

ENVIRONMENTAL IMPACT ASSESSMENT REPORT
FOR
THE PROPOSED BIOTOILET CONSTRUCTION AT ST AUGUSTINE NYAMONYE GIRLS
SECONDARY SCHOOL, SIAYA COUNTY
GPS -0.04980306, 34.14052200



PROPONENT

Lake Victoria Environmental Management Project II

PO BOX 9220-40100

Kisumu

JUNE 2014

CERTIFICATION AND SUBMISSION

CERTIFICATION

Environmental Impact Assessment Report for the BIOTOILET COSNTRUCTION AT
NYAMONYE GIRLS SECONDARY SCHOOL (June 2014).

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EXECUTIVE SUMMARY

St Augustine Nyamonye girls' secondary school in Nyamonye sub location, North Yimbo location, Bondo sub county, Siaya County has been selected to host a biotoilet facility within the school. The school was established in 1989 under the catholic arch diocese of Kisumu and with support of the local community. The school is located past Bondo town on the Bondo -Usenge road, with address Po box 73 Nyamonye. The school has about 800 students who will benefit from this project. The proposed project will entail construction of a bio toilet utilising a 124m³ bio digester for waste decomposition, the resultant gas can be tapped for use in the school kitchen. The facility will have four toilets and two bathrooms.

The Lake Victoria Environmental Management Project (LVEMPII) aims at contributing to the East Africa Community's (EAC) Vision and strategy Framework for Management and Development of the Lake Victoria Basin of having a prosperous population living in a healthy and sustainably managed environment providing equitable opportunities and benefits. The project will contribute to broad-based poverty alleviation and improvement of livelihood of people, by supporting sustainable management of shared natural resources of the Lake Victoria Basin (LVB). This will be achieved by supporting:

- I. Instituting capacity development and harmonization of policy legislation, and regulatory frameworks; and
- ii. Community Driven Development (CCD) sub-projects investments in participatory watershed management.

Improved sanitation is identified as an important goal in the second pillar (social) of vision 2030. The project has selected sanitation improvement through the construction of bio toilets as one of the community driven development project.

Nature of the project

The bio toilet will have separate rooms for men (gents) and women (ladies) accessed through different doors.

- Ladies- 4 toilets, 2 shower, sinks
- The facility is designed to have overhead tank for distributing water/ selling water to the community.
- Bio-Digester, This facility will be connected to the toilet and will have an inlet, two chambers, the bio digester and an expansion chamber. The main biodigester will have a gas outlet for evacuating the resultant gas.

To ensure sustainable development the Kenyan Government policy on all new projects, programmes or activities requires that an environmental impact assessment be carried out at the planning stages of the proposed undertaking to ensure that significant impacts on the environment are taken into consideration during planning stages. The proponent has contracted the EIA expert to conduct an Environmental Impact Assessment Study for the proposed project and compile a report for submission to NEMA for review and necessary approval before commencement.

Project Objective

The overall objective of the proposed project is sanitation improvement.

EIA Methodology

The general steps followed during the assessment were as follows:

- Environment screening
- Environmental scoping that provided the key environmental issues.
- Desktop studies and interviews
- Physical inspection of the site and surrounding areas
- Public participation via the use of questionnaires
- Reporting.

Potential impacts

Some of the positive impacts identified were Employment opportunities for workers, Improved sanitation and health, Cheap source of fuel from biogas, Provision of market for supply of building materials, Aesthetic improvement.

The negative Impacts associated with the proposed project (construction through to decommissioning phase) are:

impact	Mitigation measures
Solid waste generation and disposal	Sanitary bins for disposal of sanitary towels The proponent through a caretaker will ensure that the site is clean. Wastes from the biodigester can be used as manure Contract waste collectors to dispose waste at the council dumpsite
Air pollution/ nuisance from	Sprinkle water dusty materials such as gravel, sand, ballast Regular cleaning of the facility using detergents to kill smells

<p>odors</p>	<p>Water for flushing the toilet should also be available</p> <p>Well designed biodigester/ airtight</p> <p>Use serviced machinery and vehicles for supply of raw materials</p>
<p>Noise pollution</p>	<p>Delivery of raw materials to site to be done only during the day</p> <p>Construction takes place at day time only</p> <p>No delivery of raw materials should be undertaken during weekends</p> <p>Use of serviced vehicles and machinery is also expected to reduce noise levels</p>
<p>Sourcing of raw materials</p>	<p>The contractor will obtain construction raw materials from sources that are compliant with NEMA Regulations.</p> <p>The contractor will procure quantities that are sufficient for the intended works only to curtail wastage.</p> <p>The contractor will commit to extensive use of recycled raw materials as will be appropriate and in a manner that does not compromise the safety of the development</p>
<p>Occupational Health and Safety of Workers</p>	<p>The contractor will provide workers with appropriate PPE</p> <p>Fence site to prevent accidental falls into gaping holes</p> <p>Workers to be trained on equipment use</p> <p>First aid facilities to be available on site</p> <p>Contractor to comply with the requirements of the OSHA</p> <p>All visitors to the site to be provided with PPEs</p>
<p>Fire hazard</p>	<p>Expert advice on the use and maintenance of the biogas digester and related infrastructure</p> <p>Pressure gauge to detect stored quantity</p> <p>Fire extinguisher/sand buckets/ water in the facility</p>

Ground and surface water pollution	Wastes will be evacuated from the bio digester only after thorough decomposition Proper maintained of plumbing and associated works
Risk of disease spreading	sinks for hand washing after visiting toilet, Notices inside the toilet advising on importance of hand washing. toilets kept clean/ regular cleaning
Pests/ vermin outbreak	Proper cleaning of the toilet Use of biopesticides
Increased demand for water	Roof catchment will be installed to trap rain water for use The toilet will be connected to the existing piped water for the school Notices in the rooms to save water

Conclusion

From the study it is evident that the proposed project will have both positive and negative impacts. If the proposed project is constructed and operated taking into account the proposed mitigation measures, most of the negative impacts are considered minor against the projected short and long term benefits that will accrue from its establishment and operation. It is expected that the Environmental Management Plan developed will be fully integrated in the project during the construction as well as during the operation phase.

