal plates ideal for recycling will be collected and delivered at recycling centres. Unusable aggregates with concrete debris, chippings, sand will be sieved and the good one separated for reuse at other sites by the contractor. Natural grass to match the existing will be planted in all areas around the facility.

2.5 Project Operation

2.5.1 Collection of Sludge from Domestic Points

There are two methods of emptying on-site sanitation facilities; manual removal and mechanical emptying. Manual emptying is usually done by buckets, whereby the frog man gets into the pit or septic tank to remove the sludge. Since this method is associated with considerable health risks, it will be discouraged and arrange the ways to do the emptying mechanically.

In mechanical emptying, the key element is that the sludge has to be workable to allow it to be sucked easily into the transportation facility. Dilution and agitation are the common methods used to simplify emptying. Since the Municipality will encourage private investors/operators to

buy cesspit emptiers, then this will make the emptying service readily available to most of the users in the targeted areas. The operation sequence may be simply represented by the sketch presented below

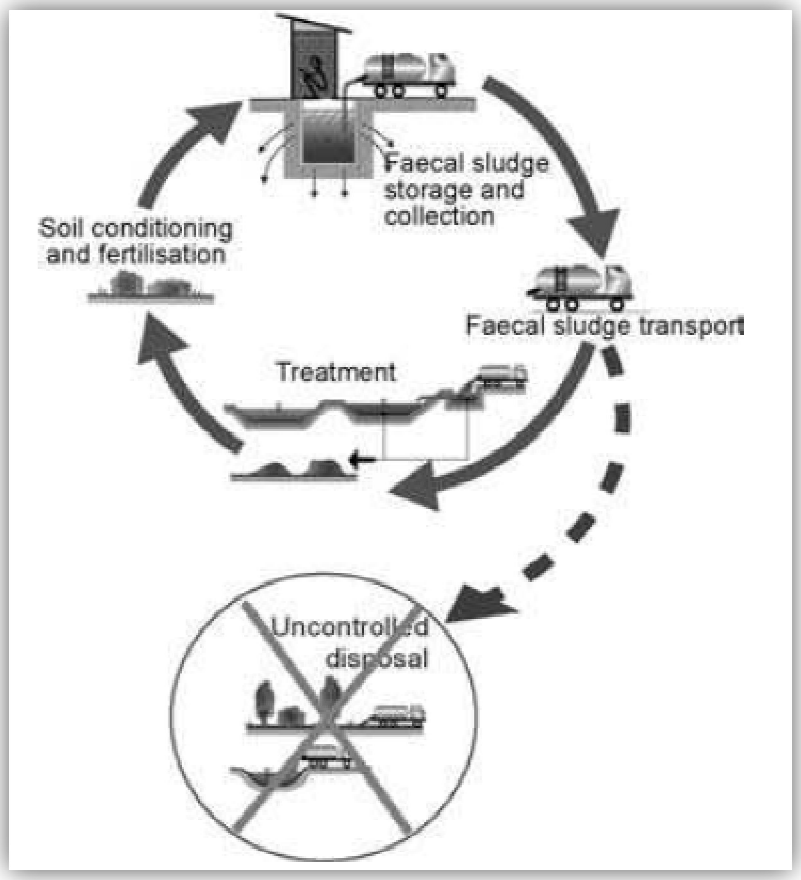

Figure 10: Conceptual representation of the sludge disposal mechanism from collection to the final point

2.5.2 Effluent Standard

The new sludge facility to be constructed must have the following effluent standards as set by the Tanzanian Standards for water receiving bodies

- BOD5 at 20 °C: 30.0 mg/l
- SS: Not cause formation of sludge or scum
- TDS: 3,000 mg/l
- PH-Value: 6.5 – 8.5
- Faecal Coli form (Bacteria 100ml) 44.50
- 5000/100ml for discharge into receiving water bodies and 100/100ml use in un restricted irrigation.

2.5.3 Final disposal of Sludge

Studies have shown that for suitably designed and operated sludge pond, and where the sludge is retained for over six (6) months, the sludge will attain inert state. Inert sludge is safe for application as a soil conditioner as it contains high concentration of nitrogen and phosphorous which are essential nutrients to plants. The organic carbon in the sludge also when stabilized, is a

good soil conditioner because it provide good soil structure for plants. Therefore the sludge from disposal facility is proposed to be used as soil conditioner. Composting of sludge is recommended to ensure die off of askari eggs and other pathogens, if sludge is to be used for horticulture.

2.6 Project Boundaries

The area of influence of the project covers the whole neighbourhood and the road network which will be linked to the project area in the course of transferring equipment, debris and construction materials during different phases of the project. Though the project is located in a remote area where at near distance there is patches of rocks which could be used as borrow site for construction materials such as hardcore stones, there some construction materials and equipment that will be required from distant places such as Bukoba town and other locations to get building sand, aggregates, cement etc. All these locations may be considered to be within project boundaries as it may influence its impacts to these locations.
Looking at this area of influence it is evident that the boundary of the project will be considered in terms of spatial, temporal and institutional boundaries as presented below in the subsequent sub sections.

2.6.1 Spatial Boundaries

Spatial boundaries refer to impact area coverage. Some of impacts have local (village, district) or regional or international implications. On impact area coverage we can consider two concentric influence zones namely;

Sludge disposal facility Area,- The proposed project for construction of sludge disposal facility will require 4 ha for the main structures and other area used as buffer zone of about 50m from the actual structures to the outer boundary of the facility. This is the area which will receive the most intense physical impacts of the construction works as it is targeted to receive permanent works. The proposed site for sludge disposal facilities is located far away from residential houses which are about 500m away. However the nearest building may be treated as “receptors” of some of the impacts such as noise or unpleasant smell during construction period and obnoxious odour during operation. Undoubtedly these will equally have a significant impact if proposed mitigation measures are not implemented.

Wider Project Area, this is the area that will coincide with the road network that will be used by project trucks during delivery of building materials and later transportation of sludge during the operation phase. This will be dictated by the number of heavy trucks needed at once to haul construction materials. Therefore the project impacts either positive or negative are likely to extend beyond the boundaries of the project area following the road network to sources of materials and back to the project site. The detailed Environmental Impact Assessment has involved carrying out a thorough analysis of these spatial boundaries. Of course the disposal facility will be used to treat sludge from different municipal areas of which is significance to environmental management especially sub-basin management and livelihood improvement among municipality residents.

2.6.2 Temporal Boundaries

Temporal boundaries are referring to project life span and the reversibility of impacts. The project under consideration is envisaged to last for over 15 to 20 years from the date of construction to the date when it requires rehabilitation. Therefore the assessment has considered areas that will be impacted by the project activities and recovery status. These will include impact to a nearby stream, borrow pits, quarries, sand pits, water sources, waterways for delivering construction materials to site, social impacts and sexually transmitted diseases, to name a few.

2.6.3 Institutional boundaries

These boundaries refer to those administrative and institutional boundaries in which the project lies or interacts. These can be determined from the legislations, ministries/departmental mandates. The project area is in the Bukoba municipality within Kagera region. Within the municipality there are various divisions, wards and sub-wards and villages. There is a long chain of authority in the local government, with three intermediate levels between the Regional Administrative levels to the sub-ward chairman. Each administrative unit is governed by its own council, responsible for environmental measures. Therefore starting from the Ministry of water where the project proponent falls, the project will need to interact with the Regional, municipality, divisions, wards and village administrative levels.

3. Policy, Legal and Administrative Framework

3.1 Introduction

The construction of sludge disposal facility needs to comply with the national environmental policy and legislation because it is going to be implemented in Tanzania. The country aims at achieving sustainable development through rational use of natural resources and incorporating measures in any development activities in order to safeguard the environment. The existing legal document, which drives toward achieving this goal, is the National Environmental Policy (NEP), which was approved by GoT in 1997.

The NEP advocates the adoption of Environmental Impact Assessment (EIA) tool for screening development projects, which are likely to cause adverse environmental impacts. In line with this, the National Environment Management Council (NEMC), which is a state organ for advise on the environmental management issues in the country, formulated the National EIA Guidelines and Procedures (1997 and subsequent amendments in 2002). The documents give directions on conducting and reporting of ESIA studies as well as their administration. Even though it is hardly mentioned in the environmental circles but they offer an ideal guide in conducting environmental assessments.
Relevant Policies and legislations pertaining to pollution of ground and surface water, pollution of soil, air, land and land use, forests, wildlife, among others, were examined in order to ensure that the proposed facility works meet and abide to the existing regulations. These are described below.

3.2 Environmental Policy, Law and Regulations

3.2.1 Policies

National Environmental Action Plan, NEAP (1994)

The plan encompasses all development sectors with the focus on the conservation of environment and sustainable development. Being implemented in the farming and grazing land of Nyanga villagers with potential mixed farming, the proposed development will have multiple social and environmental impacts to such a community, the project contractor and the proponent will ensure that the mitigation measures provided in this EIS are implemented in order to conserve the environment and the welfare of neighbouring community.

The National Environmental Policy, NEP (1997)

This highlights sustainable development as its core concept. NEP states that Tanzania is committed to sustainable development in the short, medium and long-term. Section 4 of the NEP stresses the importance of Environmental Impact Assessment in the implementation of the Environmental National Action Plan. It asserts that although it is important to tackle immediate environmental problems, precautionary, anticipatory and preventive approaches, used in EIAs, are the most effective and economical measures in achieving environmentally sound development. With specific regard to the water and sanitation, and health sector, NEP in section 48, 49 and 50 focuses on the following aspects:

- promotion of technology for efficient and safe water use, particularly for water and waste water treatment, and recycling
- In respect of marine and coastal waters the policy objective is the prevention, reduction and control of pollution of the marine and coastal waters, including that from land-based sources of pollution.
- provision of community needs for environmental infrastructure, such as safe and efficient water supplies, sewage treatment and waste disposal services; and
- promotion of other health-related programs such as food hygiene, separation of toxic/hazardous wastes and pollution control at the household level.

National Land Policy (1995)

This promotes a secure land tenure system to encourage the optimal use of land resources, and to facilitate broad-based social and economic development. The Land Policy provides for "full fair and prompt compensations" when land is acquired. The proposed project will be implemented at the land where it is currently used for illegal sludge dumping and solid waste dumping hence no any compensation will be required as the proposed site is planned as sludge disposal site in the Municipal Master Plan 2020 and it is owned by Bukoba Municipal Council.

Transport Policy (2002)

It aims at enhancing transport safety and environmental protection, through taking steps to review and update national legislation in transport operations and safety requirements. The haul equipment during construction and sludge transportation during operation of the sludge disposal facility will adhere to requirement of this policy of which it will be socially, environmentally and economically viable.

Wildlife Policy (1998)

It promotes the conservation of the biological diversity, involving all stakeholders in wildlife conservation and sustainable utilization as well as in fair and equitable sharing of benefits. The proposed project site is not in areas with wild animals it is only in area with small animals and the plantation that exist include exotic trees such as eucalyptus and cypress (*Cupressus macrocarpa*). Therefore, the requirements of this policy will be observed fully in sensitizing the contractors' employees to avoid causing any injury to any animal (if any) and unnecessary vegetation clearance during execution of the project.

National Forest Policy (1998)

This policy demarcates and reserves in perpetuity for the benefit of the present and future inhabitants, sufficient forested land and land capable of forestation, to ensure environmental stability and maintenance of the ecological balance including atmosphere equilibrium which is vital for sustenance of all life forms, human, animal and plant.

With regards to EIA, the policy calls for environmental assessment of any investment which would convert forest land to other land use or may cause potential damage to forest environment. Project construction especially the construction of operating house is identified as a relevant development activity under this policy and it may end up using forest products in form

of timber for works. Also the project area is surrounded by forests which if not protected may be harvested for fuel wood during construction and operation.

National Water Policy (NAWAPO 2002)

The overall objective of this policy is to develop a comprehensive framework for the sustainable management of the national water resources. It addresses adequately all relevant issues on integrated water resources management and adopts comprehensive policy framework and the treatment of water as both a social and economic good. Water policy issues particularly in water resources management underscore the disaster management from accidental pollution of water sources (Clause 4.8.4). The main objective is to protect against hazards associated with pollution of water sources. Since the proposed project will be implemented at Nyanga village where there is Kyamato river crossing just nearby the proposed site, if not operated as expected the project development may result to pollution of water in this river as it will be a receptor of water from the maturation ponds but also high abstraction of water resources around the vicinity during construction phase, the NAWAPO requirements will therefore be highly observed.

Section III of the policy stipulates urban water supply and sewerage. The policy aims at achieving sustainable, effective and efficient development and management of urban water supply and sewerage (UWSS) services. This will be attained by providing a framework in which the desired targets are set outlining the necessary measures to guide the entire range of actions and to harmonize all related UWSS activities and actors with a view of improving the quality of service delivery. The specific objectives of the policy in the context of developing and managing urban water supply and sewerage services are:

i. To guide the development and management of efficient, effective and sustainable water supply and waste water disposal systems in urban centres.
ii. To create an enabling environment and appropriate incentives for the delivery of reliable, sustainable and affordable urban water supply and sewerage services.
iii. To develop an effective institutional framework and ensuring that the water supply and sewerage entities are financially autonomous.
iv. To enhance an efficient and effective system of income generation from sale of water and wastewater removal.
v. To enhance water demand management and waste water disposal.

Waste water and environmental management is also one of the issues stipulated under this section it encourages the sewerage systems and sludge disposal facilities construction and rehabilitation of old ones so as to ensure domestic and industrial wastewater is not haphazardly discharged to contaminate water sources and the environment.

Cultural Property Policy (1997)

This policy covers a wide range of topics relating to both living cultural heritage and historical and archaeological remains ("cultural property"). The policy requires that "all land development shall be preceded by Cultural Resource Impact Studies". So far, no cultural property was noted in the proposed project site however during execution of the works, the sludge disposal facility project contractor will have to observe the said requirements through sensitization of his workmen particularly those involved in operation of the construction equipment.

The National Policy on HIV/AIDs (2001)

This is a policy which provides for the framework, direction and general principles in the national response interventions in the prevention, care and support of those infected and affected by the epidemic and mitigation of its impact. The specific objectives of the policy are:

- Prevention of transmission of HIV/AIDs
- HIV/AIDs Testing through voluntary testing with pre-and-post test counselling
- Care for people living with HIV/AIDs (PLHAs)
- To strengthen the role of all the sectors, public, private, NGOs, faith groups, PLHAs, CBOs and other specific groups to ensure that all stake holders are actively involved in HIV/AIDS work and to provide a framework for coordination and collaboration
- Research on HIV/AIDs
- To create legal framework by enacting a law on HIV/AIDS with a view to establishing multi-sectoral response to HIV/AIDS and to address legal and ethical issues in HIV/AIDS and to revise the legal situation of families affected by HIV/AIDS in order to give them access to family property after the death of their parent(s).

Other objectives include:

- To monitor the efforts towards community mobilization for living positively with HIV/AIDS in order to cope with the impact of the epidemic while safeguarding the rights of those infected or affected directly by HIV/AIDS in the community.
- To identify human rights abuses in HIV/AIDS and to protect PLHAs and everyone else in society against all forms of discrimination and social injustice.
- To provide appropriate effective treatment for opportunistic infections at all levels of the health care system
- To work closely with the Ministry the Ministry of Home Affairs, NGOs and Faith Groups in the fight against drug substance abuse that increases the risk of HIV transmission
- To prohibit misleading advertisements of drugs and other products for HIV/AIDS prevention, treatment and care.

In order to contribute towards observing the objectives of the National Policy on HIV/AIDs, the project Contractor will have to have HIV/AIDs programme aimed at promoting awareness of HIV/AIDs among its service providers and its employees and the residents of Nyanga village as whole.

The National Employment Policy (1997)

The policy aims at;

- preparing the conducive environment for the unemployed to employ themselves by directing more resources to the self employment sectors,
- Identifying potential areas for employment and to lay down strategies of how to utilise such areas in promoting employment in the country,

- To prepare a special procedure for coordination and developing sources of employment including creation of a body that will supervise implementation of the employment policy,
- Identify and elaborate on the status and roles of various stakeholders in promoting and sustaining employment.
- To strengthen (through removal of bottlenecks) the relationship between formal sector and that of self employment.
- To develop the self employment sector in rural areas so as to reduce the rate of migration to urban areas ,
- To ensure that activities initiated on self employment act as a basis for development of the economy and are an inspiration for the culture of self reliance, etc

In view of the Government efforts in development of National Employment Policy, the Project Proponent intends to supplement these efforts by providing some few employments during the project implementation. During this period, transfer of technology can be attained among those who will be employed and after their contract terms they can engage in self employment activities in the informal sector, especially in construction sector with abundant wealth which has not been exploited significantly.

National Gender Development Policy (2000)

The key objective of this policy is to provide guidelines that will ensure that gender sensitive plans and strategies in all sectors and institutions are developed. While the policy aims at establishing strategies to eradicate poverty, it puts emphasis on gender quality and equal opportunity of both men and women to participate in development undertakings and to value the role-played by each member of the society.
The Ministry of Works, MoW and LVEMP II have adopted the policy through provision of equal opportunities to both men and women in construction works and related activities. This project shall also ensure that women will be adequately involved at all levels of project planning to implementation.

National Human Settlements Development Policy (2000)
Among the policy objectives that touch the wastewater management sector are to improve the level of the provision of infrastructure and social services for sustainable human settlements development and to protect the environment of human settlements and of ecosystems from pollution, degradation and destruction in order to attain sustainable development. The infrastructure and services constitute the backbone of urban/rural economic activities. Wastewater management including sludge disposal, is essential to increase productivity and development among communities.

Generally, all aforementioned policies underscored the importance of applying Environmental and Social Impact Assessment in developing projects as it provides policy guidance on choices to maximize long-term benefits of development and environmental objectives. ESIA as a planning tool shall be used to integrate environmental and socio-economic considerations in the decision-making process to ensure that unnecessary damage to people and their environment is avoided.

MKUKUTA (2003)

This is national strategy for growth and reduction of poverty, MKUKUTA is committed to ensure that any development activity today does not adversely affect the development needs for future generations. The strategy stresses on the sustainable use of the country's natural resources and avoiding harmful effects on the environment and on people's livelihood.

Moreover, the strategy identifies several sources of growth meant for poverty reduction, one of them being Investment in Physical Capital which mainly emphasize on efficient and cost effective provision of social services like infrastructure for transport, power, safe water and sanitation including facilities for wastewater treatment, with special attention to opening up rural areas and areas with economic potentials in order to address region inequalities. This project therefore is aimed at meeting some of the requirements of MKUKUTA.

National Construction Industry Policy (2003)

The main objectives of the Construction Industry Policy include:

- To improve the capacity and competitiveness of the local construction enterprises (contractors, consultants and informal sector)
- To develop an efficient and self-sustaining roads network that is capable of meeting the diverse needs for construction upgrading and maintenance of civil works for trunk, regional, districts and feeder roads network.
- To improve the capacity and performance of the public sector and private sector clients so as to ensure efficient, transparent and effective implementation and management of construction projects.
- To ensure efficient and cost effective performance of the construction industry that will guarantee value for money on constructed facilities in line with best practices.
- To promote application of cost effective and innovative technologies and practices to support socio-economic development activities such as road works, water supply, sanitation, shelter delivery and income generating activities.
- To ensure application of practices, technologies and products which are not harmful to both environment and human health
- To mobilize adequate resources from both the public sector and the private sector for construction and maintenance of public infrastructure.
- To enhance participation in regional and international co-operation arrangements for the purpose of promoting the capacity and competitiveness of the industry and developing markets for export of its services and products.
- To improve co-ordination, collaboration and performance of the institutions supporting the development and performance of the construction industry.

With respect to environmental protection and conservation, section 8.2.2 of the National Construction Industry Policy addresses a number of issues regarding the environment. The construction industry is generally said to be a major source of environmental damage and occupational health problems. A number of the industry's activities are environmentally not sustainable partly owing to lack of awareness of environmentally sound practices and technologies. Moreover, Construction activities affect the environment in many ways: through resource deterioration, physical disruption and chemical pollution. Large civil engineering projects can easily

destabilize fragile hill slopes. Cement, lime and bitumen production pollutes the atmosphere. The construction of sludge disposal facility will adhere to requirement of this policy so as to avoid possible environmental and occupational health problems.

The Mineral Policy of Tanzania (1997)

The mineral policy was specifically set for the mineral sector aimed to attract and enable the private sector to take the lead in exploration, mining development, mineral beneficiation and marketing. The policy identifies the role of public sector as to stimulate and guide private mining investment by administering, regulating and promoting the growth of the sector. The policy has put forward some objectives for the mineral sector as follows:

- To estimate exploration and mining development;
- To regulate and improve artisanal mining;
- To ensure that mining wealth supports sustainable economic and social development;
- To minimize or eliminate the adverse social and environmental impacts of mining development;
- To promote and facilitate mineral and mineral-based products marketing arrangement;
- To alleviate poverty especially for artisanal and small scale miners

With specific regard to the infrastructure development sector, section 3.3.8 of the policy stresses on the creation and maintaining of reliable social and economic infrastructure facilities, such as transport; water supply; power supply; communications; education and health services; and recreation are vital for the mineral sector's development.

Moreover, section 3.3.12 of the Tanzania mineral policy emphasises on the integration of environmental and social concerns into mineral development programmes as a means for sustainability of mining sector. As mineral extraction involves different complex processes which directly affect the environment, the policy was set to address all issues due mineral development with respect to the environment. Some of issues addressed are to reduce or eliminate the adverse environmental effect of mining; improve health and safety conditions in mining areas; and address social issues affecting women, children and the local community. As well the contractors in the proposed project have to abide with Mineral Policy in quarrying areas for gravel, sand, aggregates and alike.

The National Energy Policy (2003)

This policy outlines to adopt clean technology and minimize pollution in developing the energy sector in the country. It emphasises utilization of the natural energy resources such as water, gas, coal, petroleum and wind in a sustainable and environmentally friendly way. Furthermore, the policy states that energy is prerequisite for the proper function of all sub-sectors of the economy and it is an essential service whose availability and quality can determine the success or failure of development plans.

3.2.2 Laws, Regulations and Guidelines

The Environmental Management Act (EMA) No. 20 (Cap. 191) of 2004

The act requires a proponent or developer of any undertaking to carry out EIA prior to commencement of the project. It further specifies that developer will not be allowed to undertake or to cause to be undertaken a project or activity without an Environmental Impact Assessment certificate issued under this Act. The proposed construction of sludge disposal facility project in Bukoba municipality as well is not supposed to start implementation before the Environmental Impact Assessment certificate is issued.

Environmental Impact Assessment and Audit Regulation of 2005

These regulations were prepared under EMA 2004 and require developers to conduct an Environmental Impact Assessment for any project likely to have negative impacts on the environment. Application for an Environmental Impact Assessment certificate is necessary for any such project. The project has so far gone through the respective steps of project registration, preparation of the Project Brief, preparation of the Scoping Report and this EIS.

Environmental Impact Assessment (EIA) procedures (March 2002)

The National Environment Management Council (NEMC) developed EIA guidelines and procedures using information from international agencies (NORAD, DANIDA, ODA, ADB, World Bank) and checklists from UNEP. The guidelines are contained in five volumes:

Vol. 1: Procedures and General Information on EIA
Vol. 2: Screening and Scoping Guidelines
Vol. 3: Report Writing Guidelines and Requirements
Vol. 4: Review and Monitoring Guidelines
Vol. 5: General Checklist of Environmental Characteristics

These guidelines were closely followed while preparing this Environmental Impact Assessment for the proposed sludge disposal facility project.

Land Act CAP. 114

The Land Act CAP. 114 (No. 4 of 1999) replaces the previous basic land law of 1923, and establishes three categories of land: general, village and reserved. In addition, land may be declared 'hazard land' where its development might lead to environmental damage, e.g. locations such as wetlands, mangrove swamps and coral reefs, steep lands and other areas of environmental significance or fragility. The Act recognises customary tenure as of equal status to granted rights of occupancy, and allows livestock keepers to own pasture land either individually or in groups. Importantly the land act promotes gender equality by recognizing equal access to land ownership and use by all citizens- men and women – and giving them equal representation on the land committees.

The Land Regulations of 2001(Assessment of the Value of Land for compensation)

The Land Regulations were made under section 179 of the Land Act 1999, and provide all specific forms required for Management and Administration, Granted Right of Occupancy,

Mortgage, Lease, Easement, Co-occupancy and others including compensation forms (Forms 69 and 70).

These regulations provide criteria for the assessment of compensation on land, as per market value for real property; disturbance allowance is calculated as a percentage of market value of the acquired assets over twelve months; and transport allowance calculated at the cost of 12 tons hauled over a distance not exceeding 20 km. The other criteria include loss of profit on accommodation based on audited accounts and accommodation allowance equivalent to the rent of the acquired property per month over a 36 month period.

The current enactment in force which governs compensation is the **Land Acts No. 4 and 5 of 1999.** At Section 3(g) it points out that, compensation for loss of any interest in land shall be based on the concept of opportunity cost. It further elaborates that, the concept of opportunity cost shall be based on the following:-

- The Market Value of the Real Property
- Disturbance allowance
- Transport allowance
- Loss of profits /income or accommodation
- Cost of acquiring or getting an equivalent land
- Any other immediate costs, loss or capital expenditure incurred to the development of the subject land and
- Interest at market rate

The proposed sludge disposal facility project will be implemented at the land where it is currently used for open sludge dumping and solid waste dumping hence no any compensation will be issued as the proposed site is planned as sludge disposal site in the municipal master plan 2020 and it is owned by Bukoba Municipal Council only the ownership transfer to BUWASA will be issued.

Village Land Act Cap 114

The Village Land Act Cap 114 (No. 5 of 1999) confers the management and administration of village lands to Village Councils, under the approval of the Village Assemblies, although the Minister of Lands is entitled to decide on the amount of land which can be owned by a single person or commercial entity.

The Act also provides for the fundamental principles of National Land Policy which are the objectives of the Village Land Act, 1999 geared towards;

- ensuring that existing rights and recognized long standing occupation or use of land are clarified and secured by the law
- ensuring that land is used productively and that any such use complies with the principles of sustainable development; to take into account that an interest in land has value and that value is taken into consideration in any transaction affecting that interest and
- to pay full, fair and prompt compensation to any person whose right of occupancy or recognized long-standing occupation or customary use of land is revoked or otherwise interfered with to their detriment by the State under this Act or is acquired under the Land Acquisition Act Cap. 118 of 2002.

In view of these requirements, the LVEMP II intends to coordinate land use activities with the Bukoba municipal dwellers within the proposed project to reach amicable settlement of private land use.

