



Environmental Impact Statement

FOR THE PROPOSED

MBARARA MUNICIPAL COUNCIL

COMPOSTING PROJECT

February 2007

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LIST OF ABBREVIATIONS

BOD	Biochemical Oxygen Demand
CDM	Clean Development Mechanism
COD	Chemical Oxygen Demand
CSOs	Civil Society Organizations
DWD	Directorate of Water Development
EA	Environmental Assessment
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement
EMCBP	Environment Management Capacity Building Project
EMP	Environmental Management and Monitoring Plan
MMC	Mbarara Municipal Council
EMS	Environment Management System
MSW	Municipal Solid Waste
NEMA	National Environment Management Authority
NEMP	National Environment Management Policy
NWSC	National Water and Sewerage Corporation
NGO	Non-Government Organization
QMS	Quality Management System
STDs	Sexually Transmitted Diseases
UNFCCC	United Nations Framework Convention on Climate Change

EXECUTIVE SUMMARY

Uganda is one of the many signatories to the United Nations Framework Convention on Climate Change (UNFCCC), 1992 and has thereby committed itself to combating Greenhouse Gas (GHG) emissions. The protocol also put in place a Clean Development Mechanism (CDM) as one of the mechanisms to allow developed and industrialized countries to invest in projects that would realize GHG emission reductions. By so doing, this mechanism would enable industrialized countries to use such certified emission reductions generated under the CDM to contribute to compliance with their own emission reduction commitments. It is in line with those arrangements that the National Environment Management Authority (NEMA) undertakes to collaborate with the urban authorities of Mukono, Jinja, Mbale, Soroti, Lira, Mbarara, Kabale, Kasese and Fort Portal to improve municipal solid waste management through composting of municipal waste, thereby controlling GHG emissions and subsequently attracting funding under the CDM. This initiative is based on the grounds that garbage dumping sites, with wastes undergoing a methanogenic stage of bio-decomposition, produce large volumes of greenhouse gases which contribute to global warming.

Mbarara Municipal Council as a beneficiary of the composting of municipal solid waste project contracted a consultant to carry out an Environmental Impact Assessment prior to the commissioning of the project. The composting plant will have facilities to accept mixed municipal solid waste and convert organic waste into compost.

This EIA is therefore focused on the environmental and social assessment of the proposed Mbarara Municipal Council Solid Waste Composting Project.

The assessment has shown that there is currently a problem of inefficient collection and disposal of waste. This is mostly due to inadequate manpower, equipment and other resources, as well as a lack of awareness of best practices as far as waste handling and disposal are concerned. The socio-economic analysis shows that the project is very viable, as it will improve the collection of waste and avail compost manure, leading to improved yields and higher employment rates.

The market analysis conducted during the assessment reveals that there is a ready market for the compost manure, but that it should be reasonably priced.

Positive impacts related to the development have been identified as follows:

- Provision of employment to the community
- Improved tax base from the transactions involving the sale of compost manure
- The reuse of waste will result in a cleaner environment.
- The use of compost manure will result into better agricultural yields for farmers.

Negative impacts associated with the project include:

- Loss of vegetable peelings used as fodder by zero grazers
- Mitigation: compost will aid growing of elephant grass to feed the animals
- The owners of the project site will be displaced
- Construction related impacts including; improper disposal of construction waste, possible accidents caused by trucks and dust emission.
- Leachates need to be avoided at the site as they could contaminate both surface and ground water.

The assessment has shown that this is a socially, economically and environmentally viable development and should therefore be allowed to proceed.

ACKNOWLEDGEMENTS

The EIA study team would like to express their appreciation to the authorities of Mbarara Municipal Council, more especially the Town Clerk and his team for the confidence put in the team when a decision was made to give them this work. We are particularly indebted to the following persons who contributed to the success of this work: Mr. Lubaale Timothy, Sociologist, Mr. Sulaiti Kimule, Economist, and Mr. Amos Mafigiri, Project Assistant, Eco & Partner Consult. We greatly appreciate the information and support obtained from Mbarara District, NEMA, Makerere University Department of Bio-Chemistry, and Eng. Lubowa and Mr. Seremba, the Consulting Engineers. We also recognize the input of all stakeholders, such as the Government Chemist, and all the consulted communities in Mbarara District. May God bless you all.

Eddie Luyima, EIA SpecialistDate.....

Robert Kasande, Environmental Geologist.....Date.....

1.0 INTRODUCTION

1.1 Background

Mbarara Town is believed to have picked its name from the local tall, green grass locally known as Emburara (*Hypernia ruffa*) that covered the whole area of Mbarara District. The Municipality's commercial growth began with the appearance of Asian traders and by 1950 there were about 15 commercial premises. More commercial enterprises were set up from the '60s to date. In 1957, it was declared a Township authority under the British Administration at Kamukuzi and later elevated to a Municipal Council in 1974. The mission statement for Mbarara Municipality is:

“TO PROVIDE QUALITY SERVICES TO THE PEOPLE OF MBARARA MUNICIPALITY FOR SUSTAINABLE PROGRESS AND DEVELOPMENT”

Mbarara Municipality is working towards the realization of this mission as manifested in the quality of services that it renders in infrastructure development like roads, health, education, street lighting, etc. The quality of the human resources necessary to provide these services has also been addressed through training and payment of all staff incentives.