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ABBREVIATIONS

EA	Environmental Audit
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EMCA	Environmental Management and Coordination Act
CAP	Chapter of Laws of Kenya
DEAP	District Environment Action Plan
KPLC	Kenya Power and Lighting Company
NEMA	National Environment Management Authority
CBO	Community based organization
VAT	Value Added Tax
M	Meters
Mm	millimeters
Km	Kilometer
SIBOWASCO	Siaya and Bondo water services company
SIBO	Siaya and Bondo
LVSWSB	Lake Victoria south water services board

CHAPTER 1: INTRODUCTION

1.1 Background

St Augustine Nyamonye girls' secondary school in Nyamonye sub location, North Yimbo location, Bondo sub county, Siaya County has been selected to host a biotoilet facility within the school. The school was established in 1989 under the catholic arch diocese of Kisumu and with support of the local community. The school is located past Bondo town on the Bondo -Usenge road, with address Po box 73 Nyamonye. The school has about 800 students who will benefit from this project. The proposed project will entail construction of a bio toilet utilising a 124m³ bio digester for waste decomposition, the resultant gas can be tapped for use in the school kitchen. The facility will have four toilets and two bathrooms.

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- I. Instituting capacity development and harmonization of policy legislation, and regulatory frameworks; and
- ii. Community Driven Development (CCD) sub-projects investments in participatory watershed management.

Improved sanitation is identified as an important goal in the second pillar (social) of vision 2030. The project has selected sanitation improvement through the construction of bio toilets as one of the community driven development project.

In its bid to comply with the World Bank Safeguards and the Environmental Management and Coordination Act (EMCA) of 1999 and Part II and III of the Environmental (Impact Assessment and Assessment) Regulations 2003 (Legal No. 101), LVEMP II has undertaken this Project Report for submission to the National Environment Management Authority (NEMA) for review and eventual Licensing before the development commences.

This EIA report provides relevant baseline information of the project area, anticipated impacts to the environment and social aspects, appropriate mitigation measures necessary for incorporation in the project implementation, as well as an environmental management plan. Approval will, therefore, be

sought on the grounds that environmental performance will be assured from the construction works and operation phase upon commissioning, through the development of appropriate environmental management actions and monitoring programs.

1.2 Scope and objective

1.2.1 Scope

The scope of this Environmental Impact Assessment, therefore, covered:

- The baseline environmental conditions of the area,
- Description of the proposed project,
- Provisions of the relevant environmental laws,
- Identification of any adverse impacts to the environment anticipated from the proposed project,
- Appropriate mitigation measures,
- Provision of an environmental management plan

1.2.2 Objective

- To examine in detail likely positive and adverse environmental impacts associated to the proposed project
- To propose appropriate mitigation measures for the significant negative impacts
- To develop an Environmental and Social Management Plan

1.2.3 Terms of reference

- i. To collect relevant information that will be useful for the sub project report.
- ii. To assess and report on the location of the sub project including the physical area that may be affected by the sub project's activities.
- iii. To assess and report the nature, design and budget of the sub project.
- iv. To assess and report on the economic and socio-cultural impacts of the sub project to the local community and the nation in general.
- v. To assess and report the activities that shall be undertaken during the sub project construction, operation and commissioning phases.
- vi. To assess and report the materials to be used products and by-products, including waste to be generated especially during construction phase and the methods of their disposal.

- vii. To assess the potential environmental impacts of the sub project and develop the environmental management plan for the construction, operation and maintenance including mitigation measures as per LVEMPII ESMF guidelines.
- viii. To develop an action plan that ensures the health and safety of the workers and neighboring communities in the sub project cycle.
 - ix. To fill in and submit the NEMA Project Report Form.
 - x. To provide recommendation if any, for improving the existing environment screening process.
 - xi. Prepare and submit a Project Report to NEMA.
 - xii. To provide any other information that the NEMA may require.

1.3 The EIA Methodology Approach

The approach to this exercise was structured such as to cover the requirements under the EMCA, 1999 as well as the EIA regulations as stipulated under the Gazette Notice No. 56 of 13th June 2003. It involved largely an understanding of the project background, the preliminary designs and the implementation plan as well as commissioning. In addition, baseline information was obtained through physical inspection of the site and the surrounding areas, interviews with a sample of neighboring residents using questionnaires and discussions with the client.

The key activities undertaken during the assessment were:

- (i) Continuous discussions with the Client and other sources of information on the proposed project details, the site planning and implementation plan.
- (ii) Thorough physical inspections of the proposed site and interviews with the immediate neighborhood. A questionnaire was circulated to the residents to obtain their honest opinion regarding the project (samples have been annexed to this report).
- (iii) Evaluation of the activities around the site and the environmental setting of the wider area. This was achieved through existing information, literature and physical observations.
- (iv) Review of available documentation.
- (v) Reporting, review and submissions.

CHAPTER 2: PROJECT DESCRIPTION

2.1 Site location

The proposed development will be located at Nyamonye girls' secondary school in Nyamonye sub location, North Yimbo location, Bondo sub county, Siaya County. The project site is next to the Bondo - Usenge road at Nyamonye, GPS -0.04980306, 34.14052200.

2.2 Site status

The proposed site is within Nyamonye girls' secondary school. The school has a population of 800 students. The proposed site is at the end of the school compound near the existing latrines. Currently the site is clear except for a live fence.

2.3 Existing infrastructure

The project site is in Nyamonye girls secondary school. Just before Usenge town on the Bondo-Usenge road. Access road to the school is all weather tarmac roads. Electricity and mobile phone coverage is available. Water supply system is available from a water project started by the catholic parish of Nyamonye that pumps water from the lake. The project site, just like the larger Bondo district has no public sewage system. Latrines and septic tanks are used for sewage disposal.

2.4 Nature of the project

The proposed bio toilet utilising a bio digester.

The development is intended for use by students and staff of the school. The bio toilet is designed to have separate rooms for men (gents) and women (ladies) accessed through different doors. But in the case of Nyamonye girls secondary, all the rooms will be used by the girls as this is a girls only school..