The Graves Removal Act No 9 of 1969

This Act provide for the removal of graves from land required for public purposes. The Act states that if any land on which a grave is situated, is required for a public purpose the Minister may cause such a grave and any dead body buried therein to be removed from the land and, in such case, shall take all such steps as may be requisite or convenient for the reinstatement of the grave and the re-interment of the dead body in a place approved by him for the purpose. Before the removal of the graves the Act provides for the manner in which the grave has to be removed in terms of serving notices of grave removal intention to respective persons or a religious body. The Act also gives the manner in which the graves can be removed after the expiration of the served notice.

The Act states that compensation payable under graves removal shall be limited to the reasonable expenses incurred in the removal, transportation, reinstatement and re-interment of the grave or dead body and any placatory or expiatory rites or other ceremony accompanying such removal and re-interment.

If any grave will be identified in the proposed project site, borrow site and along the access road to the proposed project site, the provisions made under this Act will be followed very closely.

The Land Acquisition Act, Cap. 118 R.E. 2002

The Land Acquisition Act of 2002 requires the minister responsible for land to pay compensation as may be agreed upon or determined in accordance with the provisions of the Act. The Act stipulates that no compensation shall be awarded in respect of land, which is vacant ground, or to be limited to the value of the un-exhausted improvement of the land, in case the development of the land is deemed inadequate.

The Act defines the circumstances in which public interest could be invoked, e.g., for exclusive government use, public use, for or in connection with sanitary improvement of any kind or in connection with laying out any new city, municipality, township or minor settlement or extension or improvement of any existing city. Other purposes are in connection with development of any airfield, port or harbour; mining for minerals or oils; for use by the community or corporation within community; for use by any person or group of persons as the President may decide to grant them such land. The acquisition of the land for the public use as well as for the resettlement sites is within the provision of this Act. Further the Act specifies other requirements prior to the acquisition of the land such as investigation for the land to be taken, issuing notice of intention to take land and mode in which notices will be served. It further defines the requirements for and restrictions on compensation.

Fortunately the land in question is owned by Bukoba Municipal Council and it is already being used as temporary solid waste dumping site and also in the area nearby there is a sludge disposal site, all in total observance of the Act.

Land Use Planning Act No. 6 of 2007

This Act provides for procedures for the preparation, administration and enforcement of land use plans; to repeal the National Land Use Planning Commission Act No 3 of 1984 and to provide for related matters. The objective of the Act is to provide for procedures for the preparation, administration and enforcement of land use plans; to facilitate an orderly management of land use, empower land occupiers and users to make better and more productive use of land, to enhance security and equity in accessing land and its resources;
The Act also provides for a legal framework for planning authorities, at the grassroots level, the mandate to prepare and implement land use plans following the laid out procedures.

The Act is divided into 9 Parts including the following: Preliminary provisions, fundamental principles of the National Land Policy and the National Human Settlement Development Policy, part 3 provides for powers and responsibilities of the Minister, establishment of the National Land Use Planning Commission, its powers and functions, Part 4 provides for sources of funds of the Commission, the powers of the Minister to impose fee and matters relating to accounts and conduct of audit. Part 5 establishes land use planning authorities. It is proposed to vest powers of such authorities to local government authorities. Part 6 contains provisions relating to acquisition of land needed for planning, demarcation, and consolidation of land, rearrangement and readjustment of land, power of entry by an authorized person and issue of statutory easements and for preservation of monuments. Part 7 contains provisions for compulsory compliance with approved/plans, control of the use of land and provides the procedures for appeal by an individual or a group of persons aggrieved with the decision of with the decision of the Commission. Part 8 contains provisions for offences by and penalties for contravention of the provision of this Act. Part 9 provides for miscellaneous provisions which include the power of the Minister to make regulations, the amendment and revocation of approvals, charging of fees, adoption or modifications of plans, rules, standards, instructions and specifications. The project proponent will observe the requirement of the Act in the course of executing it.

Urban Planning Act No. 8 of 2007

The Act provides for the orderly and sustainable development of land in urban areas to preserve and improve amenities. It also provides for the grants of consent to develop land and powers of control over the use of land and to provide for other related matters.
Section 4.1 of the urban planning Act, 2007, identifies the objectives of urban planning to which all persons and authorities exercising powers under, applying or interpreting this act shall be to:

- facilitate efficient and orderly management of land use,
- empower landholders and users, to make better and more productive use of their land;
- promote sustainable land use practices;
- ensure security and equity in access to land resources;
- ensure public participation in the preparation and implementation of land use policies and plans;
- facilitate the establishment of a framework for prevention of land use conflicts;
- facilitate overall macro-level planning while taking into account regional and sectoral considerations;
- provide for inter-sectoral co-ordination at all levels;
- ensure the use of political and administrative structures and resources available at national, regional, district and village levels; and
- provide a framework for the incorporation of such relevant principles contained in the national and structural policies as may, from time to time, be defined by the government.

The activities of the proposed project are observing the requirements of land use planning and will abide to all such other development as it may be guided from time to time during the course of the project execution.

Protected Public Places and Recreation Areas Act No. 38 of 1969

This Act was created to provide a process and mechanism for protecting specific lands as is deemed necessary at the discretion of the Minister. The Act provides for imprisonment and fines for persons unlawfully trespassing on such protected land areas.

Forest Act No. 14 of 2002

This Act deals with the protection of forests and forest products in forest reserves and the restrictions and prohibitions in forest reserves. Any contravention of the restrictions and prohibition is considered an offence under this act and subject to enforcement. The law was repealed by Act No. 14 of 2002 to meet the new requirements under the Forest Policy. The new Forest Act No. 14 of 2002 requires that for any development including mining development, road construction and construction of building within a Forest Reserve, Private Forest or Sensitive Forest, the proponent must prepare an Environmental Impact Assessment for submission to the Director of Forestry. The law also requires licences or permits for certain activities undertaken within the national or local forest reserves, such as, among others, felling or removing trees, harvesting forest produce, entering a forest reserve for the purpose of tourism or camping, mining activities, occupation or residence within the reserve, cultivation, erecting any structures. The proposed project site is not in areas with forest and the plantation that exist include exotic trees such as eucalyptus and cypress (C*upressus macrocarpa*), but the requirements of protecting the nearby trees even the forests outside the project area will be observed.

The Mining Act No. 14 of 2010

This Act provides for prospecting of minerals, mining and dealing in minerals. It also provides for building materials including all forms of rock, stones, gravel, sand, clay, volcanic ash or cinder or other minerals being used for the construction of buildings, roads, dams, and aerodromes or similar works. The Legislation makes EIA mandatory as a precondition for granting various categories of mining licenses. In this project borrow material and all forms of rock stones, gravel, clay and sand will be mined from existing borrow area or new ones developed where by all the requirements of the Act will be met in parallel to other development projects in Bukoba Municipality all in agreement to respective authorities and owners.

Explosives Act No. 56 (1963)

The Act requires all persons wanting to use explosives in their activities to hold an explosives licence. For this project this applies to use of materials from any quarries and borrow pits where blasting is to be employed or wherever explosives may be involved. Also in some sections of the proposed alignment rocks may be encountered thus requiring the use of the dynamite to remove rocks. In this case the requirements of this act will be observed.

HIV and AIDS (prevention and control) Act No. 28 of 2008

The Act provides for prevention, treatment, care, support and control of HIV and AIDS, for promotion of public health in relation to HIV and AIDS.

HIV and AIDS education in workplace, the Act requires that every employer in consultation with the ministry shall establish and coordinate a workplace programme on HIV and AIDS for employees under his control and such a programme shall include provision of gender responsive HIV and AIDS education, distribution of condoms and support to people living with HIV and AIDS. Project proponent will highly observe the requirement of this Act during project implementation.

Employment and Labour Relations Act (2004)

Among other things, an Act provides for core labour rights, establishes basic employment standards, provides framework for collective bargaining, and provides for prevention and settlement of disputes.

A contract with an employee shall be of the following form;

(a) A contract for an unspecified period of time;
(b) A contract for a specified period of time for professionals and managerial cadre,
(c) A contract for a specific task.

Subject to the provisions of subsection (2) of section 19, of this Act an employer shall supply an employee, when the employee commences employment, with the following particulars in writing, namely -

(a) Name, age, permanent address and sex of the employee;
(b) Place of recruitment;
(c) Job description;
(d) Date of commencement;
(e) Form and duration of the contract;
(f) Place of work;
(g) hours of work;
(h) Remuneration, the method of its calculation, and details of any benefits or payments in kind, and
(i) Any other prescribed matter.

Therefore, project proponent will have to ensure that all employees are treated equally as per requirements of this law.

The Water Resources Management Act No. 11 of 2009

Water legislation has been updated to bring it in line with the National Water Policy 2002. This current Water Resources Management Act No. 11 of 2009 provides for institutional and legal framework for sustainable management and development of water resources; outlines principles for water resources management; provides for the preventions and control of water pollution; provides for participation of stakeholders and the general public in implementation of the National Water Policy; vests all water in the country to the Government of United Republic of Tanzania and sets procedures and regulations for the extraction of water resources.

Section 63 of the Act states that the discharge of any effluents from any commercial, industrial, or agricultural source or from any sewage works, or trade waste systems or from any other source into surface water or underground strata requires a "Discharge Permit" from the Basin Water Board. In accordance with section 65, the water quality and effluent standards to be

applied to the discharge permit shall be made and published by the Minister in accordance with the requirements of the Environmental Management Act Cap. 191. A provisional discharge permit may be granted in cases where pollutants are already being discharged, subject to conditions and terms of issued as per requirements of clause 67.

The sludge disposal facility project being located to a place where the contents may drain into rivers later flowing into Lake Victoria, any failure of its actions is likely to cause a significant pollution to the Lake, will comply with all provisions of this Water Management Act in order to ensure efficient management of the lake near the project area. It is anticipated that the proposed project will use water possibly drawn from existing rivers within the project area especially from Kyamato River. The effluents from maturation ponds will closely be monitored to meet the standard requirements of this act. The contractor and the proponent will also observe all the requirements including use of the abstracted water for construction activities and ensure that no pollution or mismanagement of the existing water resources and thus respect and maintain the existing system of water rights. Compliance with the requirements of this Act will be through implementation of the Environmental Management and Monitoring Plans set as part of this EIS.

The Environment Management (Water Quality Standards) Regulations, 2007

These regulations were made under section 143, 144, and 230(2) (s) of the EMA Cap191 with the following objectives

a. protect human health and conservation of the environment
b. enforce minimum water quality standards prescribed by the National Environment Standards Committee (NESC)
c. Enable NESC to determine water usages for the purposes of establishing environmental quality standards and values for each usage and
d. Ensure all discharges of pollutants take account the ability of the receiving waters to accommodate contaminants without detriment to the uses specified for the waters concerned

Under the first schedule, the regulations give the permissible limits for municipal and industrial effluents for both physical, inorganic organic and microbiological components. Since these limits are now readily available the project proponent will ensure that the objectives of regulations are totally observed to safeguard the environment around the project area.

The Water Resources Management (Water Abstraction, Use and Discharge) Regulations, 2010

Among other things, these regulations contain forms that are used for application for permit to discharge wastewater to the Basin Water Officer. The information required on the discharge application include the volume of discharge during the dry weather, maximum rate of discharge, average daily volume of trade effluent, method of measurement of flows from the works (V-notch/weir/current meter etc, maximum temperature of effluent discharge and maximum concentrations of any contaminants known to be present in the discharge. The above submission shall also include the plan of the discharging facility and the adjoining properties, body of water referred to; and the point on the body of water where it is desired to discharge effluent. These are standard requirements components of such a similar project. The project proponent will apply for the discharge permit according to the laid down procedures.

The Occupational Health and Safety Act No. 5 of 2003

This act sets provisions for the safety, health and welfare of persons at work in factories and other places of work. It is also meant to provide for the protection of persons other than persons at work against hazards to health and safety arising out of or in connection with activities of persons at work; and to provide for connected matters. The proposed project will eventually be a place of work to be registered as per OSHA regulations that govern the places of work and observe all safety and health practices at work sites by its consultants, contractors and sub-contractors. Based on the requirements of this Act, the contractor for the proposed project and the proponent will abide to this Act.

3.2.3 Acts Dealing with Trades and Professional Ethics / Conduct

The Architects and Quantity Surveyors Act No. 16 of 1997 R.E. 2002

This act provides for establishment of the Board of Architects and Quantity Surveyors responsible for registering and regulating the conduct of the Architects, Quantity Surveyors and Architectural and Quantity Surveyors Consulting Firms. The project proponent is observing the requirements of this act and is ready to assist the board during inspections of the project works.

The Engineers Registration Act No. 15 of 1997, Revised Edition of 2002

This is an act which formed the Engineers Registration Board, a statutory body with the responsibility of monitoring and regulating engineering activities and the conduct of engineers and engineering consulting firms in Tanzania through registration of engineers and engineering consulting firms. Under the law, it is illegal for an engineer or an engineering firm to practice Engineering profession if not registered with the board. The board has also been given legal powers and has the obligation to withdraw the right to practice from registered engineers if found guilty of professional misconduct or professional incompetence. Registration with the board is, thus, a licence to practice engineering in Tanzania.

The proposed sludge disposal facility project is an engineering assignment and the project proponent is observing all the requirement of this act through engaging the services of personnel and firms that are registered with the Engineers Registration Board.

The Contractors Registration Act No. 17 of 1997, R.E 2002

This is an act which provides for registration of contractors and also establishment of the Contractors Registration Board, the body responsible for regulating the conduct of contractors in Tanzania. The project proponent will equally abide by all requirements of this Act in terms of supporting the activities of the board during inspection of any site for road construction, installation works for the purpose of verifying and ensuring that the works are being undertaken by registered contractors; and that the works comply with all governing regulations and laws of the country.

3.2.4 International Treaties and Conventions

Tanzania has ratified a number of multilateral Environmental Agreements (MEAs) and consequently has duties under those agreements. The most relevant MEAs to this study are:

Table 3: Multilateral Environmental Agreements (MEAs) Treaties and Conventions ratified by Tanzania

Type of Convention	Name of Convention	Relevance to the Proposed Project
Pollution Prevention Conventions	o The convention on the prevention of Marine Pollution by dumping of Wastes and other wastes, London, (1972), o The convention on the prevention of Marine Pollution from ships (MARPOL) (1973), o United Nations convention on the Law of the sea, Montego Bay, (1982).	The proposed project operations will involve generation of liquid and solid wastes from camps, concrete works during construction and wastewater from the facility during operation, etc. Such wastes will not be discharged in water bodies without treatment The project will also involve effluents from maturation ponds, the effluents will be treated to acceptable levels before discharged to Kyamato River.
Bio diversity related Conventions	o Convention of Biological Diversity, (1992) ratified by Tanzania in 1996), o Convention to combat, desertification, particular Africa, Paris 1994, o The Cartagena Protocol on Bio safety to the convention on Biological Diversity (2000).	Project activities will involve clearing of vegetations from borrow sites, quarry sites, sludge disposal facility site and operation house site. Re-vegetation will be carried out upon completion of the works. The project will also work with the respective communities in the conservation of available organisms.
Other Conventions	o The convention on International Trade and Endangered species of Wild Fauna and Flora (CITES), Washington (1973), o The convention concerning the Protection of World Cultural and Natural Heritage, Paris, (1972), o The convention of Wetlands of International Importance especially as water fowl Habitat (The Ramsar Convention) (1971) ratified by Tanzania in 1998).	The project operations may encounter areas with endangered flora and fauna species. In such cases the project staff and the contractor will not involve themselves with the trade of such species
Climatic change Conventions	o The United Nations Framework convention on climatic change (1992) o Kyoto Protocol (1997)	The project will prevent the leakage of green house gases into the atmosphere through regular maintenance of construction equipment.
Chemicals and Ozone Protection Conventions	o Basel convention on the control of Trans boundary movements of Hazardous Waste and their Disposal, 1989 o Rotterdam convention on prior Informed Consent Procedure o Stockholm Convention on Prior Informed Organic Pollutants o Vienna Convention on protection of Ozone Layer o The Montreal protocol on substances that deplete the ozone layer, Montreal, 1987 o Protocol on Liability and compensation on Damage resulting from Trans boundary movement of Hazardous waste and their disposal, 2000	All wastes generated along the project road will never be moved beyond Tanzania Boundaries. Permitted disposal will be done in Tanzania. Cooling facilities (fridges) to be used by the project will not be using chlorofluorocarbons (CFC's)

Regional conventions	o The Convention on the conservation of Nature and Natural Resources, 1968 Algiers, (1968) o The Bamako convention on the Ban of the import into Africa and the control of Trans boundary movement of Hazardous Wastes within Africa, 1990 o Nairobi Convention for the protection, management and development of the Marine and Coastal environment of Eastern African Region, 1985 and the related protocols. o Lusaka Agreement on cooperative enforcement operations Directed at illegal Trade in Wild Fauna and Flora (1994)	All importations of chemicals such as explosives at quarry sites will follow national legislations on the Industrial and Consumer Chemicals (Management and Control) Act No. 3 of 2003

3.3 The World Bank's Safeguard Policies

The World Bank has keen interest in protection of the environment, particularly for investment projects they support; they have to be in line with its safeguards policies. These policies provide guidelines, aimed at preventing and mitigating undue harm to people and the environment, when implementing development projects. The safeguard policies provide a platform for the participation of stakeholders in project design and implementation and the relevant policies to this project are:

- Environmental Assessment (OP/BP 4.01)
- Natural Habitats (OP/BP 4.04)
- Forests (OP/BP 4.36)
- Involuntary Resettlement (OP/BP 4.12)
- Indigenous Peoples (OP/BP 4.10)
- Pest Management (OP 4.09)
- Physical Cultural Resources (OP/BP 4.11)

The construction of the sludge disposal facility Project triggers some of these operational policies of the World Bank as presented below

3.3.1 OP/BP 4.01 Environmental Assessment Policy

The objective of this policy is to ensure that Bank-financed projects are environmentally sound and sustainable, and that decision-making is improved through appropriate analysis of actions and of their likely environmental impacts. This policy is triggered if a project is likely to have potential (adverse) environmental risks and impacts on its area of influence. OP 4.01 covers impacts on the natural environment (air, water and land); human health and safety; physical cultural resources; and trans-boundary and global environment concerns.

Depending on the project, and nature of impacts a range of instruments can be used: EIA, environmental audit, hazard or risk assessment and environmental management plan (EMP).

When a project is likely to have sectoral or regional impacts, sectoral or regional EIA is required. The Borrower is responsible for carrying out the EIA.

Under this project, the proponent Ministry of Water (LVEMP II) has facilitated the undertaking of Environmental and Social Impact Assessment to assess the social and environmental impacts of the project.

3.3.2 OP/BP 4.12 Involuntary Resettlement

The policy acknowledges that development projects that displace people generally give rise to economic, social and environmental problems. Its objective therefore, is to avoid or minimize involuntary resettlement where feasible, by exploring all viable alternative project designs. OP 4.12 is intended to assist displaced persons in maintaining or improving their living standards. It encourages community participation in planning and implementing resettlement; and in providing assistance to affected people, regardless of the legality of title to the land they posses, which has to be acquired for project activities. The Bank guidelines therefore, prescribe measures to minimize the negative impacts to ensure that the displaced community benefits from the project and to ensure that the affected persons are:

- compensated for their losses at full replacement costs prior to the actual move;
- assisted with the move and supported during the transition period in the resettlement site;
- assisted in their effort to improve (or at least restore) their former living standards, income earning capacity and production levels;
- integrated socially and economically in the host communities, so that adverse impacts in the host communities are minimized. This is best achieved through appropriate planning and consultation, involving affected people.

In addition; land, housing, infrastructure and other compensation should be provided to the adversely affected population, indigenous groups, ethnic minorities, and pastoral people who may have customary rights to the land and other resources taken for the project. The absence of legal title to land by such groups should not be a bar to compensation.

The policy is triggered not only if physical relocation occurs, but also by any loss of land resulting in relocation or loss of shelter; loss of assets or access to assets; loss of income sources or means of livelihood, whether or not the affected people must move to another location.
The existing policies, land laws and regulations regarding land acquisition and compensation in the country should be generally consistent with the World Bank Operational Guidelines. Therefore, if necessary at all, compensation could still be handled within the existing regulations, without contradicting the World Bank Policy requirements. Even though this respective policy is triggered but fortunately the sludge disposal facility project was identified by the municipal council who owns the proposed land hence no resettlement will be required as the existing land use of the site is open sludge and solid waste dumping.

3.3.3 OP/BP 4.04 Natural Habitats

This policy recognizes that the conservation of natural habitats is essential to safeguard their unique biodiversity and to maintain environmental services and products for human society and for long-term sustainable development. The Bank therefore supports the protection, management, and restoration of natural habitats in its project financing, as well as policy dialogue and economic and sector work. The Bank supports, and expects borrowers to apply, a precautionary approach to natural resource management to ensure opportunities for environmentally sustainable development. Natural habitats are land and water areas where most of the original native plant and animal species are still present. Natural habitats comprise many types of terrestrial, freshwater, coastal, and marine ecosystems. They include areas lightly modified by human activities, but retaining their ecological functions and most native species.

This policy is triggered by any project (including any sub-project under a sector investment or financial intermediary) with the potential to cause significant conversion (loss) or degradation of natural habitats, whether directly (through construction) or indirectly (through human activities induced by the project).

The policy is slightly triggered as the proposed project is going to inundate some of the natural habitat which might be supporting other ecosystems. Environmental Impact Assessment has identified these natural habitats and mitigation measures are presented.

3.3.4 OP/BP 4.36 Forests

The objective of this policy is to assist borrowers to harness the potential of forests to reduce poverty in a sustainable manner, integrate forests effectively into sustainable economic development and protect the vital local and global environmental services and values of forests. Where forest restoration and plantation development are necessary to meet these objectives, the Bank assists borrowers with forest restoration activities that maintain or enhance biodiversity and ecosystem functionality. The Bank assists borrowers with the establishment of environmentally appropriate, socially beneficial and economically viable forest plantations to help meet growing demands for forest goods and services.

This policy is triggered whenever any Bank-financed investment project (i) has the potential to have impacts on the health and quality of forests or the rights and welfare of people and their level of dependence upon or interaction with forests; or (ii) aims to bring about changes in the management, protection or utilization of natural forests or plantations.

The policy is slightly triggered as some of the areas where forests would have developed are the ones that will be inundated by the infrastructures of the proposed sludge disposal facility including the operation house.

3.3.5 OP 4.09 Pest Management

The objective of this policy is to (i) promote the use of biological or environmental control and reduce reliance on synthetic chemical pesticides; and (ii) strengthen the capacity of the country's regulatory framework and institutions to promote and support safe, effective and

environmentally sound pest management. More specifically, the policy aims to (a) Ascertain that pest management activities in Bank-financed operations are based on integrated approaches and seek to reduce reliance on synthetic chemical pesticides (Integrated Pest Management (IPM) in agricultural projects and Integrated Vector Management (IVM) in public health projects. (b) Ensure that health and environmental hazards associated with pest management, especially the use of pesticides are minimized and can be properly managed by the user. (c) As necessary, support policy reform and institutional capacity development to (i) enhance implementation of IPM-based pest management and (ii) regulate and monitor the distribution and use of pesticides.

The policy is triggered if : (i) procurement of pesticides or pesticide application equipment is envisaged (either directly through the project, or indirectly through on-lending, co-financing, or government counterpart funding); (ii) the project may affect pest management in a way that harm could be done, even though the project is not envisaged to procure pesticides. This includes projects that may (i) lead to substantially increased pesticide use and subsequent increase in health and environmental risk; (ii) maintain or expand present pest management practices that are unsustainable, not based on an IPM approach, and/or pose significant health or environmental risks.
Under the construction of the sludge disposal facility project, the policy will not be triggered as the project will not involve agricultural practise and any use of chemicals, only natural means of treating wastewater including constructed wetland will be applied.

3.3.6 OP/BP 4.11 Physical Cultural Resources

The objective of this policy is to assist countries to avoid or mitigate adverse impacts of development projects on physical cultural resources. For purposes of this policy, "physical cultural resources" are defined as movable or immovable objects, sites, structures, groups of structures, natural features and landscapes that have archaeological, paleontological, historical, architectural, religious, aesthetic, or other cultural significance. Physical cultural resources may be located in urban or rural settings, and may be above ground, underground, or underwater. The cultural interest may be at the local, provincial or national level, or within the international community.

This policy applies to all projects requiring a Category A or B Environmental Assessment under OP 4.01, 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.
The policy is may be triggered during excavation of fill materials at both existing and new borrow sites however it is no expected that physical cultural resources will be affected.

3.3.7 OP/BP 4.10 Indigenous Peoples

The objective of this policy is to (i) ensure that the development process fosters full respect for the dignity, human rights, and cultural uniqueness of indigenous peoples; (ii) ensure that adverse effects during the development process are avoided, or if not feasible, ensure that these are minimized, mitigated or compensated; and (iii) ensure that indigenous peoples receive culturally appropriate and gender and inter-gene rationally inclusive social and economic benefits.

The policy is not triggered as it is not expected that indigenous peoples will be affected by the proposed project and above all the local community will equally be the project beneficiaries.

3.4 Administrative Framework

3.4.1 Government Agencies Responsible for Environmental Issues

The administrative and institutional arrangements for environmental management for all sectors in Tanzania are stipulated in the Environmental Management Act No. 20 of 2004. There are seven (7) institutions mentioned by the act, of which the Minister Responsible for Environment is the overall in-charge for administration of all matters related to the environment. The legal institutions for environmental management in the country include:

National Environmental Advisory Committee

The EMA 2004 stipulates the obligations of the National Environmental Advisory committee as to advice the minister responsible for environment or any sector ministry on all matters regarding the environment. In this particular development sludge disposal facility construction project, the national advisory committee has to recommend to the minister or sector ministry on the protection and management of the environment based on the EIS.

It further review and advise the minister on any environmental standards, guidelines and regulations pertinent to the environmental protection.

Minister Responsible for Environment

The Minister responsible for Environment, VP Office is the overall responsible for all matters relating to environment, responsible for all policy matters necessary for the promotion, protection, and sustainable management of Environment in Tanzania.

Director of Environment

The Director of Environment coordinates various environmental management activities being undertaken by other agencies and promotes the integration of environment consideration into policies, plans and programmes, strategies and projects.

National Environment Management Council (NEMC)

EMA 2004 gives National Environment Management Council (NEMC) the overall responsibility for undertaking the enforcement, compliance, review and monitoring of Environmental Impact Assessment and in this regard facilitates public participation in environmental decision-making. NEMC is responsible for screening and reviewing big investments and projects of the national significance.