Uganda is one the many countries that signed the United Nations Framework Convention on Climate Change (UNFCCC) in 1992, and has therefore committed itself to combating the emission of Greenhouse Gases (GHGs). The protocol also put in place a Clean Development Mechanism (CDM) as one of the mechanisms to allow developed and industrialized countries to invest in third world projects that would realise GHG emission reductions. In so doing, this mechanism would enable the industrialized countries to use such certified emission reductions generated under the CDM to contribute to compliance with their own emission reduction commitments. It is in line with those arrangements that the National Environment Management Authority (NEMA) undertakes to collaborate with the urban authorities of Mukono, Jinja, Mbale, Soroti, Lira, Mbarara, Kabale, Kasese and Fort Portal to improve municipal solid waste management through composting of municipal waste, thereby controlling GHG emissions and subsequently attracting funding under the CDM.

Mbarara Municipal Council

This initiative is based on the grounds that garbage dumping sites, with wastes undergoing a methanogenic stage of bio-decomposition, produce large volumes of greenhouse gases whose accumulation in the atmosphere contributes to global warming.

Mbarara Municipal Council as a beneficiary of the Municipal Solid Waste Composting Project contracted a consultant to carry out an Environmental Impact Assessment prior to commissioning of the project. The composting plant will have facilities to accept mixed municipal solid waste and convert the organic waste into compost. This EIA is therefore focused on the environmental and social assessment of the proposed Mbarara Municipal Council Solid Waste Composting Project.

1.2 Proposed Project Site Location

Mbarara Municipality is approximately 266 kilometres from Kampala City along the Kampala-Kabale highway and is located in the southwestern region of Uganda. Its exact location can be geographically determined as longitude 30°37' east and latitude 0°36' south. The Municipality is the main commercial centre and houses the political and administrative headquarters of Mbarara District. One of the factors responsible for Mbarara's steady growth has no doubt been the fact that it is situated at the Kampala-Kabale-Fort Portal cross roads, and that it is the nerve centre of most of the numerous feeder roads linking up Ankole's huge territory. The opening up of Rwanda and the Congo has tripled Mbarara's logistical importance, for now the town is the gateway to Kigali, Bujumbura, Tanzania and several towns in the eastern D.R. Congo. The Municipality's boundary encloses a total area of about 51.47 sq. kilometers, that is, 5,147 hectares.^(1*)

Size: Divisions	:	3
Wards	:	6
Cells	:	51

The proposed site is in Rwentondo Cell, Kakoba Ward, Mbarara, Municipality, Mbarara District. This site is approximately seven kilometres from the Mbarara town centre.

^(1*) Kamukuzi has 1,610 hectares, Kakoba has 1,308 hectares and Nyamitanga Division has 2,229 hectares.



Figure 1 - Showing the Location of Mbarara District on the Map of Uganda

1.3 Need for an Environmental Impact Assessment

The need for an Environmental Impact Assessment (EIA) is a requirement for such a project before implementation. It is a legal requirement under the Third Schedule of the National Environment Act, Cap. 153, that proposed sites for waste disposal be subjected to an Environmental Impact Assessment before they are used for this purpose. The Terms of Reference therefore elaborate the scope of work and activities to be conducted in regard to

preparing an Environmental Impact Assessment ready for submission to NEMA for review and subsequent approval.

1.4 Scope and Terms of Reference for the Proposed Project

Composting is the controlled biodegradation of organic matter, usually under aerobic conditions, by which organic material is transformed into compost. Compost is the stable end-product derived from biological degradation of organic material under controlled conditions. Organic material can vary from dead leaves and roots to kitchen waste and vegetable remains.

If properly decomposed, compost is free from odour and contains a pathogen-free brown mixture which can be used as a soil conditioner. Compost increases the efficiency of plant nutrient uptake, water-holding capacity of soil and soil aeration. In addition to these, compost reduces soil crusting, soil erosion, water-logging problems and the incidence of some root diseases. Compost is not a substitute of synthetic fertilizers with high nitrogen, phosphorus and potassium content; but rather it complements the use of such fertilizers.

The Environmental Impact Assessment has covered the following key areas that will be integral to the waste composting process:

- (i) Evaluation of the status and suitability of the identified waste disposal site to be used for final disposal and composting of the wastes including assessment of:
 - ❖ General site suitability with respect to social issues (e.g. proximity to settlements and possible impacts on fragile/sensitive ecosystems)
 - ❖ Pollution potential
 - ❖ Haulage distance in relation to long term operational/transportation costs
- (ii) Identification of potential impacts and mitigation measures to control direct, indirect or secondary environmental impacts that arise out of the composting operations especially:
 - ❖ Addressing the potential social impacts of composting;
 - ❖ Determining social impacts resulting from diverting a significant portion of waste generated from current informal users of the resource. For this, the EIA has identified appropriate mitigation mechanisms;
- (iii) Identification of possible involvement of other stakeholders and partners, especially the private sector and Civil Society Organizations (CSOs), to ensure sustainability;

- (iv) Evaluation of composting site management requirements to ensure availability of sound environmental management capacity and effective operation of the composting project; and
- (v) Identification, in close collaboration with the Municipal authorities, of project impacts on the community including:
 - Identification of existing and potential marketing opportunities for the compost manure and any other by-products from the project (immediate and long-term market prospects);
 - Elaboration of Environmental Management and Monitoring Plan (EMP) for ensuring compliance to the national environmental laws and to the recommended environmental management and mitigation measures; and
 - Assessment of training and capacity building needs necessary to meet the human resources management needs of the project.

1.5 Proposed Activities on the Site

- Evaluation of identified sites for the composting operations – these could be sites currently in use or new suitable sites identified;
- Development and preparation of the composting site, including building the slab for the solid composting and putting in place other necessary infrastructure;
- Procuring and installation of hardware and equipment for implementation of composting operations;
- Undertaking the procurement and delivery of other goods, works and services necessary for implementation of the project;
- Processing biodegradable solid waste into a manure and recovery of other resources from the waste; and
- Trading, under CDM, of the GHG emission reductions, and sale of manure and other by-products.