- Ladies- 4 toilets, 2 shower, 2 sinks. The current design include a urinal but the engineer will be able to exclude that as this is a girls school with no need for urinals in the toilets.
- The facility is designed to have overhead tank for water storage. This tank will only be used for water storage for use in the toilet.
- Bio-Digester, This facility will be connected to the toilet and will have an inlet, two chambers, the bio digester and an expansion chamber. The main biodigester will have a gas outlet for evacuating the resultant gas.

2.4.1 Working of a Biodigester

A process, which involves breakdown of organic sludge in an airtight reactor under anaerobic condition (without oxygen) to harmless compounds; these can even be used as manure in farms. The biodigester will also produce methane gas that can be harvested for use as a fuel

In a typical anaerobic digester, there is usually presence of three different groups of bacteria working cooperatively to breakdown the sludge compound. The first group of bacteria is responsible to hydrolyze large compounds such as protein and fats to basic smaller molecules like amino acids and fatty acids. A second group known as the fermenter, further breaks down the smaller molecules under anaerobic condition mainly into acetic acid and lastly, the final group of bacteria will utilize these acetic acids to form methane and carbon dioxide. In an efficient organic waste anaerobic digester system, all these bacteria must exist in a state of dynamic equilibrium.

2.5 Site Ownership

The toilet will be located in st Augustine Nyamonye secondary school which is a public secondary school in Bondo sub county, Siaya County.

2.6 Project Activities

Construction activities will involve the following:

- (i) Site preparation (fencing to avoid intrusion/ protect residents and removal of vegetation).
- (ii) Excavations, filling and building foundation.
- (iii) Building works and removal of construction wastes.
- (iv) Procurement of construction materials and delivery of the same to the site.
- (v) Storage and utilization of materials.
- (vi) Civil, mechanical, and electrical works.
- (vii) Completion of the building.
- (viii) Solid waste collection and commissioning of the facility.

2.6.1 Wastes associated with the construction phase

- Refuse generated by construction workers, construction spoil material, debris, and other solid waste during the construction

2.7 Operational activities

This will be a toilet. Other activities are cleaning, maintenance and repairs, utilizing methane gas from the biodigester. Periodic emptying of the biodigester, the decomposed wastes can be used as manure.

2.7.1 Wastes associated with occupational activities

- General solid waste from general cleaning of the premise plastics, papers.
- Increased sanitation waste.
- Methane gas
- Manure or composted wastes

2.8 The demolition phase

Demolition exercise shall involve the following:

Demolish and remove all the concrete works, sanitary utilities, wooden and roofing materials, remove all the electrical fittings and associated cables

Ensure proper handling of the demolished materials and have an authorized and guided transportation and disposal away from the site area.

2.9 Project Budget

NEMA fee for EIA license is calculated as 0.1% of the project cost.

CHAPTER 3 BASELINE CONDITIONS

3.1 Introduction

The following baseline information details on environmental, socio-economic and bio-physical characteristics of the site. It is meant to provide for a benchmark for continued monitoring and assessment of the impact of implementing the proposal on the environment.

3.2 Environmental setting

Bondo district lies between 0° 26° to 0° 90° and from longitude 33° 58° E and 34° 35° W. this is within Siaya County which is one of the forty seven (47) counties established under the new Constitution of Kenya 2010, Bondo district covers a total of 1,972km² out of which 972km² is land mass while the rest 1,000km² is water surface. The project is location at Nyamonye sub location, North Yimbo sub location, Bondo.

3.2.1 Flora and fauna

The local landscape contains mainly bushland and scattered trees, The school has planted many trees and flower for beautification purposes in the school compound.. Most of the trees are planted within individual compounds. Gravelia, tevetia, bougainvillea, euphorbia, and kay apple among others. The are has been disturbed by human activities as such there are no large animals, except for bird and small mammals such as hare.

3.2.2 Water supply

Lake Victoria is the largest water body in the county and an important source of water, other sources is rain water and river water. The Siaya – Bondo Water Supply Company (SIBO) operates the Bondo water supply scheme though the coverage is still low. (UN-HABITAT – LVWATSAN Bondo Appraisal Report). The school accesses water through its own water supply system operated by Nyamonye catholic parish.

3.2.3 Sewage systems

Bondo does not have water borne sewerage. Sanitation in the town is predominantly pit latrines, septic tanks (no exhauster service in the town) and a public toilet constructed near the market. Use of septic tanks is limited to a few well-to-do people, such as, hotel owners, business community who can afford their construction. A number of these types of people have also constructed ventilated improved pit (VIP) latrines. (UN-HABITAT – LVWATSAN Bondo Appraisal Report). This is bound to change due to the ongoing project to install sewage system in Bondo town

Project area is no exception with pit latrines and septic tanks the main mode of sewage disposal.

3.2.4 Solid waste management

Considerable garbage is generated in the market places and shopping areas. However, the amount of garbage produced daily far outstrips the collection and disposal capacity of the town council. Most of the garbage is strewn all over the town and can also be seen in garbage mounds that spring up in undesignated areas. The Town Council uses a standard tractor towing a non-tipping trailer constructed in mild steel, to transport solid waste to a fenced disposal site.

This service is restricted to town and the school has a pit where garbage is thrown and burned.

3.3 Geographical setting

3.3.1 Topography

Topographically, the district is divided into scattered highlands such as Got Ramogi and Usenge in Usigu division, Got Abiero and Sirafuongo in Nyang'oma division, lowlands of Yala Swamp and Uyoma Plains. These result into differences in relief, soils and land use. These features give rise to altitudes ranging between 1140m and 1400m above the sea level.

3.3.2 Climatic conditions

The district has a modified equatorial climate with strong influence from local relief and the Lake. Predominantly, the district has warm, dry and humid climate with mean annual rainfall ranging between 800-1600 mm on bi-modal rainfall pattern of long rains occurring between March and May and short rains occurring between October and November. Temperatures too vary with mean of 22.5°C and evaporation varies between 2000 mm and 2200 mm annually..