Sector Ministries

Sector ministries, in this case the environmental section in the PMORALG through LVEMP II is responsible for the following duties as far as the sludge disposal facility project is concerned,

- Coordinate the activities related to the environment within the ministry, PMO,

- To ensure that environmental concerns are integrated into the ministry or in a department of development planning and project implementation in a way this protects the environment,
- To prepare and coordinate the implementation of environmental action plan at the national and local levels and
- To ensure that sectoral standards are environmentally sound, and the like.

The Ministry of Lands and Human Settlements Development will be responsible for coordinating all activities related to valuation, compensation and resettlement procedures if any.

Ministry of Water (MoW)

Ministry of Water now has four main divisions.

1. Water resource division
2. Urban water supply and sanitation division
3. Water quality services division
4. Rural water supply division

Since MoW has a main stake in the water sector, the ministry formulates policy, sets standards and specification; define the long term strategic plans; monitors and controls application of the regulations; and participates in the management of the executive agencies. In the Ministry, the proposed project can be categorized under transboundary water resource section for the management of these resources like Lake Victoria, and water resource environment protection section. All these sections aim at attaining equitable and proper management of water resources for the sustainable development among the beneficiaries and have the following activities.

Trans- boundary Water Resources Management Section

The activities of the Section are;-

- Coordinate Ministry's participation in national and international dialogue, initiatives and projects pertaining to the management, development and use of trans-boundary water resources
- Coordinate the preparation and implementation of trans-boundary water resources development, utilization of | management projects

Water Resources Protection Section

The activities of the Section are:-

- Provide guidance and support to the Basin Water Offices in their water allocation and water legislation enforcement functions (including legislation pertaining to groundwater drilling and groundwater exploitation)
- Manage the national register of water rights, water user associations and other user groups
- Coordinate and support activities relating to the protection and conservation of water resources

3.4.2 Regional and District Administrative Structures

The Regional Administration Act No. 9 of 1997 provides for Regional Commissioners to oversee Regional Secretariats, with District Commissioners directly supervising the District Councils. Local authorities oversee the local planning processes, including establishing local environmental policies.

The National Environmental Policy establishes a policy committee on environment at regional level chaired by the Regional Commissioner, mirrored by environmental committees' at all lower levels, i.e. at the district, division, ward sub ward and village councils.

At Local Government level, an Environmental Management Officer should be designated or appointed by each City, Municipal, District or Town Council. In each City or Municipality or District, Environmental Committees should be established in order to promote and enhance sustainable management of the Environment.

The Village Development Committee is responsible for proper management of the environment in their respective areas. The District Council designates for each administrative area as township, ward, sub ward, village, an Environmental Management Officer to coordinate all functions and activities related to protection of environmental in their area.

Regional Secretariat

The Regional Secretariat, which is headed by Regional Environmental Management Expert, is responsible for coordination of all environmental management programmes in their respective regions and in liaison with the Director of Environment. The Regional Environmental Management Expert is responsible for:

- Advising the local authorities on matters relating to the implementation of and enforcement of environmental by-laws/Act;
- Creating a link between the region and director of environment and the director general of the council (NEMC).

Local Government Authorities (City, Municipal, District, Township, Ward, Sub-wards, Village, sub-village)

The environmental management officer under the local government authority is responsible for promoting environmental awareness in the respective area on the protection of the environment and conservation of natural resources. Furthermore, he is the one to prepare, review and approve the EIA for local investments.

Under the Environmental Management Act (2004), the City, Municipal, District and Town Councils are headed by Environmental Inspectors who are responsible for environmental matters. The functions of the inspectors are to:

- Ensure enforcement of the Environmental Management Act in their respective areas,
- Advise the Environmental management Committee on all environmental matters,

- Promote awareness in their areas on the protection of the environment and conservation of natural resources,
- Collect and manage information on the environment and the utilization of natural resources,
- Prepare periodic reports on the state of the local environment,
- Monitor the preparation, review and approval of EIA's for all local investors,
- Review by-laws on environmental management and on sector specific activities related to the environment,
- Report to the DoE and the Director General of the NEMC on the implementation of the Environmental Management Act,
- Perform other functions as may be assigned by the local government authority from time to time.

All of the above institutions are responsible for the environmental management system and their link to this project are specified in functions as enumerated in the respective sections above.

4. Baseline Environmental and Social Conditions

4.1 Introduction

The baseline information presented in here was mainly captured and compiled to suit the EIS requirements from Municipal profile as well as development plans and technical reports such as Geotechnical Investigations carried out to suit the requirements of the sludge disposal facility. On the other hand, data for physical and biological environment were gathered by employing various methods including review of existing relevant documents in the municipal level offices, consultation of the key stakeholders, especially local authorities at community level and site visit.

4.2 Project Location

The proposed project is envisaged to be constructed at a site near Nyanga Village in Nyanga Ward which is located in the north west side of Bukoba Municipality in Kagera region one of the administrative regions in Tanzania.

Nyanga site is located in Nyanga ward which is in the North West of Bukoba Municipality. The Ward is bordered by Buhembe ward to the North East, Nshambya ward to the South East, Rwamishenye and Kogondo wards to the North.

4.3 Physical Environment

4.3.1 Climate and weather variations

Bukoba municipality including the project area enjoys an average temperature about 23^{o}C and an average rainfall of 2000mm per year. There two rainy seasons namely February to May and September to December. Even during the dry season of January to February and June to August, there are still spells of rain which account for the secret of Bukoba being evergreen the whole year around.

Table 4: Bukoba Weather recorded over the period of 3 days

Date/Time	T (°C) (Min/Max)	Wind (km/h)	Direction	Prec. mm	Humidity	Pressure
14/08/2013 00:00	21.2 (21.8/28.2)	N (0 degrees) at 2.7 km/h		0	52.4 %	1011.1
14/08/2013 06:00	18.2 (19.3/21.8)	N (0 degrees) at 2.2 km/h		0	63 %	1011.7
14/08/2013 12:00	27 (17.6/21.8)	N (0 degrees) at 1.2 km/h		0	57.6 %	1013.9
14/08/2013 18:00	42 (21.9/29.2)	N (0 degrees) at 2.5 km/h		0	31 %	1008.8
15/08/2013 00:00	21.9 (21.9/29.2)	N (0 degrees) at 2.5 km/h		1	56.9 %	1011
15/08/2013 06:00	18.8 (19.6/21.9)	N (0 degrees) at 1 km/h		0	65.5 %	1011.1
15/08/2013 12:00	27.5 (18.6/22.5)	N (0 degrees) at 1.5 km/h		0	55 %	1014.3
15/08/2013 18:00	38 (22.6/29.4)	N (0 degrees) at 2.7 km/h		0	29.4 %	1009.3
16/08/2013 00:00	21.7 (22/29.2)	N (0 degrees) at 2.7 km/h		0	50.1 %	1011

16/08/2013 06:00	20.4 (20.2/22)	N (0 degrees) at 1.5 km/h		0	52.7 %	1010.9
16/08/2013 12:00	28 (18.4/22.4)	N (0 degrees) at 0.4 km/h		0	51.3 %	1014.7
16/08/2013 18:00	41.6 (22.6/29.7)	N (0 degrees) at 3.9 km/h		0	27.4 %	1008.7
17/08/2013 00:00	21.9 (22/29.8)	N (0 degrees) at 2.3 km/h		0	53.1 %	1011.2
17/08/2013 06:00	19.9 (20.1/22)	N (0 degrees) at 0.3 km/h		0	59.5 %	1010.4
17/08/2013 12:00	24.7 (20.5/21.6)	N (0 degrees) at 2 km/h		0	53.6 %	1014.4
17/08/2013 18:00:	41.8 (22/28.7)	N (0 degrees) at 3.1 km/h		0	34 %	1008.8

(Source: MeteoLive3D August 2013)

4.3.2 Land, soils and hydrological conditions.

Bukoba urban has a land area of 80 square kilometres, with a population density approaching 1,105 people per square kilometre. The land problem is aggravated by the land tenure whereby each piece of land is under customary ownership.

The soil studies carried out recently, April 2012, indicated that the type of soil is clay silt sand of slightly plasticity for two test pits while the rest three test pits indicated silt sand of non plasticity which are located on upper area. Ground water table was observed in two test pits which are located at the lower part of the proposed pond at depth of 1.5m

Figure 11: One of the test pits located on the lower part of the project area

The topography of the site has relatively a gentle slope with rock out crops on upper area. The ground surface is covered with light brown silt sand of non plasticity soil. This field operation was conducted in the period of rain season in March where the water table was 1.6m. Five test pits were excavated at the site by hoes and chisels to the maximum depth of 3.0m down.

The permeability of the area is ranging from 10-4cm/sec to 10-5cm/sec which is semi pervious and poor drainage .This allow infiltration and cause contamination on water table.

The shear test reveal that the soil is silt fine sand of non plasticity which range from cohesion (C) of 0.015 kg/cm2 to 0.174 kg/cm2

Angle of internal friction ranges from 29° to 35° respectively, these soil are not stable for side slopes when submerged into the water, it collapses and washed out. This area has lowest compressibility since the soil is silt sand of non plasticity type.

Total settlement at 2.0m depth with a footing size of 2.0m x 2.0m is 8.04 cm. Foundation depth could reach 2.0m and footing size could be 2.0m x 2.0m. Allowable bearing capacity will be 542.5kN/m2 and net foundation pressure is 505.5kN/m2

4.3.3 Subsurface and Subsoil Geology

The site has shear rock cliffs and rock outcrops, gentle slopes, escarpments. Some places are swampy in the lower reaches near the river with deposits of water washed pebbles and fertile upper soils. There are a variety of rocks including weathered sapprolite.

4.4 Biological Baseline

4.4.1 Flora Characteristics in Nyanga Village

The vegetation of Nyanga Village consists of both indigenous and exotic tree species. Indigenous tree species include:

- Maesopsis emini *(Mihumula)*
- Markhamia spp *(Mishambya)*
- Ficus spp *(Murundu)*
- Eruthrina Abyssinia *(Mirinzi)*
- Musasae spp *(Bitoke)*
- Migango

Exotic tree species which have proved successful in the area are;

- *Gravellea Robusta*
- Pinus species
- *Senna spectabilis*
- *Senna siemea*

4.4.2 Specific vegetation in the project area near Nyanga village

- eucalyptus and
- cypress (C*upressus macrocarpa*)

Figure 12: Biological characteristics of the project area mainly eucalyptus and cypress (*Cupressus macrocarpa*) in the back-ground of this picture

4.4.3 Fauna Characteristics in Nyanga Village

The common fauna present in Nyanga village are those commonly found in other areas of Bukoba Municipality. These include excotic and indegineous species which was identified through interviews with the locals, setting traps and direct observations. The domesicated animals observed at the site consist of cattle, goets, sheep and dogs, the study revealed that the area currently consists of a very few wild animals because of ongoing activities like solid waste and sludge dumping which have reduced the natural habitat cover for the wild animals. Birds were observed directly with the aid of a pair of binoculars and through listerning to calls while tracking and carrying out other activities. Small mammals present in the area include mongoose, ground, ground squirrel and rats. Reptiles reported in the area include a variety of snakes, frogs and chamelions.

4.5 Socio-Economic Profile

4.5.1 Population

According to 2012 Population and Housing Census, Bukoba Municipality has a population of 128,796, where 66, 275 are women and 62,521 are men with an average household size of 3.9 and the average sex ratio of 94. Specific records of Nyanga village is highlighted in table 4 but the area to be served is almost from the whole municipality except the central business district which will be provided with the sewerage system parallel with this project. The population for the year 2012 is presented on table 4 below:

Table 5: Population of Bukoba Municipality by wards, Average Household size and Sex Ratio with highlighted records of Nyanga Ward

Serial No.	Ward/Shehia	Population (Number)			Average Household Size	Sex Ratio
		Total	Male	Female		
	Total	**128,796**	**62,521**	**66,275**	**3.9**	**94**
1	Hamugembe	12,906	6,116	6,790	3.5	90
2	Nshambya	9,020	4,378	4,642	4.1	94
3	Buhembe	4,042	1,938	2,104	4.4	92
4	Kahororo	6,618	3,387	3,231	4.4	105
5	Kashai	30,791	14,689	16,102	3.9	91
6	Miembeni	6,543	3,464	3,079	4.2	113
7	Bilele	5,405	2,577	2,828	3.8	91
8	Bakoba	17,474	8,481	8,993	3.9	94
9	Ijuganyondo	2,591	1,285	1,306	4.4	98
10	Kitendaguro	5,672	2,766	2,906	4.3	95
11	Kibeta	8,088	3,969	4,119	4.1	96
12	Kagondo	4,170	2,035	2,135	4.2	95
13	Nyanga	3,129	1,571	1,558	4.3	101
14	Rwamishenye	12,347	5,865	6,482	3.6	90

Source: The 2012 Population and Housing Census.

4.5.2 Economic activities

Agriculture and live stock

A substantial area of Bukoba Municipality is fully utilized for subsistence farming to enable the inhabitants to earn their living. Vanilla and coffee are the major cash crops grown in the area and banana, maize, sweet potatoes, cassava, and yams are the main food crops especially for the majority of the people in greenbelt. Dairy cattle keeping, poultry and piggery husbandry are also undertaken. The agriculture services which are provided by the council include:-

- Extension services and advice on the modern agriculture and livestock husbandly techniques.
- Training to farmers on the theory and practice of modern agriculture and livestock keeping.
- Training of farmers on new technology in order to increase quality and production of both food and cash crops.
- Provision of curative and preventive of agriculture crops and veterinary services.

These services are provided by only five extension workers. That is livestock officers 4 and agriculture officers 3. The ratio of extension worker to farmer/livestock keepers is:

- Livestock sector=1:583
- Agriculture sector =1:9,210

  On the other there are:-
  - Livestock keepers 1,750.
  - Farmers 18,420
  - Demonstration farm 1.

Table 6: Crop production in year 2010

Crops	Actual production (tones)	Market (solid)	Value
Maize	2426.6	1091	381,850,000.00
Cassava	3186	1430	786,500,000.00
Banana	5079	708	141,600,000.00
Beans	615	123	98,400,000.00
Sweet potatoes	1247	249	136,950,00.00
Coffee	338	338	253,500,000.00
Vanilla	1.8	1.8	5,760,000.00
Total			1,804,560,000.00

Source: Agriculture& Livestock department quarterly, 2010

Besides the above specified services rendered by the council extension officers, there are also private practitioners who provides agricultural and livestock service such as:-

- Sale of agricultural and livestock implements and inputs.
- Immunization and curative services
- Coffee processing and instant coffee manufacturing
- Purchase and processing of milk.

Table 7: Livestock Statistics in 2010

Type	Available
Cattle (Exotic)	2580
Cattle (Indigenous)	1118
Goat (Exotic)	376
Goat (Indigenous)	2112
Chicken (Exotic)	14957
Chicken (indigenous)	1082
Cat	356
Dog	573
Sheep	82
Pig	493

Source: agriculture& livestock department quarterly, 2010

In the coming five years, the Municipality will continue to implement the following agricultural and livestock targets:-

- Advisory services to farmers and livestock keepers on good faming and livestock keeping method/techniques.
- Training to farmers on modern farming and livestock keeping.
- Extension services and advice on modern agriculture and livestock husbandry techniques.
- Training of farmers on new technology in order to increase the quality and production of both food and cash crops.
- Provision of curative and preventive of agriculture crops and veterinary services.
- To collaborate with research institution (MARUKU) in order to get research services for agriculture crops and livestock diseases.

Commerce and trade

It is the primary responsibility of the commerce and trade section to educate entrepreneurs about the act and procedures governing business and ensure business is conducted in accordance with legal requirements. Number of traders and their category operating in Bukoba Municipality are wholesale business 30, sub-whole business 230, and rental business 1,760. On the other hand there are 211 different businesses operating as informal sector.

Fishing

Lake Victoria is the most important fishing ground. According to available data 2010 there are about 1,000 active fishermen. Common fish species are tilapia, Nile perch, sardines and haplochrornis. Earning from fishing industry has a great potential for expansion and generating employment and income. It is also among major sources of local revenue to the council.

Challenges

- Prevalence of illegal fishing
- Water hyacinth plant and other aquatic weeds
- Lack of sufficient fishing skills and capital

Industries

Large and medium scale industrial development is confined to processing of coffee, fish and crop products, the following are the main industrial establishments in Municipality**.**

(a) Tanganyika instant coffee

This factory is involved in hulling coffee cherries, roasting, cleaning of coffee and processing of instant coffee for local consumption and export.

(b) Coffee curing factory-BUKOP

The factory is involved in coffee hulling grading, and packing ready for export.

(c) Amir Hamza coffee factory

The factory process and produces coffee for local consumption and export**.**

(d) Fish processing factory export

There is one factory established in 'Nyamukazi' and is for processing fish fillet for export. The first production started in December 2004

Small industries

Small scale industrial activities play a significant role in the Municipal economy in that it provides employment to about 5% of economically active population. These activities include carpentry brick making, masonry, tailoring, pot making, black smith's tinsmiths bicycle & automobile, while repairing.

Financial institution

There are five Financial Banks namely NMB, CRDB, KFCB, NBC, and POSTAL BANK. Which provide commercial and other banking **services**, other financial institutions available includes micro credits such as FINCA, PRIDE, BAYPORT, FAIDIKA, SACCOS, BUKOBA NYKORBING MORS.

Tourism

Bukoba Municipal offers very fascinating scenery and most interesting tourist attractions with rains throughout the year and the land is evergreen everywhere. Lake Victoria is the biggest and the second largest fresh water in Africa. It attracts visitors with its waves, beautiful air breeze and diversified fish varieties with the smallest sardines to the giants like Nile perch**.**

Musila isle is good camping site and provides good scenario of vegetation coverage, beautiful species of birds and rocks of different formations. Other tourist attractions in Bukoba Municipality are Kagera museum, Germany cemetery, Kyamunene waterfalls in Rubale forest, Bunena stone beach Ntungamo caves and Gymkhana towers.

4.5.3 Transport and Communication

Road transport

The importance of Bukoba is due to its strategic locations anode in the region transportation network. Different conveyances such as roads, air and water links Bukoba with its hinterland. The existing road network covers a distance of 117.8 km classified.

Table 8: Classification of roads

Type of road	Coverage (km)	Percentage
Tarmac	24.1	20
Murram	41.1	35
Earth	52.6	45
Total	117.8	100

Source: Bukoba strategic urban development plan; 2010

Apart from tarmac road which are in good condition, the rest of the road namely, earth roads and murram roads are in poor condition due to frequent and heavy rainfall which fall each year in Bukoba. The situation is even worse especially for the roads in the green belt.

Air transport

There are air transport services of light aircraft connection Bukoba and different part of the country. 'Precision Air' is an exclusive air line operating at least two trips per day in 2006 alone, the said airtime transported 10,400 passengers.

Water transport

There are several ships and boats which sail between Bukoba and Mwanza every week. MV Victoria which in 2006 transported 65,350 passengers and 7,210 tons of cargo is the biggest and the reliable vessel in Lake Victoria.

Telecommunication

Apart from transport, there are several communication systems such as land and mobile phones, internet/e-mails etc. Undoubtedly, the presence of such communication and transport network stimulates socio-economic development in Bukoba Municipality.

4.5.4 Public Utilities

Water supply

Water services are provided by urban water authority namely Bukoba Water Supply and Sanitation (BUWASA) Bukoba Municipality has plenty of water sources such as springs, river and Lake Victoria. Currently 76% of the proper urban population is served with potable water. While in greenbelt population served is 57%. Most of water pipes are concentrated in the town centre and only a few the sub-urban areas are connected to the main pipe water system.

Challenges

- Low coverage of water supply especially in peri-urban areas.
- Low community awareness on water and sanitation issues.
- High rate for uncounted water due to the dilapidated infrastructures.

Water and sanitation

UN-HABITAT through the Lake Victoria water and sanitation (LVWATSAN) initiative is undertaking some interventions in order to rectify the situation. The main activities are rehabilitation of pump house at Custom and Kashura tank. Other interventions are construction of public toilets at primary, secondary schools and dispensaries.

Electricity supply and energy sources

Bukoba Municipal Council receives reliable electricity from Uganda. It is important to note that Bukoba is having enough supply of electricity.

Other energy sources

The main source of energy for cooking for most of households is charcoal followed by firewood which is transported from the rural districts. The main source for lighting is electricity 44%, wick lamp 32% and hurricane lamp 22%.

Solid Waste Management

The Municipality uses its one vehicle and four tractors to collect the garbage. Solid wastes are generated mainly from households, markets, bus stand and industrial areas. The volume of solid wastes generated per day is 70 tones and average of 50% of generated solid waste is collected per day. There are 14 garbage collection points and one dumping site.

Challenges

- Inadequate working tools and safety gears**.**
- Shortage of human resources

- Un protected disposal area

Liquid waste Management

Bukoba lacks a central sewerage system. Extensive use is made of cesspits, soakage pits, septic tanks and pit latrines. The underlying soil is mainly pervious, but there are certain areas where the water table is high or rocks occurs and thus there are problems associated with using such a system.

The town lacks an open surface drainage system for storm water. In many places, direct outlets of domestic water from residential premises are found. Due to lack of sewerage services, rivers and Lake Victoria are polluted and hence endanger the hearth of the residents.

Fire and rescue services

Bukoba municipality also provides fire and rescue services. The municipality has four fire fighting vehicles and two fire brigades.

4.5.5 Environmental Issues

Air pollution and Water Pollution

Air pollution is not yet a big problem in Bukoba. However with increasing number of motor vehicles and motor cycles, air pollution is expected to take place. Tree planting is encouraged to mitigate the threats. Water pollution and soil pollution is caused by direct discharge of liquid waste on open land and streets, overflowing of toilets during the rainy season, and the continuous use of agricultural insecticides and pesticides.

Ground water and aquifers

Bukoba municipality has a raised water table with a great number of springs. There are more than 100 springs within the Municipality. Protection of these water resources is of paramount importance.

Surface water

There is inadequate drainage networking in the municipality and hence great amount of runoff water. This causes soil erosion, destruction of road infrastructure and siltation of Lake Victoria**.**

Environmental Hazards

Flooding, although flooding occurs on a small scale, it is common during the rainy season whereby large areas of housing and informal settlements get flooded. This is due to the fact that some settlements in Bukoba ward, Miembeni and Bilele are built on low-laying areas, along river valleys within the natural flood plain. The effects of flooding are soil erosion and the spread of water born diseases.

Sanitation- most residents of Bukoba town live in areas with limited access to basic social services like safe water and sanitary waste disposal. There is no central sewerage service in Bukoba municipality and this is one of the biggest challenges facing the council. To remove liquid wastes, the council uses an old liquid exhauster vehicle which breaks down frequently. The

capacity of the council to deal with solid waste management is 55% only and this is caused by lack of equipment and plants. The upshot is the high incidence of endemic diseases.

Drought- Bukoba town does not experience extended periods of dry weather since it usually rains from September to December and March to June, pouring an average of 2000mm per year.

Deforestation - the cover is indiscriminately cleared mostly for agricultural activities, fuel wood collection, uncontrolled fires and urban development. The result is an increase in soil erosion, loss of soil fertility, drying up of water sources, loss of some tree species and ultimately total environmental degradation. The above stated impacts and influences draw land use conflict caused by conflicting interests between activity sectors and users resulting in deforestation.

Siltation – This is the accumulation of sand and mud caused by surface water run-off. Siltation enriches soil fertility in low laying areas especially river valleys. On the other hand siltation raises the level of the lake and river tributaries, making navigation difficult particularly near the harbour.

Wind impact- dust storms occur in dry seasons (July to August) due to differences in day time temperature between low lying areas and hilly areas. Strong winds blow off roofs of buildings, destroy crops, trees or branches of trees, which in turn destroy infrastructure like telephone and electric lines, endangering human life. Wind leads to spread of airborne diseases and accelerates cross pollination in plants. Cutting down of trees due to building construction and other reasons accelerate wind speed.

Fire hazard, the main causes of fire in the informal settlements (green belt) are the clearing of farms during the dry season to let in fresh grass. Burning of solid waste and electrical faults in the urban area are some of the causes of fire. The impact of fire hazard is the destruction of forests, houses, telephone and electrical lines, causing air pollution and the destruction of soil structure and fertility. Land use conflicts are due to competing interests between activity sectors of agriculture, forestry, energy and housing. Bukoba Town Council has a fire station without fire engines, equipment and fire fighters. The council depend on Bukoba Airport fire brigade which has both a fire engine and attendants.

4.5.6 Community Facilities

Education

(a) Primary Education

The Tanzania Education system is 2:7:4:2:3+, by 2011 Bukoba Municipality has a total of 33 pre-primary schools with total of 2784 pupils, out of whom 1418 are boys and 1366 are girls. The council has 35 primary schools with a total of 20,920 pupils of whom 10618 (equivalent to 50.75%) are girls and 10302 (equivalent to 49.25%), where as 12 of the said schools are privately owned and the remaining 23 are owned by the government.

There are also 3 special school for children with physical handicapped, the mentally retarded, the deaf and blind. The said schools have a total of 708 pupils, out of whom 333 are girls and 375 are boys.

(b) Primary school infrastructures

As regards to education facilities in primary school, not all schools have enough facilities as indicated in table 8 below:

Table 9: Primary Education facilities, 2010

Na.	Facility	Required	Available	Shortage
1	Classrooms	454	258	196
2	Offices	107	51	56
3	Teacher houses	464	59	405
4	Latrines	894	316	578
5	Desks	8378	5813	2565
6	Chairs	927	694	233
7	Tables	785	460	325
8	Text books	44,483	5200	239283

Source: Municipal Education department December 2010

Table 10: Primary Education Indicator, 2010

Indicator	Present status	National target
Teachers pupil ratio	1:46	1:40
Classroom pupil ratio	1:66	1:40
Toilet pupil ratio (boys)	1:85	1:25
Toilet pupil ratio (girls)	1:74	1:20
Desk pupil ratio	1.4	1.3
Text book pupil ratio	1:10	1.2

Source: Municipality Education department quarterly report 2010.

The challenges which faces education sector includes:-

- Shortage of teacher houses.
- Shortage of schools infrastructure such as classrooms, latrines, etc.
- Lack of water supply in primary schools.
- School meals
- Community contributions towards education promotion.
- Shortage of text and reference books in primary schools etc.

(c) Secondary education

Bukoba Municipality has 29 secondary schools with a total number of 6,082 students. Out of that number, 3,343 are girls and 2,739 are boys. As regards to ownership 20 schools are owned by government and 9 are privately owned.