1.6 EIA Methodology

The following format was followed as a basis for the assessment in accordance with National Environment Management Authority (NEMA) Guidelines for Environmental Impact Assessment 1997 and the Terms of Reference developed:

- Involving the local community, local authorities, Lead Agencies and other stakeholders through consultations so as to incorporate their views. Discussions were held with heads of Local Council authorities in Mbarara Municipal Council, and community members regarding the proposed project in the area.
- Determination of policy, legal and administrative framework and requirements. This was done through literature review of legal documents, guidelines and planning procedures. These were reviewed in order to ensure that the necessary measures were included in the new design and implementation.
- Determination of current and future baseline environmental conditions through review of work to be carried out, operations proposed and carrying out field surveys and evaluations of the area
- Identifying possible environmental, social-economic impacts and preparing a mitigation plan for reducing or eliminating the possible negative impacts
- Developing a monitoring and management plan to ensure sustainable health, safety and environmental measures

1.7 Description of the composting project process

Aerobic composting

In aerobic composting the organics are converted into compost by micro-organisms, which require the oxygen in air for their survival and growth. During this process of conversion, heat is released. There are ideal limits for different parameters within which these micro-organisms survive. If these conditions are ensured, the compost quality and time of composting can be controlled.

1.7.1 Various Parameters Which Can Affect the Composting Process and Quality

Organisms. Micro-organisms facilitate the process of decomposition. Bacteria, fungi, actinomycetes are the major organisms supporting the process. These organisms thrive in waste but there has to be a minimum start up population for quick degradation. Initial start up cultures can be obtained from cow dung slurry or special bacterial cultures

Carbon/Nitrogen (C/N) Ratio. Carbon and Nitrogen are two important elements in the composting process. Carbon provides the food and Nitrogen provides the raw material for building up bacterial mass.

Temperature. Most micro organisms have an ideal or optimum temperature for growth. The composting process is exothermic and the windrow temperature rises due to the process. The desired maximum temperature is about 70°C.

Aeration. Aerobic micro-organisms do composting. It is necessary to ensure that oxygen is supplied throughout the mass and aerobic activity is maintained. During the decomposition, the oxygen gets depleted and has to be continuously replenished.

Moisture. Moisture tends to occupy free air space between the particles. Hence when moisture is high, anaerobic conditions set in. However composting mass should have certain minimum moisture content in it for organisms to survive. The optimum moisture content is known to be 40% to 60%.

1.7.2 The Process Flow

The step-by-step process operations are given below. The various aspects, which come into play at each of the steps, is also given.

Step 1: The waste is received at the gate in trucks or other transport equipment. This waste is weighed at the weighbridge. A detailed record on incoming wastes is maintained at the gate. A time record of the staff and visitors is also there at the gate.

Step 2: The incoming vehicle directly goes and unloads the waste at the composting yard as per a plan. As soon as the waste is unloaded the large contraries like tyres, which cannot

be screened, would be manually removed. Then the tractor front-end loader is used to shape the waste into a windrow. The windrow is then sprayed with cow dung or bio-culture slurry. The cow dung or bio-culture slurry is made in a mixing tank provided at an elevation. It is then sprayed.

Step 3: The windrow is maintained for seven days. The temperature is monitored to ensure that the composting process is ongoing. The leachate from the windrow comes out and is collected in the drain. The drain is connected to the leachate tank. The leachate from the leachate tank is used for making the inoculum slurry.

Step 4: At seven days from the start, the first windrow is dismantled and the waste is transferred to the second windrow using the tractor front-end loader. The waste volume would have reduced by about 30% compared to the start with moisture reduction and degradation. The place where the waste is dismantled would receive the fresh waste for forming the first windrow. While forming the second windrow, addition of inoculum slurry and water to maintain the moisture is done using the trailer-mounted slurry tank. The temperature profile in the second windrow is monitored. The leachate from the windrow may come out and is collected in the drain.

Step 5: At 14 days from the start, the second windrow is dismantled using the front-end loader. The waste volume would have reduced by about 25% compared to the start of windrow 2, with moisture reduction and degradation. The waste is reformed into the third windrow. Addition of water is undertaken if required. The temperature profile in the third windrow is monitored. No leachate is expected from now on.

Step 6: At 21 days from the start, the third windrow is dismantled using the front-end loader. The waste volume would have reduced by about 20% compared to the start of windrow 3. The wastes are reformed into the fourth windrow. Addition of water is undertaken if required. The temperature profile of the fourth windrow is monitored.

Step 7: At 28 days from the start, the third windrow is dismantled using the front-end loader. The waste volume would have reduced by about 10% compared to the start of windrow 4. The wastes are reformed into the fifth windrow. Addition of water is undertaken if required. The temperature profile of the fifth windrow is monitored.

Step 8: At 35 days from the start, the fifth windrow is dismantled using the front-end loader. The waste is now transferred to the processing unit into the initial hopper. The waste volume would have reduced by about 10% compared to the start of windrow 5.

Step 9: The waste is sieved in a 6mm sieve to the extent that compost separated can be sold.

Step 10: The rejects are taken out for disposal in a landfill at least once every three days. The recyclables are sold when adequate quantity is available for transport. The compost is sold as per demand. The matter which cannot be sold is sent to the landfill.

Process Flow Chart

The process flow chart traces the movement of waste from the time it enters the composting plant until it is disposed of outside the plant.