3.3.3 Geology and soils.

The geology of the area is made up of the old Nyanzian rock system made up of exposed volcanic rocks such as basalt, desite and ryolite. These rocks lead to the formation of black cotton loamy and red volcanic soils. Good fertile soils can be found in Ugunja, Ukwala, Yala, West Sakwa, South Nyang'oma and Usigu while relatively poor soils are in Karemo, Boro, Wagai, Uranga, North Sakwa, East and Central Yimbo.

The district has various soil types as highlighted below;

- West Sakwa, South Nyang'oma and Usigu division have ferralsols
- North Sakwa, East and Central Yimbo have luvisols with low-moderate fertility
- Yala Swamp in Usigu division has gleysols, which are water logging, fertile and Variable
- Madiany division has fertile and moderately deep *Phaeozeous* soils

- Nyandiwa valley in South Asembo has valley soils of low fertility.

3.4 Socio economic setting

3.4.1 Demography

Siaya County has a population size of about 842,304 according to the 2009 Population Census of which 47% are males and 53% females living in 199,034 households. The county has a surface area of 2,530.38 sq km culminating to a population density of 333 people per km². The population is young with 46.1 % being between ages 0 to 14 years, 50.9 % within 15-64 years and eventually 3.0 % are above 65 years.

Table 1 County population summary as per 2009 Kenya Population and Housing Census:

Male	398,650
Female	443,654
Total	842,304
Households	199,034
Area in Sq. Km.	2,530.38
Density	332.88
Rural Population	731,444
Rural Population	110,860
Poverty	70.8

Source: KNBS

3.4.2 Land Use and Socio-economic setting

Agricultural activities: agriculture contributes 79% to the household incomes. The vast land in the District has a high potential of livestock production. Unchecked keeping of livestock has resulted to overgrazing which has increased the loss of soil cover, through soil erosion.

Fishing: the District is endowed with an estimate of 1000 km² of water mass making fishing to be one of the major economic activities in the District. Currently, there are 3 main commercial species harvested. Nile perch is processed for export, whereas Tilapia and omena are consumed locally. Fish landings have been declining over the last decade due to a complex interplay of socio-economic and

environmental factors. Excessive fishing pressure has been blamed for the declining fish stocks. Invasive weeds such as the water hyacinth have also been blamed for declining catches apparently because the weeds block fishing grounds and beaches. Aquaculture is still in its primary stages of development and is yet to pick up.

3.4.3 Poverty

Bondo is one of the poorest districts in the country with poverty levels being as high as 70.6%. The most affected group is the women. Also another group which is affected is the youth, whose percentage stands at 20.4 % of the total population. (Bondo DEAP 2008-2011)

3.4.4 HIV and AIDS

According to the National HIV Surveillance report, the national prevalence rate stands at 5.1%, Nyanza Province 15.3%, bond district with a prevalence rate 23.6%, (Bondo DEAP)

The impact of HIV/AIDS continues to be felt in most sectors of the economy with the economically active population (20-49) years being the most affected. In the health sector, most resources have been diverted to the prevention and treatment leading to a strain on the entire health sector. Consequently, HIV/AIDS is hindering the efforts to create wealth and employment by draining national economic resources. The education sector has not been spared either as most students continue to drop out of school to either care for the sick or their young siblings leading to an increase in the rates of school drop-outs in Bondo.

It is therefore imperative that workers/ community are aware of the dangers of irresponsible sexual behavior as it can lead to spread of HIV.

CHAPTER 4: LEGAL AND INSTITUTIONAL FRAMEWORK

This chapter describes the legal and institutional framework that affects the construction and operation of the project.

4.1 Institutional Framework

4.1.1 Public Complaints Committee

The PCC is established by section 31 of the Act and is chaired by an appointee of the Minister and who shall be a person qualified to be a Judge of the High Court. The function of PCC is to investigate any allegations against any person, institution or against the Authority in relation to the condition of the environment. The PCC can on its own volition investigate any case of environmental degradation and make a report of its findings together with its recommendations to the National Environment Council.

4.1.2 National Environmental Tribunal

NET is established by section 125 of the Act and is chaired by an appointee of the Minister and who shall be a person qualified to be a Judge of the High Court. The NET reviews administrative decisions made by NEMA relating to issues of revocation or denial of licenses and conditions of licenses. It also provides legal opinion to NEMA on any complex matter where NEMA seeks such advice. The Tribunal is also empowered to change or give an order, give direction and to carry out investigations where necessary.

4.1.3 National Environment Council (NEC)

NEC is established by section 4 of the Act and is chaired by the Minister responsible for environment. It is responsible for policy formulation and directions for purpose of the Act; setting national goals and objectives and determining policies and priorities for the protection of the environment. Promoting co-operation among public departments, local authorities, private sector, non-governmental organizations and such other organizations engaged in environmental protection programmes; and performs such other functions as are assigned under the EMCA.

4.2 Legislative framework in Kenya related to this project.

4.1.1 Environmental Management and Co-ordination Act No. 8 of 1999

Part II of the Act states that every person is entitled to a clean and healthy environment and has the duty to safeguard the same.

Section 58 of EMCA No.8 of 1999 states that every development shall undergo an Environmental Impact Assessment.

Compliance

- *It is this law in consideration of this that the proponent has decided to undertake an EIA for his project in order to ensure sustainable development.*

4.2.2 The Constitution of Kenya, 2010

The Constitution of Kenya 2010 is the supreme law of the land. Any other law that is inconsistent with the Constitution is null and void to the extent of its inconsistency. Under Chapter IV, article 42 provides for the right to a clean and healthy environment for all. Further, Chapter V of the Constitution deals with Land and Environment. Specifically Part 2 elaborates on the following components regarding the protection of the environment.

- Obligations in respect of the environment
- Enforcement of environmental rights
- Agreements relating to natural resources

4.2.3 The Water Act, 2002

The Act makes it an offence to throw or convey or cause or permit to be thrown or Conveyed, any rubbish, dirt, refuse, effluent, trade waste or other offensive or unwholesome matter or thing into or near to water resource in such a manner as to cause, or be likely to cause, pollution of the water resource.