(d) Secondary school infrastructures.

The infrastructures which are required and available in secondary schools are as follows:-

Table 11: Secondary Education facilities, 2011

No.	Facility	Required	Available	Shortage
1	Classroom	149	96	78
2	Laboratories	39	10	29
3	Administrative block	15	5	10
4	Teacher houses	235	81	154
5	Latrines	254	184	70
6	Chairs	3,297	1,971	1,326
7	Tables	2,892	2,174	718

Source: municipal Education department quarterly report 2011.

(c) Other Education Institutions

Table 12: Other Education Institutions

No.	Type	Number	Students	teachers
1	Open University (branch)	1	77	N/A
2	Vocational Training	4	52	-
3	Adult Education	16	242	14
4	Teachers Training college	1	-	-

Source: municipal Education department quarterly report 2011

Health

Bukoba Municipality has the following health facilities:-

Table 13: Number and type of health facilities

Health facility	Number	Ownership		Number of beats
		Public	Private	
Hospital	1	1	0	250
Health centre	3	2	1	25
Dispensaries	15	11	4	0
Drug/chemists	3	0	3	N/A
Medical stores	34	0	34	N/A

Source: municipal health department report, 2011.

(a) Incidence of diseases

Malaria is still the leading disease in most of people's lives followed by diarrhoea. The top ten diseases in Bukoba Municipality as were in 2010 are listed in the table below.

Table 14: Top ten diseases for 2010

No	Disease	Fatality	Death
1	Malaria	62,674	380
2	ARI	18,027	70
3	Intestinal worms	12,071	4
4	Diarrhoea	8,563	102
5	Skin infection	4,947	3
6	M. surgical cond.	4,669	57
7	Eye infection	4,439	1
8	UTI	3,244	3
9	Pneumonia	2,258	66
10	Anemia	1,119	183

Source: Municipal health department report, 2011

(b) Health indicators

Table 15: District Health indicators

No	Indicator	Rate /percentage
1	Maternal mortality rate	397/100,00
2	Infant mortality rate in health facilities	51/1,000
3	Under five mortality rate	36/1,000
4	Immunization coverage for under 1 year children	90%
5	Number of Malaria cases (OPD)	59%
6	HIV/AIDS	9%

Source: Municipal health department report, 2010

Challenges

- High maternal and infant mortality rate
- High prevalence of HIV/AIDS
- Inadequate health facilities to pregnant mothers for deliveries

Recreational areas

Lake Victoria landing beaches are the most important recreational areas. Other recreational facilities are Kaitaba stadium, uhuru platform, Gymkhana grounds, kiryoyera children play ground and disco halls.

5. Stakeholder Consultation and Public Participation

5.1 Introduction

Public Participation in the initial stages of the project is of great importance particularly during preparation of a scoping report as well as the planning, design and implementation of the proposed development. The consultant conducted the public participation activities which involved the necessary potential Interested and Affected Parties (I&APs). The comments received and issues raised from these public participation exercises have been incorporated into this EIS and used in determining mitigation measures for the sludge disposal facility construction project. Public participation was made through public meetings and achieved the following:

- a vehicle for public input and facilitated negotiated outcomes
- it created trust and partnerships;
- negative impacts are minimized;
- positive impacts are enhanced; and
- It provided an up-front indication of issues that may prevent project continuation, that can cause costly delays at a later stage, or result in enhanced and shared benefits.

The Consultant conducted the public participation for the proposed construction of sludge disposal facility to involve as many potential Interested & Affected Parties as possible. Accordingly, issues arising from this public participation process have been incorporated into the EIS and used in determining mitigation measures for the proposed sludge disposal facility project.

5.2 Stakeholders Identification and Analysis

The consultants identified organization, groups and individuals considered to be regarded as "stakeholders". This identification was based on each ones roles and their relevance in the proposed sludge disposal facility development project. Some of the stakeholders such as government authorities, district level, wards and village level that might be impacted by or have interest in the project or exercise some influence on the project were predetermined as shown under each level in form of tables.

5.2.1 Authorities or Decision Makers

Table 16: Stakeholders Identification based on their roles and responsibilities

Level	Institutions	Roles and responsibilities
National Level	Prime Minister´s Office Regional Administration and Local Government	- Issuing policies - Providing legal frameworks - Issuing licenses, provision of compliance - certificates - Enforcement of laws and regulations - Setting operational standards for effluents including wastewater

		- Project monitoring
	Vice Presidents Office Division of Environment and NEMC,	- Coordination of the Environmental Management Policy, Act and guidelines - Environmental Monitoring and Auditing - Advise to the government on all environmental matters
	Ministry of Water	- Parent Ministry for the Project Proponent - Issuing polices on water resources management and planning - Enforcement of laws and regulations in the water resources planning sector - Setting operational standards - Activities monitoring in planning - Providing legal frameworks in energy
	Ministry of Lands and Human Settlement Development (Sector Environmental Section)	- Authority over the national land including the project area - Authority over national wildlife resources - Enforce law and regulations in the area of influence of the project
	Occupational Safety and Health Authority (OSHA)	- Issuing certificates of compliance and Designated Authority for occupational safety issues
Regional Level	Kagera Regional Administrative Secretary	- Oversee and advise on implementation of national policies at regional level - Oversee enforcement of laws and regulations - Advice on the implementation of development projects and activities at the regional level.
	Regional Land Advisory Committee	- Overall supervision of all activities pertaining to land use in the respective in the region
Municipality Level	Municipal Director's Office	- Chief executive officer for all development activities in municipality level - Land use approval - Oversee and advice on implementation of national policies at municipal level - Oversee enforcement of laws and regulations

	BUWASA	- Project implementation - Consultation with stakeholders - Project monitoring and internal auditing
	Municipal Natural Resources Department (forest and Wildlife divisions	- Plan and coordination of community based natural resources - Enforcement of laws and regulations - Overseer of rights to utilize resources in the municipality
	Land and Environment	- Land use planning at municipality level - Environmental management
	Municipal Planning/Health/Community Development Departments	- Baseline data on social and economic conditions - Extension services
	Municipal Engineer	- Overseer of engineering activities in the municipality
	Municipal Environmental Management Officer	- Coordination of environmental matters at the municipal level
Ward Level	Ward Development Committees Ward Environmental Committee	- Oversee general development plans for ward level - Provide information on local conditions and extension services - Project monitoring in their area of jurisdiction
Village level	'Environmental Committee	- Oversee general development plans at village level - Provide information on local conditions and extension services in the village - Project monitoring in their area of jurisdiction

5.2.2 Developer

Level	Institution	Roles and responsibilities
National /Regional level	LVEMP II	- Facilitate EIA study - Project implementation - Project monitoring and internal auditing

5.2.3 Affected Parties (Directly and indirectly affected)

Level	Institution	Course of action
Community Level (neighbouring facility site)	Residents	- Residents at Nyanga village - Road side users in the project areas of which there is a nearby road used by residents which could be interfered with project development - Project Monitoring - Project beneficiaries

5.2.4 Interested Parties

Level	Institution	Roles and responsibilities
Community Level	NGOs/CBOs	- Environmental conservation groups - Social well being (SACCOS, HIV/AIDS groups - Project Monitoring - Project beneficiaries

5.3 Public Participation Process

Issues pertaining to construction of the sludge disposal facility project and its environmental and social consequences were discussed with the representative of the key stakeholders, interested institutions, private companies particularly those around the project site.

Key stakeholders, who included the following sectors, were directly informed of the proposed development through a visit in their respective offices on 25th through to 29th June 2012.

- Municipal Executive Director
- Municipal Planner
- Regional Manager-TANROADS
- Environmental Consultant BMC
- Regional Manager-NHC KAGERA
- Natural Resource Officer
- Sub-Basin Water Officer
- Municipal Health Officer
- Municipal Engineer
- Laboratory Manager
- Municipal Environmental Officer

Surrounding communities were sensitized to participate in the process through consultation meetings which were communicated to the communities through their Village Executive Officers who informed the communities to participate in consultation meetings. On 28th June 2012, meetings were held in Nyanga ward to discuss the proposed development. The minutes and attendances of the meetings are shown in Appendix V and VI.

Since the proposed project is to be implemented near Nyanga village, it is likely to affect village's residents and it is anticipated that there will be significant environmental and social impacts

affecting various groups socially and economically. It is further anticipated that the communities will have to be protected from any negative impacts, while opportunities to be offered by the project need to be made visible to the communities. Those various groups likely to be affected by the project were consulted and closely involved in raising their concerns of the project.

Figure 13: Consultation meeting at Nyanga village

5.4 Concerns from Public Consultations

Public participation process followed the guidelines as stipulated in the Environmental Management Act Cap 191 (No. 20 of 2004), part XIV regarding Public Participation in environmental decision-making and also followed EIA and Audit Regulations during the scoping process for the proposed sludge disposal facility construction. In order to facilitate an open and transparent process, Interested & Affected Persons were identified and informed of the proposed development when the project consultants visited the site for reconnaissance of the properties and activities taking place at the proposed site and the vicinity area. The comments/concerns received during all phases of scoping exercises have been incorporated and are addressed in this EIS hereunder.

5.4.1 Concerns drawn from officials

Managing Director - BUWASA

- The Municipality has 14 wards 10 of which are connected with water supply from BUWASA.
- The sludge disposal facility will serve 6 wards of Ijuganyondo , Kibeta, Rwamishenye, Buhembe, Nyanga, Kagondo
- Most of the pit latrines are emptied to nearby pits while those residing closer to the rivers allow the faecal matter to drain into the river
- Sensitization of the communities is the most important aspect for the success of the project otherwise the habits of discharging wastewater into the storm water channels will never end.
- The area earmarked for sludge disposal is under the ownership of Bukoba Municipal Council but once construction of the sludge disposal facility is completed, BUWASA will take over the ownership.

- The earmarked area had no people living there; some few residential houses are located far away from the site.

Municipal Director – Bukoba Municipal Council

- Wish number one was if the project was implemented immediately to serve the wards in the green zone. There are ten (10) proposed projects in ten (10) sub-wards. Two projects in Ijuganyondo and Kagondo in Green Belt, out of ten will start soon. As of now BUWASA will operate in town but later they will serve the wards in the green belt.
- Projects will involve land take from the local communities. Since land is a very sensitive issue in the region, therefore compensation issues should be handled with great care and it must be clear to all likely to be affected.
- There may be political interference but only positive one should be entertained. The language from all directions should be the same for smooth implementation of the project.
- In case there is a component of cost sharing (community contribution), people's willingness and ability to pay for the service should be considered.
- There are cleanliness activities in the area and every household contributes TZS 50.
- Community sensitization and awareness should be created for the success of the project

Lake Victoria Water Basin Office

- The head office of the Lake Victoria Basin Office is in Mwanza
- The problem of pollution of ground and surface water has not emerged to the extent of putting the monitoring stations especially for ground water
- The work of the Basin office is to ensure sustainable use of the water resources. We set standards on the quality aspect before water is discharged in the lake or water bodies
- There are only three facilities with discharge permits and these are TANICA, TEA PROCESSING and FISH PROCESSING. Monitoring of their discharge activities is done regularly on monthly basis.
- Since these projects have never been implemented here, it is difficult to know the impacts of such projects
- Pilot boreholes for monitoring purposes should be established. This should be similar to drilled boreholes for water supply. Normally samples are taken, tested for establishing the baseline
- BUWASA are paying for the permits to extract water and since they have not started discharging wastewater in the water bodies then they do not require our permits.
- The Lake Basin Office has not started issuing permits to individuals to discharge wastewater

5.4.2 Concerns drawn from Public Consultation Meeting and Consultants Responses

1.	How is the local community going to benefit from this proposed project? Can the project consider to give us water supply	Direct employment and businesses with the work force may be considered as one immediate benefit from the project Indirectly if the environment is protected, Nyanga residents will equally benefit from

		good health
2.	For any development impacts should be there. If the contractor comes here with his people, at least there will be some benefits from employment and service oriented gains	Comment highly commended as it indicated understanding of the project benefits by the stakeholder who gave the comment
3.	There might be chemicals percolating into the ground thus contaminating water sources	➢ The facility will be built in such a manner that no water seeps into the ground to ensure proper treatment ➢ Our main concern especially when there is a solid waste dumping site is that there might be some interference with the sludge facility. Consultants took the sample for testing to ensure there are presently no chemicals in the river water
4.	The area earmarked for the project is there, you should not interfere with other peoples land	Comment noted and the design is confined within the earmarked project area
5.	In this village there are those who understand development and those who do not. It would be in good order if the land was well planned demarcating area for grazing, area for cultivation especially ground nuts (njugu)	Plans for land use are there and the intentions to construct the sludge disposal facility are according to those land use plans
6.	Areas for traditional and cultural issues should be demarcated.	We are informed that the land use planning for the municipality considered this important aspect.
7.	What plans do you have for solid waste like generation of biogas for the local community to get an alternative source of energy? This is an advise so that the project can be of benefit to the local communities	Comment will be sent to the project proponent so that another project can be initiated within this project
8.	The project should develop a permanent water supply project for the village/ward	Comment will be communicated to the project proponent
9.	A comment from the Ward Councillor- There is a development program for Nyanga Ward. Therefore issues related to land use planning is not for these consultants. Also livestock keeping in the municipality premises is not allowed. If you keep livestock in the premises, zero grazing is tolerated as the animals will not be wandering around to disturb others.	Comment noted

6. Assessment of Impacts and Identification Project Alternatives

6.1 Introduction

Development of the proposed sludge disposal facility will involve a number of activities in various phases. Each stage, depending on the nature of activities involved, will result into a number of environmental impacts to the locality which supports other forms of life including birds and small mammals as well as social impacts to human beings. These and other project activities will lead into direct impact on the surroundings. It is for such reasons that necessitated an environmental and social impact assessment which also involved carrying out of water sampling and analysis sampling background noise levels to establish the baseline information. Vegetation check was also carried out to classify the vegetation types existing in the project site as well as identify all the plant species and assessing their biological status and document them for future references.

Based on the project site point of view, environmental elements which were assessed in terms of effects and likely significance are summarised under the following topic headings put under different project phases:

- Planning issues;
- Land and land use;
- Geology, hydrogeology and soils;
- Surface water quality and hydrology
- Landscape and visual amenity;
- Ecology, biodiversity and nature conservation;
- Archaeology and cultural heritage;
- Traffic and transportation;
- Noise and vibration;
- Air quality and dust;
- Contaminated land and waste management
- Public access and recreation; and
- Communities and socio-economics.

6.2 Positive Impactsexpected from the proposed project

- Improved quality of health from proper management of faecal matter that would otherwise be dumped haphazardly and drain into rivers where others may become in contact with.
- Improved water quality in rivers and subsequent reservoir downstream- Lake Victoria
- Increased fish catch from depleted nutrients which support the growth of water hyacinth and algae. The growth of the two plants has the tendency of depleting light and oxygen, respectively in the water bodies detrimental to the life of fish and other aquatic life.
- Employment and trading opportunities will be direct benefits to the neighbouring communities
- The government coffers will equally benefit from statutory contributions made by the contractor for his employees. Sales from construction materials will have value added tax that goes to the government.
- It is also anticipated that properly treated sludge can be re-used as fertilizer to increase agricultural productivity. The use of decomposed sludge (compost) can also minimize the use of chemical fertilizers, which are potential pollutants of Lake Victoria. Similarly, the properly treated supernatant overflow from sludge digestion process can be used for land irrigation.

This will also depend with the willingness of the community on using sludge as fertilizer, thus the community should be sensitized on the advantage of using sludge as fertilizer to avoid nuisance of using it.

6.3 Negative Impacts

Like any other development project in a village located in remote place, a number of minor to major negative environmental and socio impacts are likely to occur from the planned construction activities of the sludge disposal facility ranging from site clearance to transportation of building materials, erection, construction and operation of the facility. Such potential environmental socio impacts include;

6.3.1 Mobilization Phase

- **Vegetation clearance**

Presently the proposed site with the temporary locally made sludge disposal facility has some vegetation and greenery areas that blend very well with the surroundings. These vegetations will be lost and thus loosing the familiar aesthetic view of the area. Of course due to the nature of the sludge, there has been vegetation overgrowth in the existing local facility which is also a nuisance.

Figure 14: Existing vegetation around the locally made sludge disposal facility

- **Disturbances to historical and archaeological finds during site clearance**

Based on the nature of the site it is possible that scientific, historical, or archaeological interest or anything of value during excavation works may be encountered. Once encountered it means that disturbances will have already been done to the respective area

- **Deterioration of original land use, scenic and visual quality**
  The proposed project will involve construction of waste stabilization ponds, sludge drying beds and other ancillaries all of which will change the current land use, scenic and the visual quality of the area. On figure 12, without the existing locally made sludge disposal facility and some heaps of solid waste, the area would have been a beautiful greenery landscape which extends to Kangoma village in the background of the picture. Once the sludge disposal facility is built, it will reduce the aesthetic quality of the area.

6.3.2 Construction Phase

- **Disturbances, particularly land scarring at borrow sites for sources of construction materials** (sand, aggregates, stones,) - Borrow materials to be used for construction of the sludge disposal facility will be collected from sources far from the construction site. The immediate impact of borrow areas/sites is land scarring in the course of sourcing materials.

- **Nuisance from noise and vibration during construction** ,

  Noise may pose a problem to the population living or working in places next to areas to be affected by the project during construction work, especially in connections with the activities of construction of structures; transportation of fill materials and the facility will require use of heavy equipment and vehicles. The intensity of this impact vary according to the degree of severity or sensitivity of those affected, the most sensitive recipients to noise and vibration are schools and residential areas.

- **Increase in traffic levels likely to cause accidents**. During construction there will be heavy duty vehicles that come to construction site to deliver various construction materials. Speed will be the resulting characteristic on the roads to site leading into injuries to members of the local community. This picture below was captured near the project site during the assessment indicating that there such dangers in the project area.

Figure 15: Road construction in progress near the project site warning drivers to reduce speed

- **Contamination of water from leakages of fuels and lubricants from the vehicles carrying construction materials**
  Ground water and surface water contamination would also occur if the contractors do not follow pollution control measures. Ground water can be contaminated through leaching of contaminated soil during construction phase of the project. The Baseline water quality is presented under Appendix IX.

- **Poor air quality from dust and emissions around the construction site and material hauling routes**
  The potential impacts on air quality will be located mostly in the areas subject to excavation for trenches, basins, ponds and dikes, in the circulation area for vehicles and other equipment used at construction areas. Re-suspension of dust may occur as a result of land cleaning, formation of pavement base and sub-base, paving and circulation of vehicles on non-paved roads, either next to the working faces or in the way to support areas. This is likely to happen when these activities are developed within relatively long time under dry weather conditions.
  Atmospheric pollution due to fuel combustion during construction may also occur as a consequence of the flow of vehicles and equipment on work, operation of industrial facilities (i.e. concrete plants) which may be implemented or outsourced to supply material inputs to the project, and due to increase of vehicular missions associated with temporary mean speed reduction on the roads directly affected and in the surrounding road network.

- **Soil erosion- Once** this is likely to occur because the soils will remain bare and in some areas the soils will become loose due to vegetation clearance or cut and fill to level the ground.

Socio-economic Impacts

- **Spread of diseases (HIV/AIDs, STIs or STDs**) among members involved in construction - The construction site will be a place of work where job seekers and other service providers such as food vendors commonly known as "Mama Lishe" and sex workers will gather for various purposes of work and services. Such gatherings will allow contacts that cannot be avoided.

  In addition, drastic increase in a number of people in a small construction area such a Nyanga Village which is without adequate provision for potable water supply, waste disposal, or other basic services such as toilets and accommodation. In case this happens, then public health in the neighbourhood will actually worsen as a result of this project.

  Such influx of job seekers in the project area will demand and put more pressure on available services. While there will be a general benefit in getting income from employment but not all job seekers will get employment.

- **Safety during Construction**

  Construction of sludge disposal facility, like any other development sites, are inherently dangerous places and safety of the people around, who may not be aware of the hazards, must be assured, particularly at the vicinity of the construction equipment such as front wheel loaders, back hoe excavators, rollers and compactors .

Children and grownups are always eager to see construction equipment at work!! Therefore the public particularly the children shall not be allowed to come closer to the swing area of excavators or other equipment at site.

The nearby site which is used as a temporary solid waste dumping site attracts people looking for worms used as a "bite" for fishing. This is an incentive for people to come closer to the proposed sludge site hunting or looking for fish bite! This activity will need to be closely monitored.

Figure 16: Haphazard solid waste dumping site attracting people searching for worms

In places where there are vehicles transporting construction materials and also at turning places towards the construction site, appropriate warning signage shall be posted.

6.3.3 Contractors Demobilization Phase

- **Solid waste generation**

Contractors' demobilization phase will involve clearing all the site activities in terms of tiding up of all sites facilities and demobilization of all construction equipment. Disposal of any remaining unwanted material will also be carried out during this contractor's demobilization phase.

However, various wastes will be generated during this stage of which will be disposed to the municipal disposal site. These will include solid wastes from packaging materials, wood and steel crates, cardboard, wrapping materials, boxes, cement bags and sacks, drums, cans and chemical containers and any other unused materials. Along with this, upgrading for damaged areas will be carried out before commissioning the project.

- **Safety to workers and wastewater generation**

All workers who will be involved during demobilization activities will be sensitized to use Personal Protective Equipment (PPE) when at work to avoid occupational risks. Such

equipment include hard hats, ear plugs or ear muffs, dust coats or overalls, gloves, dust masks, goggles for eye protection, hard toed boots, safety harness etc.

On the other hand wastewater will also be generated from work camps, and runoffs crossing hydrocarbon contaminated areas. As this wastewater can cause detrimental effects to the surrounding environment, conventional wastewater treatment systems such as septic tank and soak away pit will be employed to ensure safe and proper onsite disposal of waste water. After the project completion, temporary workers especially unskilled ones will have to go back to other places or former areas where they were working before construction of the sludge disposal started.

- **Loss of temporary employment**

Sludge disposal facility construction works require both skilled and unskilled labour. The project will create job opportunities for youth living in villages where the project is implemented. This may eventually lead to migration of youth from neighbouring villages in an attempt to seek better opportunities a result of exposure from social interaction with the migrant population. Also school pupils may abscond from school to go for works in construction sites. Since this issue was discussed during public consultations, we do not anticipate any truancy from schools and the contractors will be encouraged to employ youths who register with village government offices since they (village leaders) will know if the youth has completed the compulsory primary education.
During demobilization this opportunity will be lost and the temporary workers especially unskilled ones will have to go back to other places or former areas where they were working before construction of the sludge disposal started.

6.3.4 Operation Phase

- **Poor safety of employees and neighbours from objectionable sludge**
  Sludge to be disposed at the facility will be odorous and will contain highly putrescible organic matter and will be thus very objectionable. The sludge will be producing foul gases and lot of nuisance likely to cause pollution and a health hazard.

- **Interference with the existing solid waste dumping site**
  Next to the site proposed for sludge disposal facility there is haphazard dumping site of solid wastes collected from the municipality. Leachate from this site will eventually reach the stream nearby thus defeating the purpose of having the sludge disposal facility in the same area

- **Pollution to the nearby streams and groundwater**
  If sludge disposal facilities do not function as planned, there may be a significant impact of polluting the nearby stream flowing to Kyamato River thus endangering the ecosystem downstream of the proposed works

6.4 Option Analysis for the Proposed Sludge Disposal Facility Project

The EIA procedure stipulates that an environmental investigation needs to identify environmental and social impacts likely to emanate from the project and also identify main project alternatives for the proposed development. Therefore, it is required that a number of possible proposals and alternatives for accomplishing the same objectives be considered. In principle, these should include an analysis of the location, timing, input and design alternatives as well as the do-nothing option.

6.4.1 Alternative Project Location

It should, be noted that during scoping exercise and site familiarization in the EIA initial stages, the assessment on site location alternatives was limited to existing proposed project site where existing land use is mainly open sludge dumping and solid waste dumping site on the southern side of the sludge facility as shown in the figure below.

Figure 17: Existing sludge disposal facility near a solid dumping site

6.4.2 Alternatives Sources for Construction Materials

Gravel, hardcore stones, aggregates for construction activities will be extracted from the existing outcrop rocks which are currently used as borrow sites for construction materials. This will have added advantages to the local community in supplying construction materials, a straight forward employment allowing them to earn money. No other borrow areas will be opened unless the existing ones are depleted and there is an agreement with the regional and the responsible municipal authorities.

Sand will equally be extracted from existing sources with adequate supply as will be determined during the detailed assessment of the project area. Water for works mainly for preparation of concrete, curing and other construction activities may be drawn from the nearby streams unless it is determined beyond doubts that the existing solid waste has changes the characteristics of the

water and it is thus unsuitable for construction works. The samples from this nearby river will be tested for suitability.

6.4.3 Sludge disposal design options

Different types of sludge disposal facilities have different techniques for sludge thickening and dewatering. These include the use of sludge drying beds to achieve thickening and dewatering, use of anaerobic ponds for sludge thickening followed by sludge drying beds or use of shallow lagoon for sludge thickening followed by sludge drying beds. In all these processes the supernatant liquid from the sludge disposal facility will need to be treated further separately.

Sludge drying beds

Sludge drying beds normally comprise of a series of shallow ponds designed to accommodate sludge from the on-site systems such as pit latrines, septic tanks and soak away pits. Adoption of sludge drying beds assumes that sludge from onsite facilities have high concentration of solids (3.5% to 5%) and do not require thickening. Faecal sludge is normally emptied into these beds and left to dry for several months (six months to a year) depending on the weather condition to attain effective solid liquid separation and to yield a solid concentrate.

Anaerobic pond

Anaerobic pond is one of the simplest wastewater treatment systems. The anaerobic pond functions as an open, non-mixed, unheated single stage anaerobic digester. The pond is especially effective in bringing about rapid stabilization of strong organic waste. The system works effectively in warm climates which is contrary to Bukoba weather condition, and can achieve up to around 50-70% BOD removal at 20^0C to 25^0C, respectively.

Shallow lagoons

This type of facility consists of a pond which is relatively shallow, to receive sludge from onsite facilities. The pond will operate both as a sedimentation and facultative pond allowing sludge thickening and digestion to take place at the same time. The supernatant liquid is directed to a maturation pond or a wetland system for further treatment. The pond will be designed to achieve reduction of both BOD_5 and pathogenic-helminthes eggs. Thickened sludge is removed periodically by scooping to a sludge drying bed. Wastewater from the drying bed is also directed to a maturation pond or wetland system.