	Item of work	Specification
A	Civil Works	
1.	Composting Yard works	
a.	Site leveling and lowering	As per site profile
b.	Aerobic Composting Yard	The yard would with concrete flooring and sloping AC sheet roof. Dimensions of the yard are 3,405m ² .
2.	Building Works	
a.	Security building	A 3m x 3m security building is provided
b.	Office, laboratory and vehicle parking and diesel storage. Overhead water tank.	This is a building that has the office, laboratory and parking facility. Space for diesel storage is provided. A 2,000-litre overhead water tank and a 2,000-litre slurry tank with access to roof is provided along with the building.
3.	Miscellaneous Works	
a.	Internal roads in the compost plant	Internal roads of 3.75m are provided as per requirement.
b.	Drains around the yard	Drains are provided around the compost yard and connecting to the leachate tank.
c.	Water storage tank	A 10,000-litre RCC fresh waster storage tank is provided. A 2,000-litre overhead tank is also provided.
d.	Leachate tank	A 5,000-litre RCC leachate tank is provided.
e.	Slurry tank	A 2,000-litre HDPE tank is provided.
B	Electro Mechanical Equipment	
a.	Plant vehicles	A tractor front-end loader with backhoe and tipping trailer.
b.	Weighbridge	A 30-ton weighbridge is provided.
c.	Plant and Yard lighting	Plant and yard lighting is proposed as required.
d.	Basic sieves	3 sets of sieves are proposed.
C	Others	
a.	Water supply	Adequate water supply as required.

Table 1: Synopsis of the Components of the Project

2.0 POLICY, LEGAL AND INSTITUTIONAL FRAMEWORK

2.1 Policies

This chapter presents the policy, legal and institutional framework within which this EIS was drawn. Environmental safeguard requirements and guidelines are discussed along with relevant environmental agreements and regulations.

World Bank Policy on Environmental Assessment (OP 4.01)

World Bank requires Environmental Assessment (EA) of projects proposed for Bank financing to help ensure that they are environmentally sound and sustainable, thus improving decision-making by the Bank. This study is therefore in line with the Bank's requirements. The Bank's guidelines regarding the conduct of an EA have been adequately followed by the consultants, especially the Handbook – Pollution Prevention and Abatement Guidelines and Occupational Health and Safety.

National Environment Management Policy

The *National Environment Management Policy* (NEMP) was adopted by the Uganda Cabinet in 1994. Its overall goal is the promotion of sustainable economic and social development that enhances environmental quality without compromising the ability of future generations to meet their own needs. One of the strategies identified to achieve this goal is through carrying out Environmental Impact Assessments. The policy clearly states that an Environmental Assessment should be conducted for any project that is likely to have potential adverse impacts on the socio-cultural, physical and biological environment. This statement is further embedded in the *National Environment Act* Cap.153 of 1995 which makes EIA a legal requirement for eligible projects, policies and programmes. NEMA is the institution that will review this EIS.

2.2 Legal and Regulatory Framework

The relevant laws that promote environmental management in Uganda have been adequately reviewed and applied by the consultant including the following:

The Uganda Constitution, 1995

The Uganda Constitution as the supreme law provides the legal and regulatory framework in the country and provides for all aspects pertaining to the environment and other related aspects.

National Environment Act CAP 153

The *National Environment Act, Cap. 153* provides tools for environmental management that hitherto had not been deployed, including EIAs. The Act imposes a mandatory duty on a project developer to have an Environmental Impact Assessment conducted before implementing a project. The EIA Regulations, 1998 specify the types of projects to be subjected to EIAs. An EIA should be conducted for planned activities that may, are likely to, or will have significant adverse impacts on the environment.

Water Act, 1995

The *Water Act, 1995* provides for the use, protection and management of water resources and supply. The objectives of the Act are to promote the national management and use of water resources of Uganda through the introduction and application of standards and techniques; the coordination of all public and private activities that may influence water quality and quantity; and to allow for the orderly development and use of water resources for any activity requiring water use. This study duly recognized this Act and applied it wherever required.

Land Act, 1998

The *Land Act 1998* provides for the ownership and management of land. It provides for four different forms of land tenure (customary, leasehold, *mailo* and freehold) and the procedure for applying for grant of any of these tenures. The Act provides that non-citizens of Uganda may only be granted leases not exceeding 99 years.

Public Health Act, 2000

Section 7 of the Act provides local authorities with administrative powers to take all lawful, necessary and reasonable practicable measures for preventing the occurrence of, or dealing with any outbreak or prevalence of, any infectious communicable or preventable disease to safeguard and promote the public health conferred or imposed by this Act or any other law. Section 105 of the Public Health Act (2000) imposes a duty on the local authority to take measures to prevent any pollution dangerous to the health of any water supply that the public has a right to use for drinking or domestic purposes.

2.3 Regulations

The following regulations apply for the proposed project and should be considered right from the planning phase, construction phase, operational and decommissioning phase.

National Environment (Wetlands, River Banks and Lake Shores Management Regulations) 2000

- Reg. 28: Landowner on whose land a riverbank is situated is obligated to prevent and repair degraded river banks and lake shores using prescribed or any other measures.
- Reg. 29: The Rivers specified in Schedule 6 shall have a protection zone of one hundred meters from the highest watermark of the river. Rivers not specified in the Schedule shall have a protection zone of 30 metres. No activity is permitted within the protection zone. The rivers in the sixth schedule are Nile, Aswa, Nabuyonga. Others are Katonga, Nkusi, Kafu, Rwizi, Kagera, Mpanga, Manafwa, Mpologoma,

Semliki, Mubuku, Mayanja, Sezibwa, Malaba, Sipi, Namatala, Sironko and Muzizi.