Compliance

- *Construction of a well-designed septic tank and contracting a registered solid waste collection firm to dispose of the garbage from the housing units shall be put in place.*

4.2.4 Public Health Act

This is the Act of Parliament that makes provisions for securing and maintaining health. Section 115 provides that no person shall cause a nuisance or shall suffer to exist on any land or premises occupied by him or of which he is in, charge any nuisance or condition liable to be injurious or dangerous to health.

Compliance

- *All wastes (solid waste from building operations and sewage waste) shall be put in solid waste bins and sewage systems respectively for collection and disposal away from the building to ensure good sanitation.*

4.2.5 The Land Planning Act, CAP 303, Subsidiary Legislation (The Development and Use of Land\Planning Regulations)

Part IV – Control of Development

(2) Any person who carries out development without consent shall be guilty of an offence and shall be liable to prosecution.

11. (1) every person requiring consent for development shall make application to the interim Planning authority for the area in which the land concerned is situated.

Compliance

- *The proponent should obtained all approvals of the project development and licenses from the relevant Local Authority Offices.*

4.2.6 The Occupational safety and Health Act, 2007

This statute focuses on the provision of safety, health and welfare of workers and all persons lawfully present at workplaces.

Compliance

- *The proponent and contractor undertake to prevent pollution, minimize the emission of dust and production of noise during the process of site preparation and development.*
- *The proponent undertakes to provide all workers with Personal Protective Equipment for all works associated with this project as applicable so as to ensure health, safety and welfare for the workers that will be employed onsite.*

4.2.7 The Physical Planning Act, CAP 286

The Local Authorities are empowered under Section 29 of the Act to reserve and maintain all land planned for open spaces, parks, urban forests and green belts. The same Section, therefore, allows for prohibition or controls the use and development of land and Buildings in the interest of proper and orderly development of an area.

Compliance

- *The project has been designed according to the prescribed land zoning requirements;*
- *The proponent should acquire the necessary permits from the council*

4.2.8 The Local Government Act, CAP 265

Compliance

- *The proponent has designated the proposed development in consideration of area zoning and the socio-economic trends of the area.*
- *The proponent has initiated an Environmental Impact Assessment for submission to NEMA for approval.*

4.2.9 Building code 2000

Section 194 requires that where sewer exists, the occupants of the nearby premises shall apply to the local authority for a permit to connect to the sewer line and 311 the water must be discharged into sewers. The code also prohibits construction of structures of buildings on sewer line.

4.2.10 Lake Basin Development Authority Act chapter 442. Revised edition 2012 [1991]

Function of LBDA, to initiate such studies and carry out such survey as may be considered necessary by the Government or the Authority and to assess alternative demands within the area on the natural resources thereof and to initiate, operate or implement such projects as may be necessary to exploit those natural resources including agriculture (both irrigated and rain fed), forestry, wildlife and tourism industries, electric power generation, mining and fishing, and to recommend economic priorities;

4.2.11 The Penal Code Act, Cap.63

The Chapter on Nuisances and Offences against Health and Convenience contains sections related to the environment. Section 175 states that any person who does an act not authorized by law or omits to discharge a legal duty and thereby causes any common injury, or danger or annoyance, or obstructs or causes inconvenience to the public in the exercise of common rights, commits the misdemeanor termed a common nuisance and is liable to imprisonment for one year.

4.3 Environmental Regulations

4.2.1 Environmental Management and Coordination (Waste Management) Regulation of 2006

As per this project, the proponent should minimize the wastes he generates by adopting the following methods: conserving raw materials and energy, enabling the recovery and re-use of the products where possible, reclamation and recycling, and incorporating environmental concerns in the design and disposal of a product. The unusable waste will be disposed as appropriate at the municipal disposal site after proper segregation.

4.3.2 Environmental Management and Coordination Act (Environmental Impact Assessment and Environmental Audit) Regulation of 2003

- *The proponent has undertaken this EIA in compliance with this requirement.*

4.3.3 Environmental Management and Coordination (Water Quality) Regulation of 2006

It states “Every person shall refrain from any act which directly or indirectly causes, or may cause immediate or subsequent water pollution, and it shall be immaterial whether or not the water resource is polluted before the enactment of the Act”.

- *The proponent shall put in place solid and liquid waste management mechanism to ensure they do not impact surface and groundwater.*

4.3.4 Environmental Management and Coordination (Noise and Excessive Vibration Pollution Control) Regulations of 2009

These regulations prohibit emission of excessive noise and vibration. It states that “Except as otherwise provided in these Regulations, no person shall make or cause to be made any loud, unreasonable, unnecessary or unusual noise which annoys, disturbs, injures or endangers the comfort, repose, health or safety of others and the environment”..

The proponent shall ensure that all construction activities take place within the permitted periods.

4.4 Policy framework

Kenya Vision 2030

The Kenya Vision 2030 is the new country’s development blueprint covering the period 2008 to 2030. It aims at making Kenya a newly leading industrializing “middle income country providing high quality life for all its citizens by the year 2030” The vision has been developed through an all inclusive stakeholder consultative process, involving Kenyans from all parts of the country. The vision is based on three “pillars” – economic, social and political.

CHAPTER 5: ANALYSIS OF ALTERNATIVES

5.1 Site alternative

5.1.1 Relocation of the project.

This option is considered in the event that the proposed project in the current form may lead to deleterious effect on the environment if allowed to commence. It recommends that the project be moved to another area which is more suitable for the said development.

The current project site has been identified as very suitable for a toilet taking into consideration the demand for such a service due to population, lack alternative sanitation facilities. Relocation of the proposed Project to a different site is not a viable alternative.

5.1.1 The “No Action” alternative

The “No Action” alternative in respect to the proposed biotoilet at Nyamoye girls secondary school implies that the current situation is maintained. Under the “No Action” alternative, the proposed Project would not be initiated and the benefit of improved sanitation for the students and community. From the above it becomes apparent that the “No Action” alternative is therefore not considered as a viable alternative to the Proponent, and to the local community, it is thus not pursued.

5.2 Waste management alternatives

5.2.1 Use of pit latrines

This is an option that can be considered due to the simplicity of construction a pit latrine. The disadvantages of a pit latrine involve seepage of pollutants into ground water. In order to reduce the environmental footprint of the project this option will not be used.