Depth of the lagoons is only 1 to 2 meters and at least two units are required for smooth operations. The advantage of this facility over the drying beds and anaerobic ponds however is the high efficiency in BOD_5 removal (60-90%). Because of its advantages over the other types of facilities, this type of facility is proposed for adoption in the design of the Bukoba Sludge disposal facility. One could use shallow Lagoons as a substitute for drying beds.

The design of sludge disposal facility is planned to be in two phases, medium term (2022) and Long term (2032). The medium term will include the construction of four manholes, two shallow lagoons, two embankments, a maturation pond and storm water collection system. The preliminary design consider the lagoons to be used alternatively, that one lagoon will be used while the other one left to dry up then composite sludge to be used for other activities like soil

conditioner. Considering the weather condition of Bukoba which is almost rainy throughout the year it will be somehow difficult for these lagoon to dry up, therefore it is proposed that shallow lagoon for sludge thickening should be put in place to receive wastewater followed by at least two sludge drying beds. The designer should also consider the baseline information on wind speed, rainfall data and evaporation rate of the area in order to come up with the best design option for proposed sludge disposal facility.

6.4.4 Construction Technology

The construction technologies can only be considered in two forms namely; mechanized and labour based techniques.

Mechanisation of construction works became necessary to replace labour which was becoming ever more expensive and scarce. However, in many third world countries labour is now abundant and people are prepared to work for low wages. Moreover, construction equipment and some of the inputs needed to keep it working need be imported, diverting scarce foreign exchange from more vital purposes. In such circumstances it is not surprising that efforts began some twenty-five years ago to develop construction techniques more appropriate to the economic and social conditions in developing countries.

Labour-based techniques do not imply the complete elimination of machinery but rather selective replacement. Certain tasks, for example, long distance transportation of say fill material or heavy pre-cast concrete structures and compaction of the embankment material are better done mechanically by trucks and compactors. Both of the latter have the advantage of being multi-use which is essential in the country where specialised equipment tends to be under-used. For other tasks, simple machines have been developed which can be used to save labour if wages or scarcity justify it.

Unfortunately, labour-based works have not had success in Tanzania and across Africa. Changing a well-established technology requires a multi-level approach, as well as the time to learn. It cannot be done piecemeal and hurriedly. Putting aside the profound shifts in attitude which must be induced, they require extensive retraining of construction work managers and engineers and given the trend towards private sector involvement, technical and financial assistance to construction firms. These in turn can only survive if they can be guaranteed a steady flow of similar work, which can only be assured by a global approach.

Their relative simplicity permits decentralisation to local level management. However, again we are confronted with the need to train and supervise their implantation to ensure that the acquired knowledge will continue to be used after the project is over. Too often works have been carried out without adequate training and supervision and have been of poor quality. In other cases, managers and enterprises have been trained and equipped but could not continue subsequently to apply their skills and have found unemployed or bankrupt or fail to utilize available natural resources for development.

Labour-based works can be introduced within a high level commitment to privatisation, decentralisation, employment creation and poverty alleviation. Labour-based works can be powerful policy instruments to support these objectives. However, without a real rather than rhetorical commitment of government and donors they will not realise their potential. In this project where labour based works are there, they will be utilised but in some areas where the machinery is required, they will be fully utilised.

6.5 The Do-Nothing Option

Under the No-Action Alternative, the sludge disposal facility would not be constructed or operated, environmental and socio-economic impacts described in the previous section would not occur. The do-nothing alternative assumes that future developments would comply with the existing requirements for the project area, which includes increased and continuous environmental pollution especially of the nearby stream which drain water to Kyamato River which is later linked to Lake Victoria, soil and air pollution including pollution of lake Victoria through open dumping of sludge as is the current practice will continue. Pending the proposal of other significant development within the area, population growth and other developmental activities that influence environmental pollution would likely continue on the same trend that currently exists which may later worsen the situation.

Based on preliminary assessment of issues, it is evident that the site in question is not located in any sensitive place as the existing land use is already open sludge dumping, solid waste dumping site on the southern side and the plantation that exist include exotic trees such as eucalyptus and cypress (C*upressus macrocarpa*). Therefore there would not be any significant loss of habitats for both common flora and fauna.

Since the earmarked area has not been protected, there might be some localized impacts, but are not of significance to stop the proposed project. Accordingly, the consideration of do-nothing option can be justifiably dismissed as an alternative for the following reasons.

- Need and desirability of the project to avert environmental pollution from open sludge dumping. Do nothing in other words would mean that they continue with haphazard dumping of the sludge as it is currently practised.
- The environmental impacts expected by the proposed sludge disposal facility can be mitigated to acceptable / satisfactory standards and
- The potential environmental impacts will be much localized as the construction of sludge disposal facility will not interfere with human settlement and their daily activity routine in the ward and sub-wards.

Based on the above understanding, Environmental BENCHMARK thus recommends that the proposed project on the proposed site should proceed on the conditions that proper planning is implemented and the project adheres to all proposed mitigation measures presented in section 7 of this EIS. This precautionary approach will reduce the impacts on the socio-economic systems and the environment in the project area.

6.6 Analysis of Environmental and Social Impacts

An overview of the construction of the sludge disposal facility project has been presented in the previous sections. The potential impacts of the proposed project have been listed under section 6.2 and 6.3. These impacts are now analysed into different categories based on the stakeholders' views and perceptions, the consultants experience in undertaking Environmental and Social Impact Assessments and experience gained in other projects of a similar nature.

The approach used to assess the significance of the potential impacts and later assess the effectiveness of the mitigation or enhancement measures is to apply significant ratings to each impact based on objective criteria, such as magnitude, extent and duration of that impact, to yield a final evaluation of the significance of impacts before and after mitigation.

The application of significance rating reduces the number of variables which need to be considered by the decision maker, whist providing pertinent information about the implications of the proposed roads project. The assessment criteria are given on Table 16 below.

Table 17: First step assessment criteria for evaluation of impacts

First Step Criterion	Categories
Extent or Spatial influence of Impact	Local/Site specific; Regional; National; International
Magnitude of Impact at that spatial scale	**High**: natural and/or social functions and/or processes are severely altered **Medium**: natural and /or social functions and /or processes are notably altered **Low**: natural and /or social functions and/or processes are negligibly or minimally altered
Duration of Impact	**Short Term** (ST): 0-5 years; **Medium Term** (MT) 5-10 years; **Long Term** (LT): 15+ years

Source: Brownlie and Willemse (1996)

Also another important criterion considered to evaluate whether or not adverse impacts are significant include:

- environmental loss and deterioration;
- social impacts resulting directly or indirectly from environmental change;
- non-conformity with environmental standards, objectives and guidelines; and
- Likelihood and acceptability of risk.

Criteria to evaluate adverse impacts on natural resources, ecological functions or designated areas include:

- reductions in species diversity;
- depletion or fragmentation on plant and animal habitat;
- loss of threatened, rare or endangered species;
- impairment of ecological integrity, resilience or health e.g.
- disruption of food chains;
- decline in species population;
- alterations in predator-prey relationships.

Criteria to evaluate the significance of adverse social impacts that result from biophysical changes include:

- displacement of people e.g. by roads, dams and reservoirs;
- threats to human health and safety e.g. from release of persistent and/or toxic additives, thickeners or flocculants;
- decline in commercially valuable or locally important species or resources e.g. fish, forests and farmland;

- loss of areas or environmental components that have cultural, recreational or aesthetic value;
- disruption of communities by influx of a workforce e.g. during project construction; and
- pressures on services, transportation and infrastructure.

Environmental standards, objectives and targets to evaluate significance include:

- prescribed limits on waste/emission discharges and/or concentrations;
- ambient air and water quality standards established by law or regulations;
- environmental objectives and targets contained in policy and strategy; and
- approved or statutory plans that protect areas or allocate, zone or regulate the use of land and natural resources.

The summary of impacts is made on Table 18, where they have been subdivided into direct, indirect and cumulative impacts. Furthermore a statement is made on whether or not the impact is considered to be slight, moderate or significant.

Table 18: Analysis of Environmental and Social Impacts

Environmental and Social Impacts	Analysis of Environmental and Social Impacts											
					Duration					Extent or Spatial influence		
Description of Impacts	Direct	Indirect	Primary	Secondary	Short term	Medium	Long term	Reversible	Irreversible	Local	Regional	Significance
POSITIVE IMPACTS												
During Project Mobilization Phase												
Creation of short and long term employment opportunities	✓		✓		✓						✓	Medium
During Project Construction												
Improved government revenue in terms of taxes / purchases	✓			✓			✓	✓			✓	Medium
Employment and trading opportunities	✓		✓		✓						✓	Medium
During Project Operation												
Improved quality of health		✓		✓			✓				✓	High
Improved water quality in rivers and downstream subsequent reservoir		✓		✓			✓				✓	High
Increased Agricultural Production		✓		✓			✓				✓	Medium
Increased fish catch		✓		✓			✓				✓	High

NEGATIVE IMPACTS												
During Project Mobilization Phase												
Vegetation Clearance for input to Preliminary Engineering Design	✓		✓		✓				✓	✓		Medium
Deterioration of original land use, scenic and visual quality	✓		✓		✓				✓	✓		Medium
Disturbances to historical and archaeological finds during site clearance	✓		✓		✓				✓		✓	Medium

During Project Construction												
Safety during Construction	✓		✓		✓				✓	✓		**High**
Increase in traffic levels likely to cause accidents.	✓		✓		✓				✓	✓		**High**
Disturbance, particularly land scarring at borrow sites or sources of construction materials (sand, aggregates, stones,)	✓		✓		✓			✓		✓		**Medium**
Generation of solid waste from site clearance and construction activities	✓		✓		✓			✓		✓		**Medium**
Contamination of water from leakages (oil and grease) of fuels and lubricants from the construction equipments	✓		✓				✓	✓			✓	**Medium**
Poor air quality from dust and emissions around the construction site and material hauling routes	✓		✓		✓			✓			✓	**Medium**
Nuisance from noise and vibration during construction	✓		✓				✓	✓		✓		**Medium**
Soil erosion	✓			✓			✓	✓		✓		**Medium**
Vibrations due to compaction and blasting on quarry sites	✓		✓		✓			✓		✓		**Medium**
During Project Operation												
Poor safety of employees and neighbours from objectionable sludge	✓		✓				✓	✓		✓		**Medium**
Interference with the existing Solid waste dumping site	✓		✓				✓	✓			✓	**High**
Pollution to the nearby streams and groundwater	✓			✓			✓	✓			✓	**Low**
Landscape scars at un-rehabilitated quarries and borrow sites	✓			✓			✓	✓			✓	**Medium**
Noise pollution from cesspit vehicles	✓		✓				✓	✓		✓		**Medium**

delivering sludge to the sludge disposal facility												
Impacts During Demobilization												
Generation of solid wastes	✓			✓			✓	✓		✓		**Medium**
Safety to workers and wastewater generation	✓			✓			✓	✓		✓		**Medium**

Table 19: Impact Assessment Matrix

Impact	Activities during project phases												
	Mobilization Phase			Construction and Operation) Phase					Demobilization phase				
Description of Impacts based on Project Environmental and Social Components	Sites Identification	Labour Force Hire	Transportation of construction equipment	Site Clearance	Access Road upgrading	Construction of Office and storage Facility	Actual construction works	development on completion	Demobilization of construction facilities	Reinstatement	Laying off labour force	Most Significant Impact Rating	Significance
POSITIVE IMPACTS													
Creation of short and long term employment opportunities	0	+1	+1	+1	+3	+1	+2	+1	+2	+1	-2	11	High
Improved government revenue in terms of taxes/purchases	+1	0	+1	+1	+1	+1	+2	+1	+1	+1	0	10	High
Improved quality of health	0	0	0	+2	+2	0	0	+3	0	+3	0	10	High
Improved water quality in rivers and downstream subsequent reservoir	0	0	0	+2	+2	0	0	+3	0	+3	0	10	High
Increased fish catch	0	0	0	0	0	+2	+1	+3	0	+2	0	8	High
Increased Agricultural Production	0	0	0	0	0	0	+1	+3	0	+1	0	5	Medium
NEGATIVE IMPACTS													
Vegetation Clearance for input to Preliminary Engineering Design	0	0	-1	-2	-1	0	0	0	0	0	0	-4	Low
Deterioration of original land use, scenic and visual quality	0	0	-1	-2	-2	-1	-1	0	-1	0	0	-8	High
Disturbances to historical and archaeological finds during site clearance	0	0	0	-3	-2	-1	0	0	0	-1	0	-7	Medium
Generation of solid waste from site clearance and construction activities	0	0	-1	-1	-1	-1	-2	0	-1	-1	0	-8	High
Safety during Construction	0	0	0	-1	-1	-2	-3	-1	-1	0	0	-8	High
Increase in traffic levels likely to cause accidents.	-1	0	-2	0	-1	-1	-2	0	-1	0	0	-8	High
Disturbance, particularly land scarring at borrow sites or sources of construction materials	0	0	0	0	-2	-1	-2	0	0	0	0	-5	Medium

Contamination of water from leakages (oil and grease) of fuels and lubricants from the construction equipments	0	0	-1	-1	-1	-1	-2	0	-1	0	0	-7	Medium
Poor air quality from dust and emissions around the construction site and material hauling routes	0	0	-1	-1	-2	-1	-2	0	-1	0	0	-8	High
Nuisance from noise and vibration during construction	0	0	-1	-1	-2	-1	-2	0	-1	0	0	-8	High
Soil erosion	0	0	-1	-2	-1	-1	-1	-1	0	0	0	-7	Medium
Vibrations due to compaction and blasting on quarry sites	0	0	0	0	-2	-1	-3	-1	0	0	0	-7	Medium
Generation of solid wastes	0	0	-1	-1	0	0	0	0	-2	0	0	-4	Low
Safety to workers and wastewater generation	0	0	-1	0	0	0	0	0	-2	0	0	-3	Low
Loss of temporary employment	0	0	0	-2	0	-1	-1	0	-1	0	-2	-7	Medium
Poor safety of employees and neighbours from objectionable sludge	0	0	0	-1	-1	-1	-1	-2	-1	-2	0	-9	High
Interference with the existing Solid waste dumping site	0	0	-1	-1	-1	-1	-1	-2	-1	-2	0	-10	High
Pollution to the nearby streams and groundwater	0	0	-1	-1	-1	-1	-1	-2	-1	-2	0	-10	High
Landscape scars at un-rehabilitated quarries and borrow sites	0	0	0	-1	-1	-1	-1	-2	-2	-1	0	-9	High
Noise pollution from cesspit vehicles delivering sludge to the sludge disposal facility	0	0	-1	0	-1	-1	-1	-2	-1	-2	0	-9	High

Key for impact severance and acceptability		Key for significant impact rating	
-3	Major adverse Impact (unacceptable)	0-4	Low
-2	Moderate adverse Impact (tolerable)		
-1	Minor adverse Impact	5-8	Medium
0	No impact	9-12	High
+1	Minor positive Impact		
+2	Moderate positive Impact		
+3	Major positive impact		

7. Environmental and Social Mitigation Measures

7.1 Introduction

Any development project, be it a simple construction or a major construction like sludge disposal facility; generally cause some alteration to the bio-physical and social environment. The proposed development of sludge disposal facility project is not an exception and it is going to involve construction of operation house and upgrading access road which will involve activities such as vegetation clearance and disposal, borrow of fill materials, haulage of fill material, spreading the fill, compacting, all to accommodate trucks with heavy loads for construction and facility operation activities. At the storage facilities site, vegetation clearance will equally be carried out, levelling, construction and sludge disposal operations will contribute into changing the environment.

In the previous section, a thorough understanding of the scope of potential environmental and social impacts from the proposed project roads has been developed and therefore effective mitigation strategies are presented under this section. The mitigation measures for the impacts likely to be caused by the proposed construction of sludge disposal facility project will focus on key potential impacts identified under section 6 as listed below;

Positive Impacts of the project

- Improved quality of health among the community
- Improved water quality in rivers and subsequent reservoir downstream- Lake Victoria
- Increased fish catch from depleted nutrients which support the growth of water hyacinth and algae.
- Creation of short and long term employment opportunities
- Improved government revenue in terms of taxes and purchases
- It is also anticipated that properly treated sludge can be re-used as fertilizer to increase agricultural productivity.

Negative Impacts

During mobilization phase

- Vegetation clearance
- Soil Erosion
- Disturbance to borrow sites
- Poor air quality
- Generation of solid wastes
- Disturbances to historical and archaeological finds during site clearance
- Deterioration of original land use, scenic and visual quality

During construction phase

- Environmental contamination from possible accidents of fuel takers
- Soil erosion
- Accidents to employees (Safety risk and occupational injuries at work place)

- Spread of diseases (HIV/AIDs, STDs and STIs
- Disturbances, particularly land scarring at borrow sites or sources of construction materials
- Generation of solid waste from site clearance and construction activities
- Contamination of water from leakages of fuels and lubricants from the vehicles carrying construction materials
- Increase in traffic levels likely to cause accidents.
- Nuisance from noise and vibration during construction
- Poor air quality from dust and emissions around the construction site and material hauling routes

During operation phase

- Poor safety of employees and neighbours from objectionable sludge
- Interference with the existing Solid waste dumping site
- Pollution to the nearby streams and groundwater

Demobilization Activities

- Loss of temporary employment
- Safety to workers and wastewater generation
- Solid waste generation

7.2 Negative Impacts and Corresponding Mitigation Measures

7.2.1 Mobilization Phase

Table 20: Negative Impacts and Corresponding Mitigation Measures

	Impact	Mitigation measures
1.	Vegetation Loss through sites clearance	- Clearance of vegetation for lagoons construction and operation house shall be limited to required area and landscaping after construction shall be put in place - Vegetation clearance along the access roads is already done and it shall be limited to the area required for access roads only
2.	Soil Erosion from disturbed surfaces	- Earthworks shall be carried out during the dry season to prevent soil from being washed away. - Implementation of erosion control measures on disturbed surfaces such as planting vegetation that hold soils together, terracing in steep slopes and securing the available vegetated area (surfaces not required for works shall not be disturbed)
3.	Disturbance of borrow areas	- Existing borrow pits along shall be used as much as possible to minimize impact to the environment.
4.	Disturbances to historical and archaeological finds during site clearance	- Notify the Engineer giving the nature and location of the findings. The Engineer will consult the National Museum. - The Contractor shall exercise necessary care so as not to damage artefacts or fossils uncovered during trench excavation operations and shall provide such cooperation and assistance as may be necessary to preserve the findings for removal or other disposition by the employer. - Where appropriate by reason of a discovery, the Engineer shall order

		delays in the time of performance or changes in the work, or both. If such delays, or changes or both are ordered, the time of performance and contract price shall be adjusted in accordance with the applicable clauses in the general Conditions of Contract.
5.	Generation of solid waste from site clearance	- All cleared materials from the proposed lagoons site and areas earmarked for operation house should be well managed and disposed to the municipal solid waste dump site -
6.	Deterioration of original land use, scenic and visual quality	- The proposed project site for sludge disposal facility is designated as suitable for sludge disposal facilities under Bukoba Strategic Urban Development Plan land use master plan (2008-2028). - Sludge disposal facilities to be designed and constructed in a manner that blends well with the surroundings - Operations house at the ponds shall be designed to blend well with the surrounding buildings. - Landscaping will be carried out to match the existing surroundings.

7.2.2 Mitigation of impacts during construction- phase

Table 21: Mitigation measures during construction phase

1.	Possible Environmental contamination from fuel tankers transporting construction facilities	- Sensitization of the truck drivers to use safe speed while on transit - Use of reliable fuel supplier with good track record - Prepare an emergency response plan and fuel spill contingency plan
2.	Soil erosion	- Earthworks shall be carried out during the dry season to prevent soil from being washed away. - Implementation of erosion control measures on disturbed surfaces such as planting vegetation that hold soils together, terracing in steep slopes and securing the available vegetated area (surfaces not required for works shall not be disturbed)
3.	Nuisance from noise and vibration during construction	- Use of properly serviced and well maintained equipment - Silencers (mufflers) to be used to minimize noise on otherwise noisy equipment such as generators and compressors - Sensitization of the adjacent communities on likely vibrations and increased noise resulting from construction activities - Where noise levels will be beyond 85dB(A), ear muffs and plugs shall be provided to all those working within the area with high noise levels - The site for noisy equipment such as front wheel loaders and compactors will be located away from possible noise receptors.

4.	Increase in traffic levels likely to cause accidents.	- Sensitization of the project drivers to observe traffic rules and limit the speed to 40km/hr in residential areas - Sensitization of the nearby communities about the increased traffic
5.	Accidents to employees	- Institute strict use of the personal protective equipment (PPE) to protect employees to occupational injuries - Conduct toolbox meetings every morning and job safety analysis (JSA) before sending employees to carry out their regular duties - Conducting appropriate design and maintenance of equipment - Management of dangerous/hazardous goods including proper marking of materials and goods, - Use of material safety data sheets which give information on prevention and treatment of injuries
6.	Disturbances, particularly land scarring at borrow sites or sources of construction materials	- The borrow sites are the ones used for sourcing all other construction materials for projects in Bukoba. Therefore the project will only contribute to land scarring and will not be the sole project causing this problem. - Since all the borrow areas are privately owned, the contractor employed by the Project Proponent will be buying the construction materials and thus contributing towards restoration of the borrow sites - Part of the charges for purchase of construction materials shall channelled back for the rehabilitation or reinstatement of the borrow areas.
7.	Generation of solid waste from site clearance and construction activities	- Site housekeeping to minimise solid and liquid wastes generated from construction and other related activities such as food vending and petty businesses - Allocate a special area for petty business such as food stalls provided with garbage bins - Post appropriate signage such as "DO NOT LITTER" or "USITUPE TAKA" at all strategic sites. - Assign Contractor's Environmental or Safety Officer the responsibility to ensure that the surroundings are kept clean. - All excavated spoil should be well managed through levelling or tipped into low lying areas or borrow areas which are no longer useful. - Trash and waste shall be well collected and removed from the site to municipal sanitary land fill. - Consult the Municipal Council about the suitable trash/waste dumping site - The community should instruct people to stay away from scavenging at dumping sites - Solid wastes generated from land clearing shall be collected and disposed off in municipal sanitary land fill at authorised site. - Decomposable materials shall be collected and combined with city wastes to the municipal sanitary landfill; plastics and other recyclable materials will be collected and sent out for recycling

8.	Contamination of water from spills	- No refuelling within 100 m of the water course - Dripping pans to be used to contain all leakages on mining and other support equipment
9.	Spread of diseases (HIV/AIDs, STDs and STIs	- Sensitization and health awareness campaigns to all involved in the project including service providers - Construction workers to undergo health screening according to the National HIV/AIDs Policy, - Project will assist the nearby health facility in sensitization of those involved in a project - Contractor to introduce strict site regulations and strictly follow them to avoid socio- impacts - Along with project implementation, measures to reduce conflicts must be introduced e.g. training, information, strengthening of communities or stakeholders frequenting the project sites.
10.	Poor air quality from dust and emissions around the construction site and material hauling routes	- Water sprinkling to reduce the dust at the construction site - Use of dust masks to operators and those working in the dusty areas - Use of goggles for all operators - Construction machines/equipment will be well maintained to ensure total fuel combustion. All vehicles involved in construction works will be frequently checked and well serviced during the whole construction period so that the level of exhaust emissions is reduced - Speed of vehicles hauling construction materials shall be reduced and the construction materials shall be covered with tarpaulins

7.2.3 Mitigation of impacts during facility operation

Table 22: Mitigation measures during operation phase of the facility

1.	Poor safety of employees and neighbours from objectionable sludge	- Safety of employees from unpleasant smell and possible health hazards shall be ensured from proper use of Personal Protective Equipment (PPE) - Performance of the sludge disposal facility shall be closely monitored to avoid overflowing causing any harmful effects to the communities surrounding the project site or water users downstream of the facility. - Residing area and the monitoring offices like laboratory and other workers offices should be at least 300 m away from the disposal facility so as to avoid objectionable pleasant smell from the facility.
2.	Interference with the existing Solid waste dumping	- Relocate the existing dumping site for solid waste or - Modify the dumping facility to become a sanitary landfill for solid waste disposal with proper lining material to prevent leachate from soaking into the ground. Also provide the channels to collect the leachate for treatment before it reaches the stream - If possible secure another site for the sludge disposal facility
3.	Possible accident during sludge	- The drivers must observe the road safety regulations

	transportation	- If accident occurs the polluted soil should be treated accordingly - The emptier cesspits should comprise of First Aid Kit to give pretreatment service to the injured people - Sensitization to community on possible increase of traffic due to sludge transportation.
4.	Pollution of the nearby streams and groundwater	- Close monitoring of the facility to ensure that it functions as planned, this involve water quality monitoring to the receiving bodies and to ensure facility effluent comply to national effluent standards. The parameters that should be monitored may include but not least the following; • BOD_5 at 20°c • Total Dissolved Solids (TDS) • pH value • Faecal Coliform (FC) • Nitrate-Nitrogen • Hardness and Salinity The baseline data for stream at Nyanga village which is indicated under annex ix may also be used as the reference.

7.2.4 Mitigation of impacts during contractor demobilization phase

Table 23: Mitigation measures during demobilization phase

1.	Generation of demobilization waste	- Trash and waste generated from demobilization activities mainly leftovers and broken items shall be collected, sorted and disposed off in respective places. - Recyclable materials shall be sent out of the project area for recycling - Plastic materials equally collected and packed for recycling
2.	Safety to workers during demobilization activities	- Institute strict use of the personal protective equipment (PPE) to protect employees to occupational injuries - Conduct toolbox meetings every morning and job safety analysis (JSA) before sending employees to carry out their regular duties - Conducting appropriate design and maintenance of equipment - Management of dangerous/hazardous goods including proper marking of materials
3.	Loss of temporary employment	- Arrange and effect the terminal benefits to all employees - Issue testimonials to all employees and letters showing each employee social security contributions for future benefits. - Temporary workers especially unskilled ones will have to go back to other places or former areas where they were working before construction of the sludge disposal started.

8. Environmental and Social Management Plan

8.1 Introduction

The present chapter of this Environmental Impact Statement gives an outline of the arrangements that will be put in place to ensure that the proposed mitigation measures actually do control or assist to minimize the impacts identified under section 6 of this statement.

8.2 Objectives of the Environmental and Social Management Plan

The objectives of this Environmental and Social Management Plan (ESMP) are to describe;

- the legislative and administrative frameworks in the country on Environmental Impact Assessment Management,
- implementation arrangements for the EMP
- the environmental reporting arrangements.
- design consideration regarding environmental, health and safety and social impacts.