- Reg. 34 (2) - 34 (1): Developer must undertake annual audits/monitoring on activities and submit reports to NEMA.
- Reg. 37: Anyone who deposits a substance that is likely to have an adverse effect on a wetland, or destroys or damages a wetland, removes soil or burns any wetland resource, or fails to protect a lake shore or river bank from environmental degradation commits an offence.

National Environment (Hilly and Mountainous Area Management) Regulations, 2000, Reg. 8 Restrictions on the Use of Mountainous and Hilly Areas

1. A person who desires to - (a) graze livestock; (b) establish a camping or other recreational facility for tourist purposes; (c) plant or cultivate crops; or (d) carry out any development activity requiring an Environmental Impact Assessment, in a mountainous and hilly area where the slope (gradient) exceeds 15% shall make an application to the local environment committee of the lower local governments in "Form A" set out in the Second Schedule to these Regulations.
2. The local environment committee may after considering the application submitted under sub-regulation (1) and where it deems it necessary after affording the applicant an opportunity to be heard grant a permit in "Form B" set out in the Second Schedule to these Regulations.
3. Where the local environment committee deems it necessary, it may request the opinion of a local agricultural extension officer or persons who may be affected by an activity, the subject of an application under sub-regulation (1), before granting a permit under sub-regulation (2).
4. A person permitted under sub-regulation (2) to carry out an activity in a mountainous and hilly area shall take such precautions as may be directed by the local environment committee or environment officer including the measure specified in the Third Schedule to prevent environmental degradation.
5. A person who carries out any activity regulated under sub-regulation (1) contrary to the provisions of these Regulations commits an offence.

The National Environment (Waste Management) Regulations 1999

Description of the Sections

- Reg. 4(5): Non-hazardous domestic waste can be disposed of in an environmentally sound-manner, without a license, provided the amount of waste does not exceed a certain quantity as defined by NEMA.
- Reg. 5(1): Waste generators must minimise the waste generated by adopting the following cleaner production methods:
 - Improvement of production processes through (i) conserving raw materials and energy; (ii) eliminating the use of toxic materials; and (iii) reducing toxic emissions and wastes.
 - Monitoring the product cycle from beginning to end by (i) identifying and eliminating potential negative impacts of the product; (ii) enabling the recovery and reuse of the product where possible; and (iii) reclamation and recycling.
 - Incorporating environmental concerns in the designs and disposal of the product
- Reg. 15 (1): A waste disposal site will not be licensed without an Environmental Impact Assessment.
- Reg. 15(2): An operator of a disposal site shall carry out an annual audit of the environmental performance of the site and submit reports to the authority.

The National Environment (Standards for Discharge of Effluent into Water or on Land) Regulations, 1999

The Water (Waste Discharge) Regulations, 1998 make it an offence for any person to discharge effluent or wastewater on land or water without a waste discharge permit issued by the Director, DWD. A person who has been issued a Waste Discharge Permit must ensure that the effluent or waste discharged by him/her conforms to the maximum permissible limits set out in the standards. Standards for the discharge of effluent or waste water are contained in the National Environment (Standards for Discharge of Effluent into Water or on Land) Regulations, 1999. The discharge of effluent on land or into water is regulated by the Directorate of Water Development (DWD) under The Water (Waste Discharge) Regulations, 1998. In this respect, NEMA has formally delegated its powers to DWD under The National Environment Instrument (Delegation of Waste Discharge

Functions), 1999. These regulations give the maximum permissible discharge limits on parameters such as BOD, COD, nitrates, phosphates, pH, and temperature.

The Mbarara Municipality Solid Waste Management By-Laws, 2005

1. These By-laws may be cited as the Mbarara Municipality (Solid Waste Management) By-laws, 2005.
2. These By-laws are intended to regulate and enforce proper and effective solid waste management within Mbarara Municipality.
3. In these By-laws, unless the context otherwise requires—
 - “Controlling authority” means Mbarara Municipal Council;
 - “Currency point” shall be equivalent to twenty thousand Uganda shillings;
 - “Inorganic waste” means unwanted matter which is non-biodegradable;
 - “Mbarara Municipality” means the area within the boundaries of the Municipality and includes division of Kamukuzi, Kakoba, Nyamitanga or any other divisions that may be included in future;
 - “Organic waste” means unwanted matter which is biodegradable;
 - “Special waste” means solid waste which is hazardous such as medical and industrial waste.
4.
 - (1) Solid waste that is not managed at the owner’s property shall be disposed of at approved solid waste disposal sites.
 - (2) No solid waste shall be disposed of indiscriminately within Mbarara Municipality.
5.
 - (1) A producer of solid waste shall sort and separate the solid waste into organic, inorganic and special waste.
 - (2) Inorganic matter shall be deposited in a container marked red, while organic matter shall be deposited in a container marked blue.
6. A producer of solid waste shall pay for its disposal at an approved solid waste collection site at a fee that shall be determined by the controlling authority from time to time.
7. A producer of solid waste shall pay for disposal of the waste at a fee that shall be determined by the controlling authority from time to time.
8. Any person who—

Mbarara Municipal Council

- a. fails or neglects to manage his or her solid waste or fails to deposit it at an approved solid waste collection site;
- b. fails to sort and separate his or her solid waste into organic, inorganic and special waste;
- c. Defaults or neglects to pay the prescribed solid waste disposal fee,
Commits an offence and is liable on conviction to a fine not exceeding two currency points or to imprisonment not exceeding three months or both.