5.2.2 Use of septic tanks

This involves the construction of underground concrete-made tanks to store the sewage and a soak pit with an outflow. Periodic emptying of the pit latrine with an exhauster may prove prohibitive for the community/ school. The septic tanks can also have leaks that will lead to ground water pollution. Thus the toilet will not use septic tanks.

5.2.3 Using a biodigester

A process, which involves breakdown of organic sludge in an airtight reactor under anaerobic condition to harmless compounds; these can even be used as manure in farms. The biodigester will also produce methane gas that can be harvested for use as a fuel for cooking and heating. This option is best for the targeted communities.

5.3 Water Supply alternatives

Water is a necessity in life and an important factor in sanitation. Therefore, the proponent looked into methods of sustaining water supply.

5.3.1 Rain water harvest

The proponent can construct a roof catchment to harvest and store rain water. This method is cost effective and can be implemented.

5.3.2 Borehole water consumption

The proponent may consider sinking a borehole. This option is expensive the water is more than the demands of the toilet facility. This option will not be taken.

5.3.3 Use piped water use

This happened to be the preferred option by the proponent. The school is connected to a water supply from Nyamonye catholic parish water project. The water is pumped from the lake.

5.4 Conclusion

Nyamonye secondary school is located in an area with no sewer coverage; this project will therefore improve the overall sanitation system in the school. The biogas produced will also be useful in the school as an alternative source of energy. The project is suitable for the proposed environment under the existing condition. The property under the current conditions is appropriate for the area and also the proponent.

CHAPTER SIX: PUBLIC PARTICIPATION AND SITE VISITS

6.0 Introduction

Site visits and Public Participation was held on 24th and 25th June 2014 at the project site and its environs. Most of those interviewed were students, staff and teachers of the school.

The purpose of the meeting was to:

- Inform the neighbors about the proposed project,
- To inform the neighbors about the benefits and the negative impacts of the project
- To seek the views, suggestions, concerns, fears and issues from the community about the project.
- To fulfill one of the crucial requirement of the EIA process
- Obtain suggestion from public on possible ways that they feel potential negative impacts can be effectively mitigated.

6.1 Results



Public participation at nyamonye girls staff room



Students of Nyamonye girls

6.1.1 Some of the positive and negative impacts were

The students interviewed were particularly happy with the proposed project as it will reduce congestion in the latrines, it was explained that congestion was especially high given that some of the form four students from last year had repeated.

Another positive is the aesthetic value brought about by a modern toilet in the school, the biotoilet also last longer than normal latrines as the waste will be decomposing in the biodigester and then evacuated.

The proposed project is bound to improve the sanitation of the area of the area by providing modern toilet facilities. This will have a ripple on effect by improving the health of the students and reducing disease outbreaks.

Negative impacts were few but those mentioned include nuisance that can brought about by activities of construction sites. Another negative impact is the risk of diseases brought about by improper use of the toilets, i.e. wash hands after visiting the toilet.

6.2 discussion

The analysis of the questionnaires and the interviews showed that the neighbourhood had no objections on and had no fears associated with the proposed project. Hence they welcomed it as it has positive objective towards their health, sanitation and development

CHAPTER SEVEN PROJECTED IMPACTS AND MITIGATION MEASURES

This Section identifies both negative and positive impacts associated with the proposed biotoilet in Siaya county. These are identified according to the proposed project phases namely: Construction Phase, Operational Phase and the Decommissioning Phase.

7.1 Positive Impacts of the Project

- **Job Opportunities-** Several workers including casual laborers, masons, carpenters, joiners, electricians and plumbers are expected to work on the site for a period that the project will start to the end.
- **Provision of Market for Supply of Building Material-** The project will require supply of large quantities of building materials most of which will be sourced locally in within Bondo town and the surrounding areas.
- Livelihood improvement, the project can also be an income generating project as the management will charge for use in order to ensure sustainability of the project. The profits can then form a source of income.
- Improved sanitation and health, the modern toilet will reduce incidences of diseases by providing toilet facilities in areas that had very few latrines. The toilet will also have water that users can wash hands with increasing cleanliness.
- Aesthetic improvement, the modern toilet will be attractive in design and will have reduced smell compared to the existing old latrines.
- Methane gas produce at the facility can be used as alternative source of cheap fuel.

7.1 Negative Impacts and their Mitigation Measures

7.1.1 Construction Phase

7.1.1.1 Continued sourcing of raw materials

To complete the construction phase, the project will still source raw materials from the environment including sand, ballast, building blocks, cement, steel, wood etc. These materials will have an impact on the environment at their point of origin either through extraction or industrial pollution associated with their production.

Recommended mitigation measures

- *The contractor will obtain raw materials for construction from sources that are compliant with NEMA Regulations.*

- *The contractor will procure quantities that are sufficient for the intended works only and recycle as far as practical to curtail wastage.*
- *The contractor will commit to extensive use of recycled raw materials as will be appropriate and in a manner that does not compromise the safety of the development.*

7.1.1.2 Occupational health and safety of workers

The movement of materials into the construction site, and the actual construction activities by workers may cause accidents with a potential to cause injury, permanent disability or even death.

Recommended mitigation measures

- *The contractor will provide workers with appropriate (PPE and ensure their use*
- *First aid facilities to be available on site*
- *Contractor to comply with the requirements of the Occupational Safety and Health Act (OSHA) by registering the site as a work place*
- *All visitors to the site to be provided with PPE*

7.1.1.3 Workforce sanitation

The workforce will need to be provided with suitable sanitation facilities. This is important to prevent disease outbreaks such as cholera.

Recommended mitigation measures

- *The proponent will construct a pit latrine that will be used by the site workers.*
- *Water is available for cleaning and washing by the workmen*

7.1.1.4 Solid waste at construction stage

Metal cuttings, rejected materials, surplus materials, surplus spoil, excavated materials, plastic paper bags, broken glass, empty paint containers among others will be generated during construction phase of the project. These materials can cause injuries or if disposed off poorly can form breeding ground for disease causing organisms.