In Tanzania the Environmental Assessment Framework, as presented before under Chapter 3, is guided by the following two key national legislations

1. The Environmental Management Act (EMA) Cap 191
2. The Environmental Impact Assessment and Audit regulations, 2005

Environmental Assessment is under the Vice Presidents' office where the Minister of Environment falls. Therefore, for environmental impact assessment for development of sludge disposal facility project in Nyanga village in Bukoba municipality and subsequent permit procedures will be under the following bodies:

- Minister of Environment who will approve the EIA and issuing the EIA certificate,
- NEMC, who are responsible for arranging for EIAs, undertakes enforcement, compliance, review and monitoring of EIA
- Ministry of Water which is the mother ministry in which the project falls.

8.3 Implementation Arrangement of the EMP

LVEMP II in collaboration with Bukoba Municipal Council main objective in this assignment is to contribute to achieve the vision of the EAC of "creating a prosperous population living in a healthy and sustainable managed environment and providing equitable opportunities and benefits".

The project proponent of this project in Bukoba Municipal will hire various contractors to assist in construction of various elements of the project. The proponent will have his own staff overseeing every step of the project. At different stages of the project, the proponent will be assisted by an environmental expert from Environmental BENCHMARK in overseeing that the Environmental and Social Management Plan takes shape in order to minimize the potential environmental impacts. For the project to succeed and achieve its environmental objectives, it will require the support of the community and all institutions in the project area. The table 23

below outlines the actions of the EMP. The organizational framework for the EMP is designed to evolve as the project progresses through mobilization, mine operation and finally closure and demobilization stages as contained in the agreement.

8.4 Reporting Arrangements

An Environmental Representative from LVEMP or Consultant's appointee to deal with Environmental Management will cooperate with other experts in Bukoba Municipality such as Municipal Land Officer, Municipal Environmental Officer, Community Development Officer to provide the Regional Environmental Management Expert and LVEMP's office in Bukoba with environmental reports of the project implementation as part of the progress reports and annual environmental monitoring reports. The Regional Management Expert is the link person between the Region and the Director of Environment as well as the Director General of NEMC. The environmental teams at lower levels such as Village Environmental Committees and Ward Development Committees will be consulted on regular basis to register any complaints from the local communities and informing them on the project operation works.

Table 24: Environmental and Social Management Plan

Environmental and social Impact	Indicator-mitigation target	Responsible for mitigation	Time Frame	Estimated Cost 000TZS/ Year	Remarks
Mobilization phase / Pre-construction phase					
Vegetation Clearance for input to Preliminary Engineering Design	Limit clearance to required area for project facilities installation	BUWASA and contractor	During land patching and levelling	3,000	Avoid clearing vegetation in areas not need for permanent works
Soil erosion on disturbed surfaces	Control earthworks, Install erosion control measures, Install drainage structures	BUWASA and Contractor	During land scaring and levelling	5,000	Avoid land scaring works during rainy season
Disturbance to borrow areas	Use existing borrow pits for construction material	BUWASA and contractor	During material mobilization	5,000	Landscaping after quarrying or modification of pits to ponds
Disturbances to historical and archaeological finds during site clearance	When discovered, the Engineer shall order delays in the time of	Municipal cultural coordinator	During site clearance	3,500	Notify the contractor on nature and historical background of

	performance or changes in the work, or both.				the site
Generation of solid wastes from sites clearance	Controlled burning, allow community to harvest firewood and grasses for soil cover.	BUWASA and contractor	During site clearance	2,000	Good housekeeping at site
Deterioration of original land use, scenic and visual quality	Sludge disposal facilities to be designed and constructed in a manner that blends well with the surroundings	BUWASA and contractor	During site clearance works	3,000	Landscaping to be carried out to match with the existing surroundings.
Construction phase					
Disturbances, particularly land scarring at borrow sites or sources of construction materials	Use existing borrow pits for construction material	BUWASA and contractor	During construction phase	10,000	Part of the charges for purchase of construction materials shall be channelled back for the reinstatement of the borrow areas.
Poor air quality from dust and emissions around the construction site and material hauling routes	Sound service to equipment Water sprinkling, PPE, sound service, speed limit	Resident Engineer and contractor	Daily during construction activities	5,000	Regular equipment service and Proper use of PPE
Nuisance from noise and vibration during construction	Silencers (mufflers) to be used to minimize noise on otherwise noisy equipment such as	Municipal Safety Officer.	Daily during compaction	4,000	Noise levels to be limited to <85dB(A)

	generators and compressors				
Generation of Solid waste from construction activities	Tidy surroundings	Contractor	Daily during construction	5,000	Ensure good site/house keeping
Increase in traffic levels likely to cause accidents	Zero accidents to villagers	BUWASA/ Contractor	Daily during material hauling	2,500	Abide to road use regulations
Contamination of water from leakages of fuels and lubricants from the vehicles carrying construction materials and construction equipments	Dripping pans to be used to contain all hydrocarbon leakages on construction equipment	BUWASA /BMC and Contractor	Daily during construction works	5,000	Ensure equipment services
Spread of diseases (HIV/AIDs, STIs or STDs)	Sensitization and health awareness campaigns to all involved in the project including service providers	BUWASA/ Municipal AIDs control coordinator and Community Development Officer	During site preparation	50,000	Ensure timely awareness
Safety to workers	Institute strict use of the personal protective equipment (PPE) to protect employees to occupational injuries	Municipal Safety Officer and Contractor	During Construction	3,500	
Operation phase					
Poor safety of employees and neighbours from objectionable sludge	Safety of employees from unpleasant smell and possible health hazards shall be ensured	BUWASA /BMC	Fresh sludge delivering	2,000	

Interference with the existing Solid waste dumping site	Relocate the existing dumping site for solid waste	BMC /BUWASA	Sludge disposal facilities operation	25,000	Relocation of existing SW dumping site should be done before project commencement.
Pollution to the nearby streams and groundwater	Water Quality data abide to the available Tanzanian effluent standards (i.e. BOD_5-30mg/l, TDS-3000mg/l, pH-6.5 to 8.5)	BMC and BUWASA	Sludge treatment	3,000	Constructed wetland should involve plant species that has high remediation abilities
Exploitation of women and children	Ensure employments are made through village governments	MEO/ BUWASA /village government	During employees recruitment	5,000	Child labour is strictly prohibited

Demobilization					
Generation of demobilization wastes	Collect all leftovers, scrap materials for recycling and landscaping of the project area	Resident engineer and demobilization contractor	On closure of the construction activities	1,000	Demobilization waste to be properly disposed
Loss of temporary employment	Arrange for terminal benefits to all employees	Contractor and village chairman	On closure of the construction activities	10,000	
Safety to workers	All workers involved in demobilization activities should be sensitized to use Personal Protective Equipment (PPE) when at work to avoid occupational risks	Contractor and Municipal safety officer	At the end of the project	7,000	Workers Sensitization on PPE use

9. Environmental and Social Monitoring Plan

9.1 Introduction

Environmental and social monitoring describes the processes and activities that need to take place to characterise and setting a line of follow up on the quality of the environment and social related aspects.

Monitoring may sometimes become a long term process that should begin at the start of the project and continue throughout the life of the project or possibly at the end of the impact that emerged from the proposed sludge disposal facility project. Its purpose is to establish benchmarks so that the nature and magnitude of anticipated environmental impacts are continually assessed. So monitoring involves the continuous or periodic review of mitigation activities to determine their effectiveness. If the performance of environmental management system is low when using internal monitoring plan, then the proponent has to organize for external monitoring. All types of monitoring help to make a follow up of different stages of the project and ensure proper use of limited resources. Consequently, trends in environmental degradation or recovery can be established and previously unforeseen impacts can be identified and dealt with during the monitoring period or passed on to the subsequent stages of the project such as operation of the facility in future.

Environmental audits are also usually carried out some few years after completion of the project. These audits assess the relevance, efficiency and impact of any mitigation measures administered. BUWASA and Bukoba Municipal Council may initiate such audit processes to cover the project area, following its commitment to environmental protection.

Besides this Environmental Impact Statement, project contractor(s) should prepare environmental and social monitoring plans which will cover the mobilization, construction, operation, and demobilization phases of the project. Tasks to be covered and monitored during each phase are presented below.

Mobilization phase

- Site clearance and identifying construction material haul sources
- maintenance and checking of construction equipment ready for transportation to site and during the actual construction works;
- hiring of worker, training and sensitization of the staff on safety and environmental issues;
- initiation of HIV/AIDS sensitization campaign;

Construction phase

- implementation of all mitigation measures as amplified under section 7;
- implementation of HIV/AIDs sensitization campaign;
- Occupational health and safety measures (conditions at materials storage places, borrow sites, equipment, personal protective equipment (PPE), etc,).

- Conditions at workmen's' camps (accommodation, sanitation facilities, hygiene, water availability etc,).
- Collection and analysis of baseline data on air and water quality, noise levels and socio-economic aspects.

Both BUWASA and Municipal Environmental Officers will be responsible for monitoring environmental impacts after construction of project in respective areas of their jurisdiction. Municipal Community Development Officers and Municipal Aids Control Coordinator will be equally involved in monitoring the trend in socio-economic status and HIV/AIDs pattern respectively.

Therefore, among other issues, Municipal Environmental Officers, Community Development Officers and Municipal Aids Control Coordinator, should deal with,

- monitoring water pollution from various pollutants from construction equipment such as oil spills;
- Soil erosion and degradation control measures during construction;
- Water quality monitoring;
- changes in socio-economic status;
- HIV/AIDs trends

9.2 Reporting Arrangements

Contractors' appointees to deal with Environmental Management will cooperate with Municipal Environmental Management Officers and other sectoral officers in the municipality to provide the Regional Environment Office with environmental reports of the project implementation as part of the progress reports and annual environmental monitoring reports. The Regional Environment Management Officer will be the link between the project and the National Environment Management Council and the Department of Environment under Vice President's Office

Since the proposed project involves the construction and operation of the sludge disposal facility, the project proponent, LVEMP II, has developed a thorough understanding of the scope of potential environmental impacts of the project, and will set effective monitoring strategies matching those exiting in the project area where Bukoba Municipal Council and BUWASA will have major roles to play.

Table 24 below presents monitoring activities and preliminary costs for monitoring implementation and operation of the Sludge Disposal Facility project in form of an Environmental and Social Monitoring plan. The plan outlines the parameters that will require monitoring during construction and later operation of the facility, indicators for monitoring, assigns responsibilities and states the means and frequency of monitoring. Cost estimated for monitoring activities is also presented.

9.3 Environmental Monitoring Plan

The regulatory authorities at the Municipal level have to see to it that the commitments made by the project proponent through mitigation measures are really put into practice and that is the essence of this environmental and Social Monitoring Plan as presented on Table 24 below.

Table 25: Environmental and Social Monitoring Plan

Environmental or Social Impact	Target level for monitoring parameter	Responsible organ for monitoring	Monitoring Time Frame/ frequency	Sampling area	Estimated monitoring Cost (TZS'000)/ Year
During mobilization phase					
Vegetation loss through sites clearance	Limit vegetation clearance to the required area (area receiving permanent works)	Municipal Natural Resources officer/ BUWASA	Once during vegetation clearance for Facility installation and Access road area	Project area including the access road to the site	3,000
Soil erosion on disturbed surfaces	Soil eroded	Municipal Natural Resources Officer/ BUWASA	Once during the clearance of vegetation for Facility installation and Access road area	Facility installation and Access road area	3,000
Disturbances to historical and archaeological finds during site clearance	Disturbed cultural and historical structures	Municipal Natural Resources Officer /Municipal cultural coordinator	Once during mobilization / pre-construction phase	Facility installation and Access road area	2,000
Deterioration of original land use, scenic and visual quality	Minimal and landscaping to match with the surrounding	MLPO and Municipal Natural Resources Officer	Once every 6 months for 3 years	Community	3,000
Total estimated cost during mobilization phase					**10,000**
During Project Construction phase					
Disturbances, particularly land scarring at borrow sites or sources of construction materials	Disturbed surfaces	BUWASA and contractor	Once every 3 months for 2 years	Borrow areas	2,400
Poor air quality	(SOx)-Daily Av of hourly	MEMO/	Daily during	Workers at	5,400

from dust and emissions around the construction site and material hauling routes	values≤ 0.1mg/kg or 0.5mg/Nm^3 for 10min. CO- A maximum permitted exposure of 100mg/Nm^3 for a period not exceeding 15min. Black smoke and suspended PM – Daily av. Of hourly values≤0.10µg/Nm^3 NOx - ≤150 µg/Nm^3 for 24 hrs -1≤20 µg/Nm^3 for 8 hrs Hydrocarbon (as total organic C) ≤20 mg/Nm^3	BUWASA	construction	Construction site and material haul routes	
Soil erosion	Soil erosion control	MEMO/ BUWASA	Once every 3 months for 3 years	Along the access road	2,400
Contamination of water from leakages of fuels and lubricants from the vehicles carrying construction materials and construction equipments	Pollution control Pollutants in water, TSS, Target not > 20mg/Nm^3 on yearly average	MEMO/ BUWASA	Once every 3 months for project duration	Rivers/stream and shallow wells Along the access road and construction site	2,400
Spread of diseases (HIV/AIDs, STIs or STDs)	Lower-zero incidents of sickness	Municipal Aids Control Coordinators	Once a year for 3 years	Community around the project area	7,200
Vibrations and noise pollution	Intensity of vibration within 100m of residence -≤25mm/s in residential -≤50mm/s near water supply well	MEMO/ BUWASA	Once every 3 months for 3 years	Residence near the project site and the access road	3,000
Pollution due to Solid and liquid waste generation	Good housekeeping	MEMO/ BUWASA	Once every 3 months	At construction site	2,400
Increase in traffic levels likely to cause accidents	Zero or Minimum Accidents	Traffic Officer	As per traffic regulations	Community	3,000
Safety to workers	0-Accidents and injuries	Municipal Health Officer /OSHA Regional Office	Once every month	Project Construction area	2,000
Total During Construction Phase					**30,200**

Project Operation Phase					
Poor safety of employees and neighbours from objectionable sludge	Effective lagoon function measures in place	MEMO/ BUWASA	Twice a year or immediately after fresh sludge delivering	Community	2,200
Landscape scars at un-rehabilitated quarries and borrow sites	Reinstated borrow sites	MEMO/ BUWASA	Once a year for 3 years	Borrow sites	6,000
Reduced air quality from cesspit vehicles carrying sludge	(SOx)-Daily Av of hourly values$\leq$ $0.1mg/kg$ or 0.5mg/Nm^3 for 10min. CO- A maximum permitted exposure of 100mg/Nm^3 for a period not exceeding 15min. Black smoke and suspended PM – Daily av. Of hourly values$\leq 0.10\mu g/Nm^3$ NOx - $\leq 150\ \mu g/Nm^3$ for 24 hrs -1$\leq 20\ \mu g/Nm^3$ for 8 hrs Hydrocarbon (as total organic C) $\leq 20\ mg/Nm^3$	MEMO/ BUWASA	Once a year to assess the situation	community	4,500
Interference with the existing Solid waste dumping site	Relocation of solid waste dump in place	MEMO/ BUWASA	Once a year for 3 years	Project area	3,200
Pollution to the nearby streams and groundwater	Low to zero pollution level (i.e. BOD ≤ 30 mg/l)	Municipal Environmental Management Officer/ Quality Assurance	Daily during operation period	Receiving water bodies	4,000
Exploitation of women and children	Gender balance in employment opportunities in place	Municipal labour office /Community Development Officer	Once per month	Project area	1,500
Impact on cultural environment	Land use as per approved land use plan	Municipal Land Office /community Development Officer	Once every three months	Villages near the project area	1500
Total during operation phase					**22,900**

Contractor Demobilization Phase					
Generation of demobilization wastes	All wastes collected and transported from site to disposal area	MEMO/ BUWASA	Once during demobilization	Construction site	1,000
Loss of temporary employment	All terminal benefits and letters awarded to all	BUWASA/Village Community Development Committee	Once on termination	Temporary employee	500
Safety to workers	0-Accidents and injuries	BUWASA/OSHA municipal Office	Once every month	Project Construction area	2,000
Total during Contractor Demobilization phase					**3,500**
Total Estimated Cost for Monitoring activities					**66,700**

10. Cost Benefit Analysis

10.1 Introduction

Cost Benefit Analysis is a tool used either to rank projects or to choose the most appropriate project option. The ranking or decision is based on the expected economic costs and benefits. The general rule is that the project should be undertaken if lifetime expected benefits exceed all expected costs.

The aim of the cost benefit analysis here is to present the lifetime costs and benefits of the proposed project as a single number that can be compared to either the interest rate prevailing (e.g. using the internal rate of return) or the costs and benefits of other competing project to give either a net present value or a benefit/cost ratio. To do this, the stream of net benefits is discounted.

The process of conducting the environmental cost benefit analysis involves:

- Description of the project and corresponding capital costs.
- Identification of the project consequences in time frame order and obtain their monetary values.
- Determination of the type of Environmental and Social Cost Benefit Analysis

In the following sections, the environmental cost benefit analysis of the project is presented.

10.2 Project Capital Costs

The estimated cost for implementation of the project under phase I and 2 is summarized on the tables below

Table 26: Summary of Costs for phase I

Item	Description	Amount (USD)
1.1	Preliminary and general items	45000
1.2	**CIVIL WORKS**	
1.2.1	Construction of two (2 Nos.) shallow lagoon of equal size (Length = 68m, Width (top) = 42m, Width (bottom) = 30m, Depth = 2m), including excavations, filling, embankments, base and side reinforcements	220,000
1.2.2	Construction of two (2Nos.) inlet Manholes; 1m deep and 1m wide	1,000
1.2.3	Construction of two (2Nos.) outlet Manholes 1m deep and 1m wide	1,000
1.2.4	Supply and install two (2Nos) coarse screen with 12mm mild steel bars	4,000
1.2.5	Construction of storm water channels on each side of the ponds	3,000
1.2.6	Supply and install PVC sludge collection pipe DN 300mm PN8, total approximate length of 14m	600
1.2.7	Supply and install PVC supernatant liquid collector pipe, DN 200 PN8 total length approximated to 90m	4,200
1.2.8	Supply and install perforated two (2Nos.) DN 200PVC pipe at the outlet side total length approximated to 85m to receive the supernatant liquid	4,000
1.2.9	Provide two (2Nos.) DN 200mm PVC equal tee and fittings	5,000
1.2.1 0	Construction of (2Nos.) wastewater receiving channels from each manhole, length 3m, with top width 1.5m and 1m deep.	1,000
1.2.1 1	Construction of Operator's house	12,000
1.2.1 2	Construction of one (1Nos.) Maturation Pond (length 12.2m, Width (top) 10m, width (bottom) 6m and 1.5m deep)	20,000
1.3	**Tools and equipment**	
1.3.1	Procurement of new Vacuum suction truck/ cesspit emptier	200,000
1.3.2	Laboratory equipments	40,000
1.4	**Other works**	
1.4.1	Improvement access road	50,000
1.4.2	Fencing and landscaping	12,000
1.4.3	Storm water collection system	10,000
Total		**632,800**
Value Added Tax (VAT) 18%		**113,904**
Contingencies 10%		**63,280**
Total investment for Package I		**809,984**

Table 27: Summary of estimated Costs for Phase 2

Item	Description	Amount (USD)
1.1	Preliminary and general items	30,000
1.2	**CIVIL WORKS**	
1.2.1	Construction of two (2 Nos.) shallow lagoon of equal size (L = 32m, Wt = 32m, Wb = 20m, Depth= 2m)	160,000
1.2.2	Construction of two (2Nos.) inlet Manholes; 1m deep and 1m wide	2,000
1.2.3	Construction of two (2Nos.) outlet Manholes 1m deep and 1m wide	2,000
1.2.4	Supply and install PVC sludge collection pipe DN 300mm PN8, total approximate length of 14m	1,200
1.2.5	Supply and install two (2Nos) coarse screen with 12mm mild steel bars	8,000
1.2.6	Construction of storm water channels on either side of the ponds	6,000
1.2.7	Supply and install PVC collection pipe PN8 DN 200mm, total approximate length of 180m	16,800
1.2.8	Supply and install perforated two (2Nos.) PVC pipe at the outlet side to receive the supernatant liquid, total approx. length 64m	6,000
1.2.9	Provide two (2Nos.) DN 200mm PVC equal tee and fittings	4,000
1.3	Tools and equipments	15,000
1.4	Other works including landscaping and storm water collection systems	10,000
Total		**261,000**
Value Added Tax (VAT) 18%		**46,980**
Contingencies 10%		**26,100**
Total investment for Package II		**334,080**

The total investment cost of the project for construction of the sludge disposal facility will be about USD 1,150,000.

10.3 Environmental and Social Costs

As presented under Section 7, the project negative impacts will include landscape scarring especially at borrow sites, vegetation loss through clearance, soil erosion, poor air quality-emissions and dust, safety to workers during construction, noise pollution, solid and liquid waste

generation, impacts on public health and safety from work camp operations, depletion and pollution of water sources, water and soil contamination, possible increase in traffic accidents during material hauling, poor safety of employees and neighbours from objectionable sludge, interference with existing solid waste dump, deterioration of original land use, scenic and visual quality, spread of diseases, socio-economic changes and disturbance to cultural and historical sites.

During operation of the sludge disposal facility project, the impacts were noted to be soil erosion along the access road, interference with existing solid waste dumping site, pollution to receiving water bodies especially Kyamato river, poor safety of employees and neighbours from objectionable sludge, groundwater contamination through leaching, reduced air quality from sludge hauling vehicles, landscape, increase of water related diseases from stagnant water at borrow sites and scars at un-rehabilitated quarries and borrow sites.

If each one of these negative impacts is assigned a monetary value at current market value, based on a combination of market value methods and one's willingness-to-pay methods for the damage or impact caused, or based on cost for a remedy such as water sprinkling to control dust or provision of PPE, all these impacts are estimated to cost about TZS 154.5 Million equivalent USD 99,677. The costs of monitoring estimated under Chapter 9 are about TZS Sixty Seven Million equivalent to about USD 45,000, all environmental and social costs and monitoring are worth less than USD 150,000.

The market prices or monetary values of environmental negative impacts are very difficult to obtain. They cannot be easily calculated as we can do for the project costs. The estimates on environmental costs are based on the assumption that the environmental cost may be equated to the cost of impact prevention, cost avoided or remedy in terms of providing PPE or health insurance covers as per common practice.

10.4 Intangible Costs of other Environmental and Social Impacts

In the previous section, attempts have been made to assign monetary value on other impacts such as emissions, poor air quality, noise pollution, pollution of soils and ground water, etc, but it has emerged that some of these impacts can be quantified in monetary terms with great difficult. The fact that cost-benefit-analysis seeks to translate all relevant considerations into monetary terms makes the whole analysis complex. In cost –benefit analysis, both the cost of, say, putting a dripping pan under the leaking grader or a front-wheel loader to reduce ground water pollution and the benefits of doing so including saving the human lives and prevention of debilitating and painful cancer diseases from consuming carcinogenic substances, are presented in monetary terms.

10.5 Environmental and Social Benefits

The Sludge Disposal Facility construction will improve quality of health from proper management of faecal matter that would otherwise be dumped haphazardly and drain into rivers where others may become in contact with and contract diseases, improve water quality in rivers and subsequent reservoir downstream- Lake Victoria, Increase fish catch from depleted

nutrients which support the growth of water hyacinth and algae; the growth of the two plants has the tendency of depleting light and oxygen, respectively in the water bodies detrimental to the life of fish and other aquatic life, The government coffers will equally benefit from statutory contributions made by the contractor for his employees; sales from construction materials will have value added tax that goes to the government.

Project activities will have offered some short-term employments to local community such as construction labourers, security personnel, contractors, Engineers, Environmental Impact Assessment teams, etc.

It is also anticipated that properly treated sludge can be re-used as fertilizer to increase agricultural productivity. The use of decomposed sludge (compost) can also minimize the use of chemical fertilizers, which are potential pollutants of Lake Victoria. In overall, the construction of sludge disposal facility project will have great benefits economically and environmentally compared to current sanitation status of Bukoba Municipality which still disposes the sludge haphazardly. Therefore the benefits to be realised from the proposed project surpass the envisaged capital investment cost of (USD 1,150,000), plus environmental, social and motoring costs (USD 150,000). If for example, the records of the top ten diseases for Bukoba Municipality in 2010 are checked (Refer Table 13 on Top Ten Diseases for 2010, under Chapter 4), one would notice that diarrhoeal diseases and intestinal worms claimed the life of 106 people from over 20,634 cases reported. If the project can even save only 50 lives out of 106, then implementation of this project would worth a cause!

10.6 Conclusion on Cost Benefit Analysis

As a conclusion on the Sludge disposal facility project, the investment capital costs, environmental, social and monitoring costs are relatively low in value and are thus outweighed by the benefits to be realised from the project, even if the project will serve only 10 lives from intestinal and diarrheal diseases. The consideration of No-Project or Do-Nothing option is dismissed as an alternative due to the need and desirability of the sludge disposal facility to solve sanitation problems in Bukoba municipality and its consequences on Lake Victoria. Therefore, the country at large stands to benefit significantly in terms of reduction of death causing diseases if the project is implemented.

11. Decommissioning

Decommissioning is the final phase in the life cycle of the project after locating the project site, design, construction, commissioning and operation for the design life. Most often, it is a process involving operations such as dismantling and demolition of structures, and management of resulting demolished materials. All these activities have to take into account of the environmental health and safety requirements for the operating personnel, the general public, and any implications for the environment.

The sludge disposal facility is not like a manufacturing facility or machinery whereby the methods used to manufacture some products are increasingly replaced by modern technology or process! The design life of the project will be about 20 years or so based on associated infrastructures which may require rehabilitation such as concrete side walls, manholes, connection channels, etc.

As long as the residences in Bukoba municipality are on continuous expansion especially by replacement of small and old housing and building structures by big and modern ones with modern sanitation facilities and more development is coming rapidly, there will always be a need for even a better wastewater management system for them in form of central sewer system. Therefore decommissioning of the proposed project should be thought in terms of upgrading the waste water treatment and sludge disposal facilities from the present status to the next higher stage depending on the demand at that time.