3.0 PROJECT BASELINE INFORMATION

This chapter presents findings on the baseline information collected from the proposed project site.

3.1 Climate

As part of Mbarara District, the Municipality experiences two rainy seasons which are separated by two dry seasons in a year. The average annual rainfall is 1,125mm, while the average annual temperature is 25° Celsius.

3.2 Topography

The Municipality is built on hilly areas separated by short, small, generally shallow valleys. It lies on an elevated basin forming part of the East African rift valley. The proposed site is also on a hilly area sloping to the east towards Rweminiga Wetland

3.3 Human Settlements

The Municipality is moderately densely built with predominantly low and medium income housing, followed by commercial premises located mainly in the Central Business District (CBD); and the lowest proportion being high-income housing. A series of industries have sprung up thereby contributing to rapid growth urban settlements. Human settlements can be seen as one moves towards the site. It is worth noting that this site is currently being used by the Municipality as a waste dumping site. An EIA was conducted before it was commissioned as a dump site and mitigation measures were suggested. However, as seen in Plate 2 and 3, there is open dumping of waste without any treatment.

About 17 homesteads were noted to be within half a kilometer from the proposed site including the Mbarara Army Barracks which is approximately one kilometer west of the site. If composting is not properly managed, these dwellings will be affected by the odour from the composting site and other environmental impacts such as leachates, thus contaminating the neighborhoods.

3.4 Demography

By 1991, the Municipality had a total population of 41,031 and the population in 2002 was 69,208 persons. Of this total, 35,017 are females, while 34,191 are male. The population growth is estimated at 4.5% per annum – well over that of Mbarara District estimated at 2.83% per annum. However, this population trend didn't take into consideration the urban-rural migration that takes place during the late hours of the day. Secondly, the Census was conducted during holidays when most of the school children had gone for holidays in the neighbouring villages.

Table 1: Mbarara Municipality and Division Population Levels and Trends by Sex

Municipality Division	1991	1991	1991	2002	2002	2002
	Male	Female	Total	Male	Female	Total
KAKOBA	10,531	8,765	19,296	17,171	17,518	34,689
KAMUKUZI	6,960	6,539	13,449	11,335	11,505	22,840
NYAMITANGA	4,002	4,234	8,236	5,685	5,994	11,679
MUNICIPALITY	21,493	19,538	41,031	34,191	35,017	69,208

Source: Population Office, Mbarara District

Within the Municipality population^(2*) there are special groups of interest that deserve special attention and treatment in the planning and development process of the Municipality. These include children, women, youth, elderly and people with disabilities. Various policy-makers and laws of government have specific provisions for these groups as special interest groups and strategic actions are designed to address issues that put these groups at a disadvantage in respect to planning and development. Within the child population, there is the special group of street children. The situation and various issues relating to the street children in Mbarara Municipality are clearly specified by Boonah Chris Smart^(3*) in *The Influence of Parenthood and Parental Care on Street Childhood*. According to this study, street childhood is growing together with its associated bad effects.

^(2*) The population of the Municipality by Division in 2002 was 22,840 in Kamukuzi, 34,689 in Kakoba and 11,679 in Nyamitanga.

^(3*) Boonah C.S. 1998; "The Influence of Parental Status on Street Childhood in Mbarara Municipality": Dissertation Paper prepared in fulfillment of the award of Postgraduate Diploma in Development Studies, MUST.

3.5 Ecologically Sensitive Areas

A wetland called Rweminiga exists approximately half a kilometre east of the proposed project site. This wetland will need protection from leachates pollution resulting from the proposed project. Therefore any discharge to the environment should be treated at any cost to save the wetland. A water quality sample was taken in order to determine the water quality baseline. Water Sample Analysis report is attached in Appendix II.

3.6 Soils and Vegetation

The soils range from clay loams, sand loams to murram in most areas of the Municipality and within the proposed project site. Vegetation is mainly open Savanna grass which is in some places mixed with woodland. The proposed project area has no significant vegetation cover which will be affected. The present vegetation noted was mainly short grass for grazing the cattle as seen in Plate 1 below.



Plate 1: Showing part of the vegetation cover at the site

3.7 Fauna

There was no game that could be affected by project activities and operations. Animals noted within the vicinity were long horned cattle illegally grazing within the proposed site area and some few goats as seen in Plate 1.

3.8 Transportation and Communication

The main modes of transport used are coaches and taxis (minibuses) traveling from Kampala to Kabale via Mbarara. This route also enables transit of goods to Rwanda, Burundi and the Democratic Republic of Congo via Kabale Municipality; more especially fuel and other consumables. Small taxi cars and *Boda-bodas* also carry passengers from one place to another. The area has access to all major telephone networks including Uganda Telecom, Celtel and MTN networks. Mbarara Municipal Council also has access to Internet and fax services.

3.9 Commerce and Other Related Sectors

Commerce is the dominant component of the economy followed by the service sector, industry, construction and agriculture. There is great potential for exploiting the resources in these sectors of the Municipality's economy. Commerce is carried out in the form of wholesale and retail trade and is mainly conducted by private individuals. The Municipality plays a role in this sector as far as location of operation, quality of premises and licensing of business units are concerned. The various groups in this industry are expected to work in harmony with the Municipal Council to create a conducive environment for smooth running of commercial activities. The current level of commerce in the Municipality is fair by the country's standards, although some improvement is required in the area of physical locations like marketplaces, premises, etc where commerce is carried out.