Recommended mitigation measures

- *Use of durable, long- lasting materials that will not need to be replaced as often, thereby reducing the amount of construction waste generated over time*
- *Provision of facilities for proper handling and storage of construction materials to reduce the amount of waste caused by damage or exposure to the elements*
- *Purchase of perishable construction materials such as paints incrementally to ensure reduced spoilage of unused materials*

- *Use of building materials that have minimal packaging to avoid the generation of excessive packaging waste*
- *Use of construction materials containing recycled content when possible and in accordance with accepted standards.*

7.1.1.5 Increased demand for water

It is expected that the complete construction works and future activities will lead to an increase in the demand for water as Construction projects utilize significant quantities of water for mixing, casting and curing concrete. Water will also be required for drinking and sanitation by the workforce.

Recommended mitigation measures

- *The proponent*
- *The contractor to ensure prudent use of water resources during construction by avoiding wastage such as running pipes and taps*

7.1.1.6 Increased traffic and potential safety concerns

This will occur as contractors' vehicles bring in deliveries at the site and as workers leave or come to the site.

Recommended mitigation measures

- *Contractor will erect appropriate signage to designate the use of the Road by heavy commercial vehicles delivering raw materials*
- *Delivery of raw materials to be undertaken off-peak*

7.1.2 Operation Phase

7.1.2.1 Increased demand for water

Water availability is an important factor in the maintenance of sanitation. The water is used for cleaning and for washing of hands after visiting the toilet. Inadequate clean water will reduce health standards in the community and can lead to spread of diseases.

Recommended mitigation measures

- *Roof catchment will be installed to trap rain water for use*
- *Water saving mechanism such as self-cancelling taps to avoid unnecessary flows.*

7.1.2.2 Security of the facility and related fixtures

The location of the toilet in largely rural areas means that there will always be petty thieves out to strip the facility of its fittings and stock. Items such as sinks, windows, detergents are all attractive to criminals. This is especially important for the biotoilet located in public areas such as beaches.

Mitigation

- *Lockable doors and or entrances*
- *Community participation to encourage ownership*
- *Fencing of the facility*

7.1.2.3 Solid waste disposal

Most of the solid waste from paper and plastic packaging containing detergents and other supplies. Solid wastes lead to blockage of drains, they can form breeding ground for pests and vermin, plastics can also be fatal if ingested by animals that browse within the neighborhood.

The ladies section of the toilet can also generate sanitary solid waste in form of sanitary pads. These can interfere with the plumbing and efficiency of the biotoilet if thrown into the toilet.

Mitigation

- *Sanitary waste bins should be availed in the ladies section of the toilet*
- *There should also be waste bin inside the toilet for disposal of any wastes.*

7.1.2.4 Risk of fire from accumulated methane.

Biogas is the result of anaerobic decomposition of organic material in the biodigester. The gas is mainly methane which is a highly combustible gas. The biogas digester will accumulate vast quantities of this gas. Leaks from the storage tanks and piping can lead to fires and explosions leading to damage to property and even injuries to man and animals. Methane is also a highly potent green house gas when released into the atmosphere.

Mitigation

- *Expert advice on the use and maintenance of the biogas digester and related infrastructure*
- *Fire extinguisher/sand buckets/ water in the facility*

7.1.2.5 Ground and surface water pollution

This is a sanitation facility that will handle human waste. Any fugitive discharge into the environment can lead to pollution of surface waters and or ground water. Human wastes may contain pathogens and vectors that can cause diseases such as cholera, typhoid, dysentery, and diarrhea.

Mitigation

- *Wastes will be evacuated from the bio digester only after thorough decomposition*
- *Proper maintained of plumbing and associated works*

7.1.2.6 Risk of disease spreading

Communal toilets are a source of pathogens mainly from use without washing hands, and poor waste disposal. Diseases such cholera, typhoid, dysentery and diarrhea can be spread are spread through contact with dirty material. Dirty toilets also are home to various vectors (flies, cockroaches) and disease causing organisms.

Mitigation

- *sinks for hand washing after visiting toilet,*
- *Notices inside the toilet advising on importance of hand washing.*
- *toilets kept clean/ regular cleaning*

7.1.2.7 Nuisance from Bad odor

Anaerobic decomposition regularly releases offensive smell, mainly from hydrogen sulphide. Poorly maintained toilets always release a bad smell emanating from the decomposing wastes. This smell is a nuisance especially if the facility is located in a school, near class rooms, or in a market near hotels and food vendors. The smell also attracts flies and other pests which are disease vectors which can spread cholera, diarrhea, and typhoid.

Mitigation

- *Regular cleaning of the facility using detergents*
- *Water for flushing the toilet should also be available*
- *Permanent supply of water to enable users to wash hands after visiting the toilet*

7.1.2.8 Pest outbreak

Common pests attracted to dirty environment are rats, cockroaches, flies. These animals are also disease vectors. They transport germs from the toilet to nearby human settlement. When they come into contact with human food they cause food spoilage and spread of diseases. Dirty environmental also offer a perfect breeding ground for these pests to multiply.

Mitigation

- *Proper cleaning of the toilet*
- *Use of biopesticides*

7.1.3 Decommissioning Phase

7.1.3.1 Solid waste

The waste will contain the materials used in construction including concrete, metal, drywall, wood, glass, paints, adhesives, sealants and fasteners. Although demolition waste is generally considered as

benign since they are composed of inert materials, there is growing evidence that large quantities of such waste may lead to release of certain hazardous chemicals into the environment. In addition, even the generally non-toxic chemicals such as chloride, sodium, sulphate and ammonia which may be released as a result of leaching of demolition waste, are known to lead to degradation of groundwater quality.

Mitigation measures.

- *The proponent is encouraged to re use or sell any valuable materials*
- *Potentially hazardous material will be disposed off through registered waste transporters*

7.1.3.2 Dust

Large quantities of dust will be generated during demolition works. This will affect demolition staff as well as the neighboring residents.