If at any one time, the constructed sludge disposal facility become ineffective such that an upgrade, or rehabilitation is require, then according to the first schedule of the Environmental Impact Assessment and Audit Regulations of 2005, the project will be falling under the list of projects requiring a fresh Environmental Impact Assessment. Alternatively if at any time, the facility becomes unusable, life threatening or unsafe to a state where its demolition is necessary the following demolition activities will be involved;

- demolition and removal of concrete structures and associated appurtenances
- re-shaping of landforms around the facility to remove embankments followed by reinstatement of land to return it into a state that would be usable by others after removal of facilities. Alternatively usable for other activities as may be deemed fit
- completing the rehabilitation and remediation - All contaminated sites will be rehabilitated and re-vegetated and all sites initially cleared will be re-vegetated
- all materials will be disposed off in proper manner as follows
    - Items that will have useful value should be stored for reuse
    - The sites will be rehabilitated and re-vegetated so as to make them useful by the villagers.
- processes monitoring and measuring the performance of closure activities against the agreed standards and criteria and
- inspections, consultation and reporting to stakeholders on progress

Such good practices and other measures will reduce the consequential costs of decommissioning and the project proponents will therefore set aside a budget estimated to about USD 70,000 to facilitate demolition and reinstatement of the area to another usable form or to match the surroundings.

12. Summary and Conclusions

LVEMPII in collaboration with Bukoba Urban Water and Sanitation Authority identified poor sludge disposal as one of the areas responsible for pollution of the Lake Victoria. Bukoba municipality does not have a central sewerage system, each building or a number of buildings in the municipality have own on-site sanitation facilities which include extensive use of cesspits, soak-away pits, septic tanks and pit latrines. When most of these on-site sanitation facilities fill up, the following methods are normally applied;

- emptied manually to the nearby open pit which is later backfilled
- drained into the nearby storm water channel leading to the river which later drains into the lake (mainly during rainy season)
- Abandon the pit latrine and dig another hole nearby
- Use mechanical cesspit emptier followed by illegal and indiscriminate dumping in rivers or open land.

Such illegal practices lead into contamination of terrestrial and aquatic environment by human excreta with high risks of transmission of gastrointestinal infections. As a technical solution to these challenges a designated sludge disposal facility was proposed and Ministry of Water (MoW) through LVEMP II commissioned the Consulting Engineers to carry out a detailed engineering design and supervision of construction of sludge disposal facility for Bukoba Municipality.

According to the requirements of Environmental Management Act (EMA) Cap 191 of 2004, Environmental Impact Assessment is mandatory for projects of this nature since they are likely to have the potential of causing significant impacts on the environment. The Environmental and Social Impact Assessment Study has been completed in accordance with the Tanzanian Legislations including the Environmental Management Act (2004) and the Environmental Impact Assessment and Audit regulations (2005). The Environmental and Social Studies Team has carried out field surveys to collect the environmental and some social data and also discussed with the local authorities concerning the environmental and social impacts of the sludge disposal facility project and proposed mitigation measures. The environmental and social team also carried out consultation with the representatives of local communities at the project area to integrate their requirements in the project. This consultation enabled the Consulting team to have a physical feeling of the local conditions around the project site.

The construction of Sludge Disposal Facility is essential for the improvement of health of residents of Bukoba municipality and also reducing faecal matter contamination of Lake Victoria. This will have a consequential value in improving the economy of the country through increased fish catch from healthy communities. Sludge disposal facility construction will improve quality of health from proper management of faecal matter that would otherwise be dumped haphazardly and drain into rivers where others may become in contact, improve water quality in rivers and subsequent reservoir downstream- Lake Victoria, increase fish catch from depleted nutrients which support the growth of plants with the tendency of depleting light and oxygen, respectively in the water bodies detrimental to the life of fish and other aquatic life. The government coffers will equally benefit from statutory contributions made by the contractor for

his employees; sales from construction materials will have value added tax that goes to the government.

It is also anticipated that properly treated sludge can be re-used as fertilizer to increase agricultural productivity. The use of decomposed sludge (compost) can also minimize the use of chemical fertilizers, which are potential pollutants of Lake Victoria. In overall, the construction of sludge disposal facility project will have great benefits economically and environmentally compared to current sanitation status of Bukoba Municipality which has no central sewer system increasing risk of soil and water contamination including Lake Victoria.

On the other hand, the construction of sludge disposal facility project may cause serious negative impacts that must be mitigated if the projects benefits are to be realised in a permanent and sustainable way. These environmental and social impacts are related to landscape scarring especially at borrow sites, vegetation loss through clearance, soil erosion, poor air quality-emissions and dust, safety to workers during construction, noise pollution, solid and liquid waste generation, impacts on public health and safety from work camp operations, depletion and pollution of water sources, water and soil contamination, possible increase in traffic accidents during material hauling, poor safety of employees and neighbours from objectionable sludge, interference with existing solid waste dump, Deterioration of original land use, scenic and visual quality, spread of diseases, socio-economic changes and disturbance to cultural and historical sites.

The spread of HIV/AIDs, STIs associated with project construction workforce, sitting of the construction camps and later the presence of cesspit truck drivers that will be delivering the sludge at the facility were mentioned to be a major social impact of the project. This was a major concern and was highlighted during public consultations and the measures to be taken by the Contractor were included in the mitigation measures.

Most of the project negative impacts can be mitigated with appropriate measures. The EIS has management and monitoring plans which are meant to show that all the mitigation are acted upon and there is an outside "eye" which follows up the mitigation actions in terms of frequency, responsibility, what to monitor (parameter) and the target levels expected to be attained. The corresponding cost estimate for monitoring are presented. The environmental cost benefits analysis of the project has been carried out and it revealed that the benefits to be realised from the project far outweigh the investment costs, environmental social and monitoring costs to be incurred. However, it is worth noting that some of the environmental and social costs are hard and complex to give a "monetary" value due to their nature in cause linkages. However, all beneficial considerations being weighed against all costs, the project is worth implementing!

Constant involvement of Bukoba Municipality Authorities, BUWASA, LVEMP II, the Contractor and all stakeholders including ward government authorities and the local communities in the project area will be required, to implement and monitor the mitigation measures. Monitoring of environmental and social impacts will be important in ensuring sustainable development of the municipality and the management of the trans-boundary resources.

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Annexes

Annex I: Approved Terms of Reference for Conducting Environmental Imact Assessment

1. Introduction

The Lake Victoria Environmental Management Project Phase Two (LVEMP II) was initiated which is somewhat a compliment and an upscale of LVEMP I Works, with an implementation period of eight (8) years (2009-2013 and 2014-2017). Again, this phase II is equally a regional initiative and a multi-sectoral approach on the management of the Lake Victoria Basin implemented in the five East African Community (EAC) Partner States, Burundi, Kenya, Rwanda, Tanzania and Uganda. Lake Victoria Basin Commission (LVBC) coordinates the project regionally through the Regional Project Coordination Team (RPCT) based in Kisumu, Kenya. The Ministry of Water is the Focal Point Ministry on the Tanzanian side. In Tanzania the project became effective on 20th August 2009, covering a total of 23 districts in Mara, Shinyanga, Mwanza and Kagera Regions. The Project is funded by the World Bank, Global Environmental Facility (GEF), Swedish International Development Agency (SIDA), Government of Tanzania and Communities.

LVEMP II objectives and key outputs targets at reducing pollution into the lake by reducing discharge of untreated effluent from municipal waste by supporting public investments, including:

- Rehabilitating and improving selected wastewater treatment facilities to reduce discharge of untreated effluents into the Lake,
- Connecting primary treated effluent discharge to constructed/restored wetlands; and
- Providing on-site sanitation facilities.

In order to carry out this assignment the Consultant M/s Environmental BENCHMARK, Consulting Civil-Environmental Engineers has been commissioned by the Ministry of Water (MoW) through LVEMP to undertake Environmental & Social Impact Assessment for proposed LVEMP II Works in Lake Victoria Basin pursuant to these Terms of Reference (TOR).

2. Environmental Assessment Requirements

The ESIA will be prepared consistent with the requirements of Tanzania National Environmental laws as well as the World Bank's safeguard policy on Environmental Assessment, OPBP 4.01. The Environmental Management Act (EMA) Cap 191 of 2004 requires that ESIA be undertaken for all new projects that may cause adverse environmental and social impacts. Under the Environment Impact Assessment and Audit Regulations, 2005 the proposed project is categorized as an ESIA obligatory project for which a full EIA is required.
On the other hand, the core requirements for the triggered World Bank safeguard policy include: screening early for potential impacts and selecting appropriate instruments to assess, minimize and mitigate potential adverse impacts. OP/BP 4.01 is triggered if a project is likely to have potential environmental risks and impacts in its area of influence. The policy covers impacts on the natural environment (air, water, land and noise); human health and safety; physical cultural resources; and transboundary and global environment concerns.

3. Objectives of ESIA

- The objectives of the Environmental and Social Impact Assessment are:
- To establish baseline information on both natural and built environment including socio-economic conditions of the proposed project area.
- To identify, predict and evaluate foreseeable impacts, both beneficial and adverse, of the proposed project; and
- To develop mitigation measures that aim at eliminating or minimizing the potential negative impacts and promote positive ones.
- To develop management clauses and monitoring aspects to be observed during project implementation.

The key findings and recommendations from the ESIA study will be incorporated into the detailed design, engineering drawings and specifications of the proposed construction of Sludge Disposal Facility.

4. Scope of Work

The ESIA should assemble and evaluate baseline data on the biophysical and socio-economic characteristics of the project area and areas of influence. The baseline information should include: any changes anticipated before project commences; an identification of operationally relevant issues that may affect project design, implementation and outcomes. Specifically the following task will be carried out

Task 1: Description of the Proposed Project

- The Consultant shall give details of:
- Location of all project-related development and operation sites
- General layout of facilities - diagrams of structures, design basis, size, sources of utilities;
- Pre-construction activities, construction activities; and post construction activities; and
- Organizational relationships, mandates and interactions among the different parties to be involved in the project

Task 2: Description of the Environment

The Consultant shall:

- Provide general description of the project environment and sources of information for anyone requiring a more extensive description (especially the ESIA reviewers).
- Identify those features that are particularly important in the project area and other areas related to the project in Bukoba Municipality maps at appropriate scales to illustrate the surrounding areas likely to be environmentally and socially affected.
- Identify areas that require special attention during different phases of the project implementation.

Task 3: Legislative and Regulatory Considerations

The Consultant shall: Describe pertinent local, national and international regulations and standards governing environmental quality, health and safety, land use control which the project developer is required to observe during the implementation of the project activities.

Task 4: Determination of Potential Impacts of the Proposed Project Activities

Under this activity the consultant shall:

- Identify and evaluate significant environmental and social impacts (positive and negative) and risks, identify indirect, residual and cumulative impacts that may be anticipated , predict and assess in quantitative terms probability, magnitude, distribution and timing of expected impacts; and proposed alternatives (e.g. technology, structure and size, sites, routes, etc

Task 5: Estimation of the significance of the impacts

The consultant shall:

- determine which environmental and social components are mostly affected by the project or its alternatives;
- list issues raised by the public and classify them according the level and frequency of concern whenever possible;
- list regulatory standards, guidelines etc. that need to be met; and
- Rank predicted impacts in order of priority for avoidance, mitigation, compensation and monitoring.

Task 6: Developing an Appropriate Environmental Management System/Plan (EMP) Based on Impacts Identified

The consultant shall:

- determine appropriate measures to avoid or mitigate undesirable impacts;
- assess and describe the anticipated effectiveness of proposed measures;
- ascertain regulatory requirements and expected performance standards;
- determine and assess methods to monitor impacts for prediction accuracy remedial measures for effectiveness;
- determine and assess methods to monitor for early warning of unexpected effects;
- re-assess project plans, design and project management structure;
- describe follow-up scheme and post-project action plan for achieving ESIA objectives; and
- Assess the level of financial commitment by the project proponent for the management and monitoring plan, and follow up activities

The environmental management plan should also outline how the project will be run (equipment/building material stored etc to avoid environmental damage) during implementation and how it will be cleared up after construction.

The consultant shall be guided by the cost-effectiveness principles in proposing amelioration measures. Estimation of costs of those measures shall be made. The assessment will provide a detailed plan to monitor the implementation of the mitigation measures and impacts of the project during construction and operation.

Task 7: Institutional Set-up for the Implementation of EMP

The Consultant shall review the institutional set-up - community, ward, Municipal/ Regional and national levels - for implementation of the ESMP and EMP recommended in the environmental assessment. The ESMP and EMP shall identify who should be responsible for what and when.

Task 8: Drawing Recommendations

The consultant shall:

- highlight key environmental and social concerns/ issues that should be considered for incorporation into the detailed design architectural and engineering drawings and specifications for the proposed office building;
- Determine resources requirements for implementing recommendations;
- determine capacity and resourcefulness of the client to meeting such commitment;
- explain rationale for proposed development and benefits and costs vis-à-vis the no-project option;
- Ascertain degree of public acceptance of or reaction to recommendations.

Task 9: Production of an Environmental Impact Statement (EIS)
The assessment shall result into an EIS focusing on findings of the assessment, conclusions and recommended actions, supported by summaries of data collected etc. This shall be a concise document limited to significant environmental issues. The report format will be as per The Environmental Impact Assessment and Audit Regulations No.349 of 2005 managed by the National Environment Management Council (NEMC).

Task 10: Review
The review report from NEMC may require further input (data collection, consultation inputs etc.). The consultant shall undertake to provide extra information and inputs until the project review is satisfactorily concluded.

Task 11: Public Consultations
The assessment shall establish the level of consultation of the affected stakeholders before designing the project, level of involvement in the running and maintenance of the project facilities as this is an important aspect for both environmental and project sustainability.

The assessment will provide a framework:

- for coordinating the environmental impact assessment with other government agencies, and
- For obtaining the views of affected groups, and in keeping records of meeting and other activities, communications, and comments and their disposition.

The consultants shall provide record of the names of organizations, government and departments and individuals whose views were obtained. The record will also provide description of views and information that will be obtained. These will be additional consultations to what will conducted during the scoping study.

Task 12: The Consultant shall take all necessary steps to ensure that permission (Certificate) to proceed with other stages of the project from National Environmental Management Council (NEMC) is obtained within short period of time as agreed and stated in the consultants work plan.

5. Time Scale

Unless suggested otherwise at the screening stage of EIA process, the study has to be 'Comprehensive' in nature and hence shall involve data collection, analysis and results within 10 weeks from the date of the signing of the contract. This period accommodates registration for the project; follow up of the review with NEMC, and obtaining certificate on behalf of the Client. However, the effective consultancy period will be determined by the consultant based on the timeline for deliverables.

6. Consultant Firm Requirements

The firm must have at least five years of working experience in similar assignment; must be registered with NEMC. The firm should also show evidence having carried out similar assignments including references from previous clients. The key personnel shall have the following Qualifications.

Team Leader (Environmental Specialist): the Team Leader shall be a professional environmental scientist with prove experience in the preparation of environmental and social management plans. The Team Leader shall have a minimum M.Sc. in Environmental Engineering, Environmental Economics or related fields. The Team Leader shall have a minimum 8 years experience on similar environmental and social management plans preparations. He must as well be registered by NEMC as Environmental Expert.

Environmental Engineer: The Environmental Engineer shall have proven experience in the EIA of water resources. The Environmental Engineer shall have a minimum BSc degree qualification in science or engineering as well as relevant post graduate qualifications in Environmental management. The Environmental Engineer shall have a minimum of 5 years experience relevant experience on environmental assessment. He must as well be registered by NEMC as Environmental Expert.

Sociologist: The sociologist shall have proven experience in the social impact assessment of water resources and resettlement matters in large projects. The sociologist shall have a minimum bachelor degree qualifications in sociology or applied anthropology as well as relevant post graduate qualifications. The sociologist shall have a minimum of five years experience on social assessment.

Water Engineer: She/he shall be a professional water engineer with proven experience in the EIA of water resources. The Water Engineer shall have a minimum BSc degree qualification in a relevant field as well as post graduate qualifications in demand EIA. She/he shall have a minimum of 5 years in relevant experience and professional registration with Tanzania ERB or equivalent professional body.

Land Use Planner: She/he shall have proven experience in land use planning and resettlement matters. The Land Use Planner shall have a minimum bachelor's degree qualification in land use planning as well as relevant post graduate qualifications. The land use planner shall have a minimum of 5 years in relevant experience.

7. Reporting

The following are the main reports and deliverables expected from the consultant.

Deliverables and Time Frame

S/No	Reports	Content	Timeframe
1	Inception Report	A review of the documents and pre-meetings and interviews. Confirmation of the work plan and timing of deliverables together with a description of key challenges and issues which must be addressed by the client to enhance completion of the assignment on time and at an acceptable quality	Two (2) weeks after start of the assignment

2	Interim Report	Findings and recommendations for the detailed environmental impact assessment	Four (4) weeks after start of the assignment
3	Final Report	Final report on the detail environmental impact assessment	Ten (10) weeks after start of the assignment.

Reports should be prepared according to the National EIA Regulations (2005), two reports are to be submitted to NEMC, the initial Scoping report and the EIS. Both scoping and the EIS shall be presented in formats prescribed by the National EIA Regulations (2005).

8. Services, Facilities and Materials to be provided by the Client

The client will provide necessary services, facilities and materials to the Consultant including:

- Providing relevant reference documents as on the reference list, including the proposed design for rehabilitation works
- Organizing stakeholders meetings to validate consultancy reports

9. Deliverables

The consultant shall prepare and present of reports at various milestones in the ESIA process and as per the time schedule mutually agreed. Deliverables by the consultant shall include:

- Prepare and submit project brief to NEMC for registration;
- Undertake scoping study and submit report together with the ToR for full ESIA to NEMC;
- Draft ESIA/EIS report for submission to Technical Review Committee (TRC); and
- Final ESIA/EIS report.
- Certificate from NEMC

The consultant will be required to submit to the client six (6) bound hard copies and four (4) softcopies of each work. All the reports shall be in Standard English language, neatly bound with an attractive outlay and shall contain the main text and annexure, with designs, figures/frameworks, illustrations and/or logical flow diagrams. The softcopies shall be in MS Office on CDs/DVDs. The Consultant shall also make 15 copies for the review process as stipulated in the EMA 2004 (the costs for making such copies will be included in the budget for the assignment).

The Consultant will prepare and submit a work plan for undertaking the ESIA, activities that would be carried out and methods that shall be used, timeframe, deliverables, etc.

A scoping study which will involve literature review, identification of stakeholders, conducting a scooping exercise around the construction site and identification of alternatives, will precede the full ESIA study. The scoping exercise will further enrich these ToR for the full EIA including suggesting the likely expertise required for the assignment.

Annex II: Copy of letter for Screening Decision upon Project Registration

NATIONAL ENVIRONMENT MANAGEMENT COUNCIL (NEMC)

BARAZA LA TAIFA LA HIFADHI NA USIMAMIZI WA MAZINGIRA

Tel Dir.: +255 22 277 4852
Tel +255 22 277 4889
Mobile: +255 713 - 608930
Fax: +255 22 277 4901
E-mail: dg@nemc.or.tz
Website: www.nemc.or.tz

Regent Estate / Migombani
Plot No 29 / 30
P.O.Box 63154
Dar es Salaam
Tanzania

In reply please quote:
Ref: NEMC/616/1/Vol.1/ 25

Date: 24/07/2012

Project Coordinator,
Lake Victoria Environmental Management Project,
P.O. Box 9153,
Dar es Salaam.

RE: SCREENING DECISION ON THE PROPOSED CONSTRUCTION OF SLUGE DISPOSAL FACILITY IN BUKOBA MUNICIPALITY IN KAGERA REGION

Please refer to your letter attached with the EIA certificate application form and the Project brief in respect of the above mentioned project.

Following the review of the submitted documents, the Council has reached a decision that your project requires a full Environmental Impact Assessment (EIA) study. As a first step towards this process, you will be required to carry out a scoping exercise and submit a Scoping Report and draft Terms of References (ToR) to the Council for review and approval before the beginning of the EIA study. Also, be reminded that the scoping report should conform to the EIA and Audit Regulations 2005 and particularly Regulation 13 (3) and the Fourth Schedule made under Regulation 15 for the *contents* of the scoping report and the *essence* of the scoping exercise respectively.

For further information or clarification on this matter please do not hesitate to contact us through Telephone No. +255 715-511131.

Yours Sincerely,

K.P.Luteganya
For: Director General.

CC: Environmental Benchmark Consulting Engineers,
P.O. Box 77222, **Dar Es Salaam**.

All correspondence should be addressed to the Director - General

Annex III: Copy of the Letter for Approval of the Scoping Report and Terms of Reference

NATIONAL ENVIRONMENT MANAGEMENT COUNCIL (NEMC)

BARAZA LA TAIFA LA HIFADHI NA USIMAMIZI WA MAZINGIRA

Tel Dir.: +255 22 277 4852
Tel +255 22 277 4889
Mobile: +255 713 - 608930
Fax: +255 22 277 4901
E-mail: dg@nemc.or.tz
Website: www.nemc.or.tz

Regent Estate / Migombani
Plot No 29 / 30
P.O.Box 63154
Dar es Salaam
Tanzania

In reply please quote:

Ref:..... NEMC/616/1/Vol.1/ 25 Date:.....23/08/2012.....

Project Coordinator,
Lake Victoria Environmental Management Project,
P.O. Box 9153,
Dar es Salaam.

RE: SCOPING REPORT AND TERMS OF REFERENCE (TOR) FOR THE PROPOSED CONSTRUCTION OF SLUGE DISPOSAL FACILITY IN BUKOBA MUNICIPALITY IN KAGERA REGION

Please refer to the subject above.

We acknowledge receipt of your letter of 11th January 2012 submitted with the Scoping report and Terms of Reference (TOR) for undertaking an EIA for the aforementioned project.

The scoping report and Terms of Reference have been reviewed and found to be generally adequate as most of the environmental and social issues have been addressed, thus these Terms of Reference are approved. However, you will be required to ensure that:

- All applicable legal and policy frameworks and their respective requirements are addressed during the EIA.
- All key stakeholders are exhaustively consulted and their views and concerns are addressed

Upon submission of the EIS, the Council will arrange for the site verification visit to the proposed project site. You will be required to facilitate the visit and review of the Environmental Impact Statement. The budget whose details are herewith attached, amounts to **Tshs 6,413,000/=** which can be paid by cheque or in cash.

For further information or clarification on this matter please do not hesitate to contact us on Telephone No. +255 715-511131.

All correspondence should be addressed to the Director - General

Yours Sincerely,

K.P.Luteganya
For: Director General.

CC: Environmental Benchmark Consulting Engineers,
P.O. Box 77222,
Dar Es Salaam.

Annex IV: Sample of Copy of Invitation Letter to Consultation Meetings

Environmental BENCHMARK
Consulting Engineers
EBM
P. O. Box 77222 - Dar es Salaam
Tel : 0754 / 0784 / 0715 - 353954 & 022 2775058
E-mail: admin@environmentalbenchmark.com

Kumbu Yako: **LVEMP II WORKS**	Kumbu Yetu .: **EBM/BDC-2012/282**
Tarehe: **26 Juni 2012**	Tarehe: **26 Juni 2012**

Mkurugenzi Mtendaji
Halmashauri ya Wilaya ya Bukoba
S.L.P. 284,
Bukoba

Yahusu: Tathmini ya Athari za Miradi ya Ujenzi wa Miundombinu ya Maji Taka na Mabaki ya Maji Taka katika Manispaa ya Bukoba

Tafadhali rejea kichwa cha barua hapo juu

Wizara ya Maji kupitia katika mradi wake wa kuhifadhi Mazingira yaliyokaribu na Ziwa Viktoria inakusudia kutekeleza miradi miwili katika manispaa ya Bukoba inayohusisha ;

1. Ujenzi wa Mfumo wa Maji Taka katika mji wa Bukoba
2. Ujenzi wa Dampo la Mabaki ya Maji Taka (Sludge Disposal Facility).

Ili kufanikisha zoezi hili, Wizara ya Maji imeiteuwa kampuni ya Wahandisi Washauri wa Mazingira ya Environmental BENCHMARK ifanye tathmini ya athari za miradi hii kwa mazingira na maisha ya jamii.

Kwa barua hii tunaiomba Ofisi yako ya Manispaa ya Bukoba itutambulishe kwa watendaji wa kata za Miembeni, Bakoba, Bilele, Kahororo, Kashai, Nyanga na Nyakato ili tuweze kukutana na wadau katika maeneo husika kwa ajili ya zoezi zima la tathmini ya athari za miradi hii.

Tunategemea kufanya mikutano hiyo kama ratiba inavyoonyeshwa kwenye jedwali hapo chini

Na	Kata	Siku, Muda na Tarehe	Eneo la Mkutano
1.	Miembeni	Jumatano Saa 4 Asubuhi , Tarehe 27/06-2012	Ofisi ya Kata Miembeni
2.	Bilele	Jumatano Saa 8 Mchana, Tarehe 27/06-2012	Ofisi ya Kata – Bilele
3.	Bakoba	Jumatano Saa 10 Jioni ; Tarehe 27/06-2012	Ofisi ya Kata- Bakoba
4.	Kashai	Alhamisi Saa 4 asubuhi ; Tarehe 28/06-2012	Ofisi ya Kata - Kashai
5.	Kahororo	Alhamisi Saa 8 Mchana; Tarehe 28/06-2012	Ofisi ya Kata- Kahororo
6.	Nyanga na	Alhamisi Saa 10 Jioni; Tarehe 28/06-2012	Ofisi ya Kata - Nyanga
7.	Nyakato	Ijumaa Saa 4 Asubuhi; Tarehe 29/06-2012	Ofisi ya Kata- Nyakato

Tumepanga ratiba hii bila kuzingatia ratiba za wadau husika katika shughuli nyinginezo. Kama itawezekana mkajua utaratibu wa ratiba zao tungefurahi kupata mapendekezo ya ofisi yako kwa ajili ya mafanikio ya miradi husika.

Tunatanguliza shukrani.

Wako,

Venant RWENYAGIRA
Mkurugezi Environmental BENCHMARK- Wahandisi Washauri.