Related to commerce is the processing and manufacturing sector, popularly known as the industrial sector. Mbarara Municipality is an urban centre with physical, social and economic attributed for accelerating industrial development. The current rate (about 8%) of industrial development has gone up and the various factors of industry location indicate high potential for the development and promotion of industries within the Municipality.

Industrial development can play a significant role in the development of the Municipality. It will create employment (the Municipality has many unemployed and under-employed residents). It will increase revenue for the government and income for the people,

transforming the Municipality's economy, and making use of agricultural materials thus creating a market for agricultural products and other benefits to the people.

The potential for industrial development in the Municipality lies in the presence of land, availability of manpower, presence of utilities (such as water, hydro-electric power and communication), favourable central government policy, high demand for industrial products and other elements of industrial location and operation.

Construction is another key economic activity in the Municipality. A high percentage about 98% of construction is done by people for their own facilities mainly commercial, residential and industrial premises. The few construction activities carried out by the Municipal authorities are implemented on a contract/tender basis. Force account is used in road construction where there is the advantage of free road equipment.

Agriculture is practiced on a very small scale in areas that are still undeveloped, and on land in open spaces such as compounds and road reserves. This agriculture is in the form of crop and livestock production (zero-grazing, free range grazing, poultry and rabbit farming). It is for both commercial and subsistence purposes, and is carried out privately.

Employment

Commerce, trade, industry and public service are the major sources of employment. However, there is no other data to show the magnitude of engaging the population on a sectoral level.

Ethnicity

The ethnicity of Mbarara Municipality consists of Baganda, Bakiga, Batoro, Banyarwanda, Nubians and other tribes but is dominated by the Banyankole.

Water and Electricity

There is a sufficient and reliable water supply provided by the National Water and Sewerage Corporation, which serves about 47.5% of the population. The rest, especially in the fringe areas, survive on protected point sources, as well as on unprotected ones.

The Municipality is served by hydro-electric power from Jinja which has of recent become unreliable due to constant load shedding. This power covers about 90% of the Municipality area and serves nearly 98% of the Municipality's population. It is supplied by UMEME.

3.10 Geology

The geology of Mbarara is made up of the underlying rock, mainly the Precambrian rock, which is described in four types as follows:

- (i) The Buganda Toro system – age dating over 1,800 million years.
- (ii) Wholly granitized or high to medium grade metamorphic formation (Northern part of District)
- (iii) The Karagwe – Ankolean System (Southern and North Western):- age dating varies from 1300-1400 million years.
- (iv) The Granitoid and highly granitised rock (South of Districts)

3.11 Current Waste Management Practices and Infrastructure in MMC

Present Solid Waste Dumpsite

Currently the Municipality dumps its solid waste at the proposed site as seen in Plate 2 and 3. According to the NEMA and the Mbarara Municipality Environmental Officer, an Environmental Impact Assessment was conducted in 2004 and the site was subsequently approved as a waste landfill. However as seen in Plate 2 and 3, it's an open waste dumping site which poses a threat to the environment.



Plate 2 and 3: Showing the current dump site

Equipment Handling Solid Wastes in MMC

A recent study done by Makerere University Biochemistry Department (Municipal Solid Waste Composition and Gas Emissions of Discards in 10 Municipalities of Uganda) showed the following results for MMC.

Equipment Used to Handle Solid Waste Management in MMC

Presently, the equipment used for handling solid waste includes:

- 3 trucks
- Wheelbarrows and spades



Plate 4 and 5: Showing the two trucks that transport waste to the dumpsite.



Plate 6: Showing one of the trucks transporting waste to the dumpsite



Plate 7: Showing one of the skips within the Municipality

4.0 SOCIO-ECONOMIC ANALYSIS OF THE PROPOSED PROJECT

Introduction

Socio-Economic Impact Assessment was designed to assist the donor establish the economic impact of the proposed project on communities. It is aimed at facilitating and informing the decision making process in order to promote long term sustainability, and to ensure economic prosperity, a healthy community, and social well-being.

The assessment was conducted using both quantitative and qualitative measurements of the impacts of the proposed development.

The indicators used to measure the potential socio-economic impacts of the project included the following:

- Extension of power lines in the project area
- Instillation of water pipes
- Changes in employment
- Increased agricultural output
- Increase in the demand for housing
- Increased demand for public services;
- Higher income levels; and
- Capacity development

Quantitative measurement of these factors was an important component of the Socio-Economic Impact Assessment. In addition, the perception of community members on how the proposed project would affect their lives was investigated, as it is a critical contribution to deciding on whether or not to move ahead with this project.

Components	Refuse collection centres (Mbarara Municipality)								
	Bichepe Lane	Winnie Byanyima's place	Kakyeka	Kajogo (Ntare Road)	Byafura (Kamukuzi Ward)	Lotus	Pride House- Opposite Tax Park Kakoba Division	Rwemigina- Kakika Dumping site	Average
Food	64.5	76.9	58.8	47.1	32.6	69.9	56.6	38	55.6
Garden	25.4	10.2	24.5	34.9	36.7	3.9	18.4	42.3	24.5
Paper	2.6	1.7	1.6	0.7	4	4.9	3.9	1.2	2.6
Plastic	2.7	2.8	1.1	2.5	9.4	5.2	5.6	8.6	4.7
Glass	1.1	0.1	0	0	1.4	1.7	0.4	0	0.6
Metals	0	0.1	0	0.5	0.1	0.7	0.5	0	0.2
Textile	0	0.1	0	0.1	0.1	0.4	0.5	1	0.3
Wood, charcoal, leather, rubber	0	0.3	2.6	3.2	2.5	2.2	1.3	0.5	1.6
Other (soil, ash, stones and debris)	3.8	7.8	11.4	11.1	12.4	11.1	12.8	8.5	9.9
Total	100.1	100	100	100.1	99.2	100	100	100.1	100

Note: The total/subtotal may not equal the sum of the material categories due to rounding.