Mitigation measures

- *The proponent and contractor should choose manual demolition methods as the dust produced will be less; this has an added advantage of enabling the recovery of as much scrap as possible.*

7.1.3.3 Safety of workers

During demolition certain materials can pose health risk such as glass, nails, paints, dust. Falling object is also risk due to weakened structures

Mitigation

- *PPE by workers*

7.1.3.4 Noise and Vibration

The demolition works will lead to significant deterioration of the acoustic environment within the project site and the surrounding areas. Prolonged exposure to such high level noise can lead to temporary or permanent hearing loss.

Mitigation measures

- *The proponent and contractor should choose manual demolition methods as the noise produced will be less; this has an added advantage of enabling the recovery of as much scrap as possible.*

CHAPTER 8: ENVIRONMENTAL MANAGEMENT PLAN AND MONITORING

EMP outline

The tables below outline the environmental management plan for the proposed development cycle. The plan considers the following;

- Predicted environmental impact
- proposed mitigation measures,
- Responsible party / parties
- Timeframe, and
- Costs.

The EMP will be in the following sections.

- Construction phase EMP
- Operational Phase Management Plan
- Decommissioning Environmental Management Plan

EMP for construction phase

Environmental impact	Mitigation measures	Responsible party	Time frame	Cost ksh
Sourcing of raw materials	<p>The contractor will obtain construction raw materials from sources that are compliant with NEMA Regulations.</p> <p>The contractor will procure quantities that are sufficient for the intended works only to curtail wastage.</p> <p>The contractor will commit to extensive use of recycled raw materials as will be appropriate and in a manner that does not compromise the safety of the development</p>	Contractor	During construction	Nil
Occupational Health and Safety of Workers	<p>The contractor will provide workers with appropriate PPE and ensure their use</p> <p>Workers to be trained on equipment use</p> <p>First aid facilities to be available on site</p> <p>Contractor to comply with the requirements of the OSHA</p> <p>All visitors to the site to be provided with PPEs</p>	Contractor, workers and site supervisors	throughout construction	10,000for procurement of PPEs

Solid waste generation and disposal	Provide waste handling facilities such as waste bins The proponent through a caretaker will ensure that the compound is clean	Proponent	Continuous	2000
Air pollution	Sprinkle water dusty materials such as gravel, sand, ballast during offloading Use serviceable machinery and vehicles for supply of raw materials	Contractor and workers	During construction	2,000 per month water bill
Noise pollution	Delivery of raw materials to site to be done only during the day No delivery of raw materials should be undertaken during weekends Use of serviceable vehicles and machinery is also expected to reduce noise levels	Contractor and transporters	throughout construction	negligible
Increased demand for water	The contractor to ensure prudential use of water resources during construction by avoiding wastage such as running pipes and taps	Contractor and proponent	During construction	negligible

Increased traffic and potential safety concerns	Contractor will erect appropriate signage to designate the use of the Road by heavy commercial vehicles delivering raw materials Delivery of raw materials to be undertaken off-peak			
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EMP for operational phase

Environmental impact	Mitigation measures	Responsible party	Time frame	cost
Fire hazard	Expert advice on the use and maintenance of the biogas digester and related infrastructure Pressure gauge to detect stored quantity Fire extinguisher/sand buckets/ water in the facility	proponent	construction	10,000
Security of the facility and stock	Lockable doors and or entrances Community participation to encourage ownership Fencing of the facility	Proponent	continuous	10,000
Ground and surface water pollution	Wastes will be evacuated from the bio digester only after thorough decomposition Proper maintainance of plumbing and associated works	proponent	Continuous	-negligible
Risk of disease spreading	sinks for hand washing after visiting toilet, Notices inside the toilet advising on importance of hand washing. toilets kept clean/ regular cleaning	Proponent / student	continuous	No cost
Pests/ vermin	Proper cleaning of the toilet	proponent	continuous	Use existing school

outbreak				staff
Nuisance from bad odor	Regular cleaning of the facility using detergents Water for flushing the toilet should also be available Well designed biodigester/ airtight	Proponent	continuous	Cleaning done by current school staff
Solid waste generation and disposal	Provide sanitary waste bins The proponent through a caretaker will ensure that the compound is clean Wastes from the biodigester can be used as manure	Proponent in	Continuous	3000
Increased demand for water	Notices in the rooms to save water The toilet will be connected to the schools water supply	Proponent	One off at construction phase	Implemented at construction phase

EMP for decommissioning phase

Environmental impact	Mitigation measures	Responsible party	Time frame	cost
Safety risks	The site will be fenced Collection and proper disposal of all waste Proper PPE will be provided to the workers on site	Contractor workers	Throughout decommissioning phase	
Solid waste pollution	Segregate demolition material into different waste streams waste will be transported by a NEMA licensed waste Sale or donation of material for re use in construction	Proponent and contractor	Throughout decommissioning phase	-
Dust generation	Sprinkle water on to dusty material Speed limit on trucks that will be ferrying demolition material	Contractor	Continuous	-
Noise and vibration	Demolition works should be conducted only during daylight hours (6am – 6pm) Reduce reliance on heavy machinery	Contractor Proponent and	Continuous	-

CONCLUSION AND RECOMMENDATIONS

Conclusions

The EIA study has established that the proposed project will no doubt contribute to an increase the level of sanitation and by extension the standard of living in the school. A However as has been outlined in the report there will be some negative impacts during the running of the facility, for these mitigation measures have been proposed and an EMP generated for use in controlling the negative impacts. This project is deemed of high value to the area and community due to the low density of comparable sanitation facilities.

Recommendations

The following recommendations have been listed to ensure that significant adverse impacts that may emanate from the proposed project are mitigated. They include;

- The implementation of safety measures and emergency plans to contain accident risks associated with operation of biodigester and its related biogas,
- The biogas produced can be directed into the kitchen for use as alternative cooking fuel.

REFERENCES

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7. The Physical Planning Act, (Cap 86)
8. The Water Act, 2002,
9. The Public Health Act, Cap. 242,
10. The Occupational Health and Safety Act, 2007
11. Penal code
12. Kenya gazette supplement (1999) Policy Paper a Environment and Development (Sessional Paper No. 6 of 1999)
13. Architectural Designs and notes as well as project cost projections,

ANNEXES (TO BE DISCLOSED)