Annex V: Officials Consulted during Public Participation Process

Stakeholders' Consultation for Environmental and Social Impacts Assessment for LVEMP II Works for Construction of Sludge Disposal Facility and Sewerage System in Bukoba Municipality, Kagera Region

OFFICIALS CONSULTED

NO.	DATE	NAME	POSITION	MOBILE NO./EMAIL	SIGNATURE
1.	26/6/2012	REBORATI KWELA	Ag MD	0754-358506 0767-358906	
2.	26/6/2012	MARCO R. VITTA	LAB. MANAGER	0755 929292 0784 834479	
3.	26/6/2012	JOHN NDALAHWA	SUB-BASIN WATER OFFICER	0754 888275 0788 339966	
4.	26/06/2012	Arch. Hamza R. Kambuga	Architect Afisa Mazingira	0784472705 hkambuga@yahoo.co.uk	
5.	28/6/12	ENG. STEPHEN NIMUSIIMA	MUNICIPAL ENGINEER	0784-633252 stephenmsanga@yahoo.com	
6.	28/6/12	ENG. JOHNNY DIE KALUPALE	REGIONAL MANAGER TANROADS	0754295337 Kalupale@yahoo.com	
7.	28/6/12	DAMAS NGOWA	REGIONAL MANAGER NHC KAGERA	0754/071973 0784 dngowa@nhctz.co.	
8.	28/6/2012	Dr. R. KIUCA	MMOH	0734 895391 raphaelkiula@yahoo.co	
9.	28.6.2012	LADISLAUS PAUL OISSO	Municipal Health Officer	0754958890 ladislausoisso@yahoo.com	
10.	27-29.6.2012	CORIN SCHWAB	Env. consultant BMC	0685 399 505 corin.schwab@interteam.ch	
11.	29/6/2012	JAFARI A. OMARI	NATURAL RESOURCE OFFICER	0787211036 0764604449 jao1709@yahoo.com	
12.	29/06/12	CATRES RWEGASIRA	MUNICIPAL PLANNER	0754623938 crwegasira2001@yahoo.com	
13.					
14.					

OFFICIALS CONSULTED

NO.	DATE	NAME	POSITION	MOBILE NO./EMAIL	SIGNATURE
1.	25/06/2021	Eng. CHAGGAKA J.A. KALIMBIA	MD	0787860591 0784860591 buwasabukoba@yahoo.com	
2.		CHARLES M. CHIBUGA	O&M Engineer	0754-513364 chibuga1@yahoo.com	
3.	26/4/20	ENG. PHILBERT ISHENGOMA	NCTA (T2)	UN-HABITAT	
4.					
5.					
6.					
7.					
8.					
9.					
10.					
11.					
12.					
13.					
14.					

Annex VI: Pictures of Consultation meetings

Annex VII: Public Attendance to a Consultation Meeting

MAHUDHURIO KATA YA NYANGA

NA	TAREHE	JINA	MTAA	SAHIHI
1.	28/06/2012	Deus K. Mutakyahwa (Diwani)	Nyarubanga	[illegible]
2	28/6/2012	Leticia Revocatus	11 – 11 – 11	ER.
3	28/6/2012	Jasoni yusilad	11	[illegible]
4	11	Restuta Audax	11	Restuta
5	28/6/2012	Theonestina Michael	11 – 11 – 11	[illegible]
6.	28/6/2012	Adelina Alistides	– 11 – 11	Rizik
7	28/6/2012	Godwin. L. Tegamaisho	Mkiti Ihyolo	[illegible]
8	– 1 –	STADIUS PASCHAL	MJUMBE	SPaschal.
9	– 11 –	Rugambwa J.	– 11 –	Rugambwa
10	28	Gesoni	Mkosi	[illegible]
11	29	GRYSONI FELICIANI	– 11 –	Grysoni
12.	28/6/2012	Godwini. F. Kamgisha	– 11 –	Kamgisha
13	28/6/2012	Willison Erasto.		[illegible]
14	28/6/2012	Audax Costantine	Nyarubanga	[illegible]
15	28/6/2012	AONI GOSN	[illegible]	[illegible]
16	28/6/2012	MGTA SOSNI	[illegible]	[illegible]
17	28/6/2012	Juma YUSUPH	NYARUBANGA	[illegible]
18	28/6/2012	JOSEPH PASTORY	NYARUBANGA	[illegible]
19		Dominic Alex	NYARUBANGA	[illegible]
20	28/6/2012	Benjamini Mtagobwa	Ihyolo	Mtagobwa
21	28/6/2012	Anastha . Sospatri	Nyarubanga	[illegible]
22	28/6/2012	[illegible]	[illegible]	[illegible]
23	28/6/2012	Ausoni Apikadi	Nyanga	Ausoni

AFISA MTENDAJI KATA NYANGA

MAHUDHURIO KATA YA NYANGA

NA	TAREHE	JINA	MTAA	SAHIHI
24	28/06/2012	RESPICIUS CHRISTOPHER	NYAKAKANJA	
25	28/06/2012	JONAS BALIKWA	NYANGA	
26	28/6/2012	EGIDIUS RWEKAZA	-H-	
	28/06/12	JOSEPHAT KANJAGE	-11-	
	-11-	CHRISTOPHER RWEKAZA	-11-	

OFISA MTENDAJI KATA NYANGA

Annex VIII: Minutes for public meetings at Nyanga Ward

MUHTASARI WA KIKAO CHA WADAU WA MRADI WA MIFEREJI YA MAJI KATA NYANGA KILICHOFANYIKA TAR 28/06/2012

AGENDA

1. KUFUNGUA
2. UTAMBULISHO
3. MRADI WA MAJI MACHAFU
4. MRADI WA MAJI TAKA
5. KUFUNGA KIKAO

AFISA MTENDAJI KATA NYANGA

01. KUFUNGUA

Mtendaji wa kata bwana Egidius Rwekaza alifungua kikao kwa kumkaribisha Diwani 10:13 AM

02. UTAMBULISHO

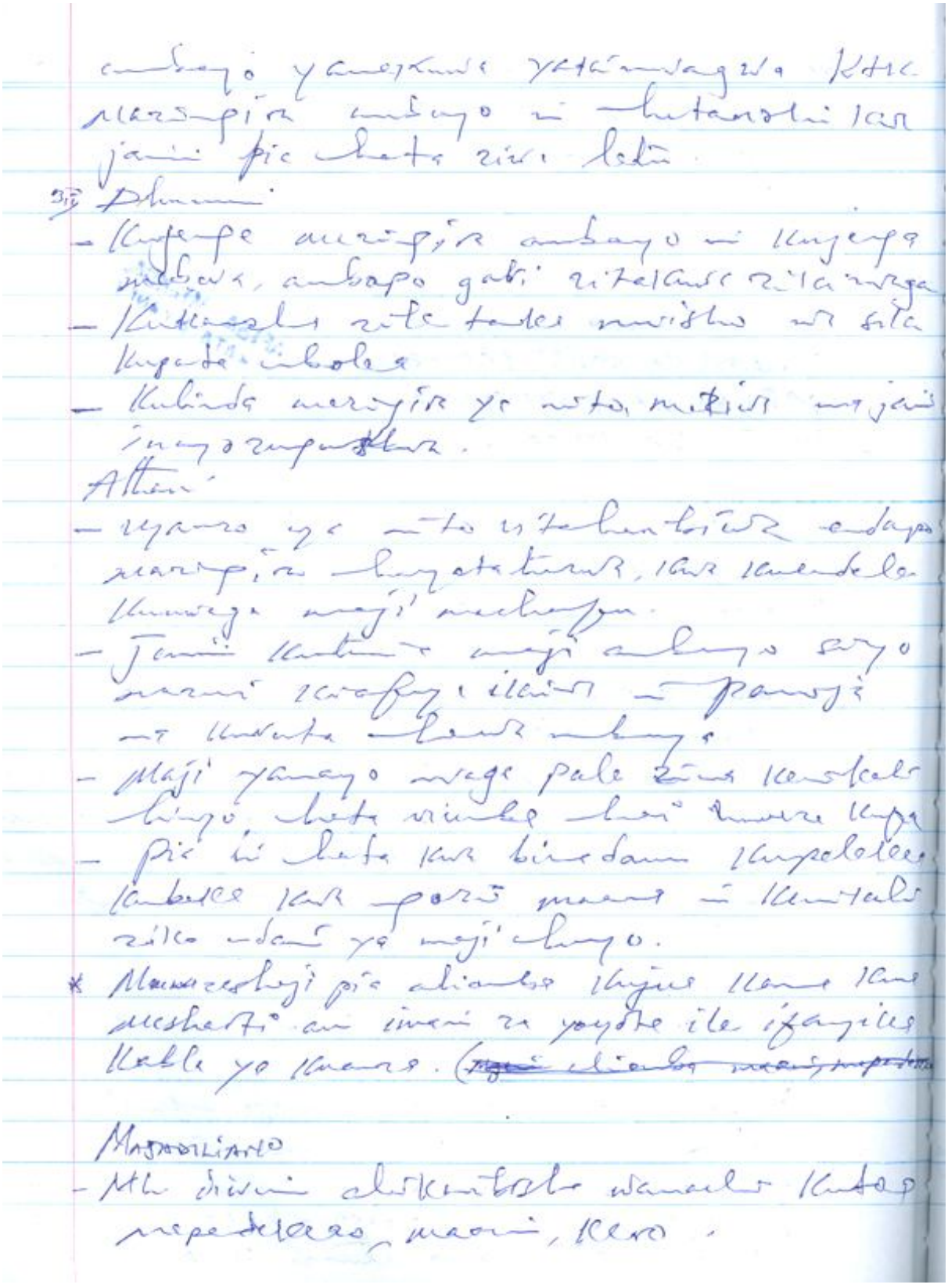
MH Diwani alifanya utambulisho wa wageni ambao ni wengi [illegible] [illegible] radhi kwa [illegible] [illegible] [illegible], [illegible] afisa mtendaji aliwakaribisha wageni ambao mmoja wapo aliwatambulisha wageni

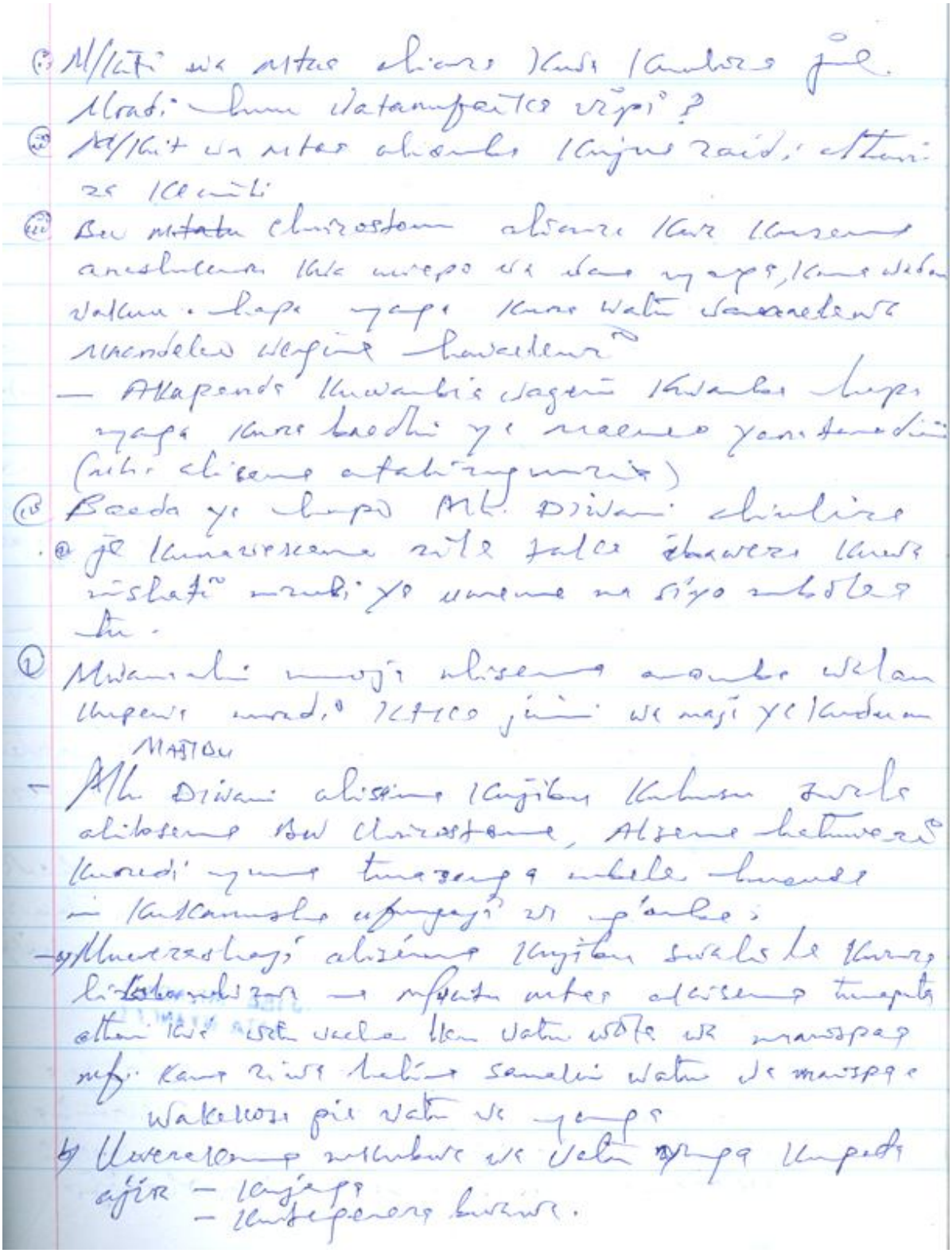
(3) MRADI WA MAJI MACHAFU

Mwezeshaji alianza kufafanua [illegible] maji machafu

alianza kusoma (i) [illegible] maji [illegible] kuchafua maji pia [illegible] oxygen kwa samaki

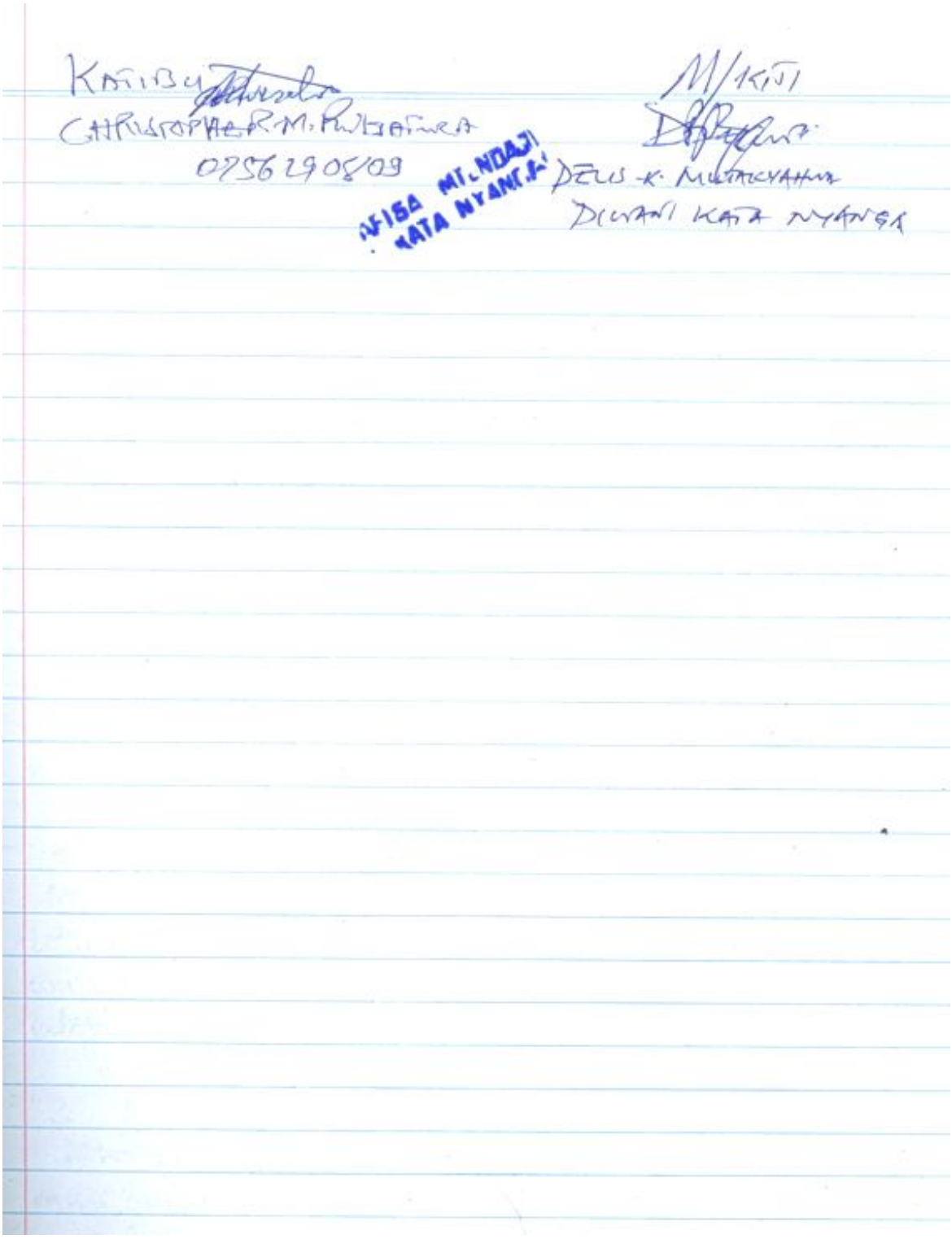
(ii) Maeneo yenu ni madogo [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] ya maji hayo.





- Akina mama kuuza vyakula kwa watu ambao watafanyakazi pale.
- Kupunguza magonjwa mf. yatakuwa baadala ya pesa kutumika kwa shughuli nyingine za maendeleo
- Suala la [illegible] — [illegible] [illegible] [illegible] mradi [illegible] [illegible] [illegible] atakaelipwa kwa pande zote za Wananchi.
- Suala la fidia kwa wananchi walio karibu na eneo ya Tukio [illegible] kwa kuwa eneo lishatengwa lisipodaiwa [illegible] fidia ata per
- Kufanya vyoo vya kudumu
- Suala la maji kwa [illegible] kupimwa na wataalamu kupima maji mara kwa mara.
- Suala la Kutenga ardhi [illegible] kwa kuwa kupata eneo la ardhi ni dili [illegible] mapema.
- Suala la Kuboresha [illegible] [illegible] kwa mshahara mf. Bio na [illegible] [illegible] [illegible] [illegible] [illegible] wateja [illegible]

KUFUNGA
M/kiti Kamati ya maendeleo ya Kata ya Nyanga alifunga mkutano kwa kuwashukuru wote waliohudhuria pale Wananchi pamoja na wageni wengine [illegible] pale, [illegible].



Annex IX: Water Quality Baseline near Sludge Disposal Site

THE UNITED REPUBLIC OF TANZANIA

MINISTRY OF WATER

Telegram:" MTO",
Tel: +25528 2220544
Telefax: +25528 2220544
E-mail Address: waterquality-bukoba@africaonline.co.tz

Water Quality Services,

P. O Box 81,
BUKOBA.
Date...29 June 2012.

In reply, Please quote:
Lab. No...*BK 243/12*.....

PHYSICAL AND CHEMICAL WATER ANALYSIS REPORT.

1. ORIGIN OF THE SAMPLE.

Analysis requested by: ...*Environmental Benchmark*.....
Ref: No.....-.....
Dated.....-.....
.Date received at the Laboratory.....*14 June 2012*.....
Date collected for analysis.....*14 June 2012*.....
Time.....*11.00*.....
Temp...*25*°C.....
Water source.....*Stream at Nyanga sludge disposal area*...
Region.....*Kagera*...
District...*Bukoba .MC*....
Ward...*Nyanga*
Village.. *Nyanga*
Purpose of sampling... *BASELINE DA TA*
Sampling position...*S01.---------0º, E031.--------*...
Preservative added/Type of treatment to water before sampling.....*Nil*.....

2 PHYSICAL EXAMINATION

Appearance:
Turbidity...*1.90*.....NTU
Settleable matter...*<0.1*....Ml/L
pH.....*5.8*.....
Conductivity at 25°C...*8.73*...µS/cm
Total Non filterable residual at 105°c...-....mg/L
Colour.....*5.0* .mg Pt/L
Temp...*23.3*..
Odour...*Unobjectionable*.....
Taste.....*Unobjectionable*.....
Total Filterable residual at 105°C.....*<0.1*.....
Total volatile and fixed residual at 550°C - mg/L

3 CHEMICAL EXAMINATION (In milligrams per liter)

Alkalinity (as $CaCO_3$)
Phenolphthalein.....Nil.....
Total .....32.00.....
.....
Cadmium.....
Chromium.....
Copper.....
Lead.....
Mercury.....
Sulphate.....*0.73*...
Permanganate Value (as mgKMnO₄/L).....
Hardness (as $CaCO_3$)
Carbonate...*13.0*...
Non-carbonate...*Nil*...
Total Hardness...*13.0*.....
Total Nitrogen.....
Ammonical-Nitrogen...
Organic Nitrogen.....
Nitrate-Nitrogen...*0.018*.....
Nitrite-Nitrogen.....*0.019*...
Total Phosphorus.....
Salinity...*Nil*...
Calcium...*2.80*.....
Magnesium...*1.46*....
Sodium.....
Potassium.....
Chloride...*21.27*...
.Fluoride...*3.0*.....
Iron...*0.97*.....
Manganese.....
Zinc.....
Orthophosphate...*0.211*...
TDS...*10.0*.....

4 BACTERIOLOGICAL EXAMINATIONS.

Number of colonies per 100mls of water sample growing on nutrient Agar/Broth
Total Coliforms at 35-37°Cfor 24-48Hrs *ND*....Faecal Coliforms at 44-44.5°C for 24hrs... *ND*. and Faecal Streptococci at 37 0C for 72 hrs *ND* ...

5 REMARKS

The water sample analysed according to customer's request.

6 RECOMMENDATIONS

I have no comment on the water sample sent to our Lab for analysis since was to know their quality before commencement of the Sludge disposal project.

Date..29.06.2012.Reporting Officer.....Head of the Laboratory.....

MINISTRY OF WATER & IRRIGATION
WATER QUALITY LABORATORY
BUKOBA

Annex X: NEMC Comments – Response Table (sludge disposal)

S/N	ITEM	ACTION
1.0	GENERAL COMMENTS	
1.1	The Non-technical Executive Summary in English and Kiswahili version is missing.	They are included as separate documents
1.2	The content of Executive Summary should be in line with Reg. 18 (3) of the EIA and Audit Regulations, 2005.	Contents made according to the requirements of Regulation 18(3) of the EIA and Audit Regulations, 2005
1.3	The title of the project should be "proposed construction of sewerage sludge disposal facility in Bukoba Municipality, Kagera Region".	The word Sewerage has been added to the title but one should bear in mind the fact that the old title is in many correspondence and contract documents, therefore changing the title on the final report may make this report stand alone without any link to the other records
2.0	SPECIFIC COMMENTS: **Review Area 1** **Description of the development, local environment, baseline conditions**	
2.1	In section 2.4.2 page 15 more description should be included e.g. component of pumping station and their capacities. Also the pumping pressure should be discussed in this section.	Unfortunately there is no pump station in this project. This information is wrongly placed.
2.2	Section 4.2 on page 41-42 should be narrowed down to specific project site and recent data of the soil study should be used as the provided one is outdated.	The section is now presented specifically to the project Area but one should note that the facility will be receiving sludge from the whole of Bukoba Municipality which is not served by the central sewerage system.
2.3	The source of data for table 4 is contradicting as the heading present the population by wards in 2012 while the source of data on page 43 in census of 2002.	Information rectified to match the 2012 population and housing census.
2.4	Baseline condition chapter on page 41-54 should include the following data I. Wind direction on the project site. II. Current disease profile III. Hydro geological information.	Information on wind , top ten diseases and hydro geological information included in respective sections under baseline conditions
2.5	The project description should clearly describe the specific method of disposing sludge after the treatment/dry cake.	Described under section 2.5 consisting of the project operation
2.6	The way/method used to collect sludge from households to the project site should be described in report.	Described under section 2.5.1 on collection of sludge from domestic points.
2.7	The design of constructed wetland is should be described in terms of its capacity and efficiency.	Most designs are comprised of assumptions like the operating temperatures, retention time, evaporation rates etc. When the wetland

		is completed then monitoring of the system determines the efficiency and the actions are then decided. The physical capacities are there and are based on dimensions of the facilities as contained in the drawings presented (figures 5 to 9). But removal efficiencies are subject to variations as it will be determined during performance monitoring.
2.8	In section 2.1 on page 9, 1st sentence, mention the exact village in which the project will be located.	Nyanga Village is the exact location where the project will be implemented and it is indicated under section 2.1
2.9	Describe the accessibility of the project site from Bukoba Central Business District.	Presented under section 2.1
2.10	On page 28 The Land Acquisition is Cap 188 R.E. 2002.	Corrected as required
2.11	On page 29 section 3.3.3 the Forest Act is not administered under the forest ordinance (1957) the sentence should be removed. Also the law was not revised but was repealed by Act No. 14 of 2002.	Corrected as necessary
3.0	**Review Area 2** **Identification and Evaluation of Key Impacts**	
3.1	Cumulative and residual impact of the project should be discussed in the impact chapter.	No cumulative or residual impacts were noted during the assessment of the proposed project
3.2	Waste associated with existence of construction crew should be incorporated in the impacts associated with construction phase.	Included under section 7.3 item or impact 16 which covers generation of construction solid and liquid wastes whose mitigation measures have been covered under same section
4.0	**Review Area 3** **Alternatives, Mitigations and Commitment**	
4.1	Summary of compensation status should be included in the report.	There is no resettlement at this site and the site belongs to Bukoba Municipal Council and that is why the adjacent land is used for disposal of solid waste.
4.2	Alternative site, design/technology and operating conditions should be discussed in the report.	These elements are discussed under sections 6.4.1 Alternative project area and Section 6.4.3 on sludge disposal options. Construction technology has also been presented under section 6.4.4.
4.3	The qualitative monitoring system of influent from the facility is should be well described in the design as one of mitigation measure to avoid pollution of the river.	This mitigation action is strictly mentioned under section 7.2.3 item 4 which refers to the mitigation measures for pollution of the nearby streams and ground water.
4.4	Table 24 (Environmental and Social Monitoring Plan) on page 96-99 include the column for monitoring parameter.	Table No 24 is for the Environmental and Social Management plan. The column for monitoring parameter is

		under table 25 column no 2.
5.0	**Review area 4** **Public participation and communication of results.**	
5.1	Stakeholders' views response table to show how issues raised by stakeholders have been taken care in the EIS should be included in the report.	Stakeholders consultation meetings were a two-way communication system whereby issues asked were responded to immediately and some were mainly on gaining understanding on how the system works. Some or many of the issues were for information only, then how does one show these in the report. Responses are included Important issues are handled under important subjects like mitigation measures for impacts of the project.
5.2	Language used and spell check should be checked throughout the report.	The whole document has been checked and spellings checked.
5.3	On the cover page, the e-mail address of NEMC is incorrect; it should dg@nemc.or.tz	Changed as advised on this item.
5.4	The report structure should be in a way that executive summary should start and followed with table of content. Also the content of the executive summary should be in line with Reg. 18(3) of the EIA and Audit Regulation, 2005.	The Executive summary has been shifted and it now appears before the table of contents.