Table 3: Composition Analysis of Waste Streams in Mbarara Municipality Source: Kyambadde 2006

The table above illustrates the analysis of waste streams in Mbarara Municipality. The easily degradable organic waste materials in the MSW (food, garden and paper waste components) on average constitute 82.7% of total MSW generated. This indicates a high degradation potential of Mbarara's MSW and thus its suitability for composting purposes. On average, the MSW contains 55.6% food wastes, 24.5% garden wastes, 2.6% paper and cardboard materials, and 4.7% plastic materials (Table 3). Other components include glass 0.6%, metals 0.2%, textile 0.3%, wood, charcoal, leather and rubber 1.6%, and soil/ash, stones and debris 9.9%.

4.1 Identifying and Evaluating Development Impacts

This section has two parts: (i) estimating quantitative changes in the socio-economic characteristics of the community and (ii) measuring community perceptions about the manure compost project.

(i) Estimating Quantitative Changes in the Socio-Economic Status of the Community

The project will change several community characteristics including demographics, housing, public services, markets, employment and income.

Extension of Power Lines in the Project Area

The extension of electricity supply in Rwentondo towards the site will be a catalyst for socio-economic development as it will foster development of agro-processing small scale industries like mills and milk cooling plant among others. It will also boost other businesses like the clinics and veterinary centre (which have to refrigerate some of their stock) and those of restaurants and bars that have to serve most of their products cold.

Instillation of Water Pipes

This will equally have a significant socio-economic impact through an increase in convenient access to clean water hence minimising water born diseases. It will also boost farm productivity through availability of water for irrigation and feeding of livestock in times of drought.

Capacity Development

The primary stakeholders will benefit from the planned trainings through workshops and seminars. Before commencement of the project, the recruited staff e.g. supervisors,

technology operators and the waste collection team will be trained. This will enhance their capacity to perform competently.

Also, village management committees will be trained on how to ensure effective waste management in their respective areas by passing on acquired knowledge to the waste generators i.e. market vendors, farmers and households, in order to appreciate the need to manage waste for the successful implementation of the project. Therefore, capacity development will enhance the stakeholders' intellectual competence and appreciation of waste management practice.

Increase in Agricultural Output

The application of the compost manure will enrich the soils to produce greater and better quality yields. The assessment established that over 95 per cent of the farmers in Mbarara are conscious of the need for manure.

Housing Market Impacts

A housing market analysis was done to determine whether the proposed development will be beneficial to the target community in relation to housing market needs. The assessment established a connection between the housing market and employment. For example, the proposed development is expected to generate over 20 low-wage jobs, this will impact on Rwentondo's community through an increase in revenue for landlords accruing from rising rent charges. Consequently it will induce residential house construction so as to absorb the new workers.

Retail Market Impacts

The project will attract a variety of new commercial developments including community shopping centres, restaurants, drugs shops/clinics and bars. These developments will provide the Rwentondo community with basic household products like paraffin and soap as well as foods and beverages. It will also spur the services sector to serve the

community. Services will include medical care, leisure and entertainment hence improving the quality of life of local residents.

Employment and Income

The development will avail employment opportunities to both skilled and semi-skilled workers. Over 90 per cent of the employees will be will be sourced from local communities in Mbarara.

Table 4: Estimated Number of Employment Opportunities, Skills and their Sources

Type of Employment	Estimated Number of Employees	Type of Skill	Sourcing of Employee
1. Direct Employment			
Employees during construction	20	Skilled and semi-skilled	Mbarara & outside the District
Casual workers	20	Semi-skilled	Mbarara
Project administrators	5	Skilled	Mbarara
Waste collectors	20	Semi-skilled	Mbarara
Marketers		Skilled	Mbarara
2. Indirect Employment			
Retail shop attendants	80	Semi-skilled	Mbarara
Transporters (drivers, conductors and loaders)		Semi-skilled	Mbarara
Bar attendants		Semi-skilled	Mbarara
Clinic or drug shop operators		Skilled	Mbarara
Contractors of buildings to house project-related activities like shops, bars and restaurants		Skilled and semi-skilled	Mbarara & out side the District

The project will impact on the community through the employment of 145 workers both directly and indirectly hence an increase in the local community revenue/income. During construction it is estimated that 20 casual labourers will be recruited specifically from Mbarara Municipality, excluding professional civil workers who will be working with the contracted companies.

During project implementation 20 full-time workers will be directly employed on the site in operations like sorting, medical personnel, supervision, administration and management to mention but a few. Another twenty will be recruited to work for companies that will be contracted to collect wastes from the three Municipality divisions. There will also be direct employment by the marketing firm.

The project will have a “multiplier economic effect” through stimulation of commercial activities accruing from the project. It is estimated that over eighty (80) workers both skilled and semi-skilled will have employment opportunities. These will be indirectly employed. Commercial activities will be established through setting up of small businesses like restaurants, retail shops, clinics/drug shops, bars, transportation (drivers, conductors and loaders) of the purchased manure from the site. The development will directly influence changes in employment and income opportunities in Mbarara Municipality. Such changes will be permanent after design and construction of the project premises although temporary changes will be experienced for those involved in the construction projects. These types of changes will socially impact on the community because growth in employment will place additional demands on community services and resources.

Increase in Revenue for the Community

With the creation of employment opportunities, the level of income among the local community members will increase. The least paid directly employed workers will earn a net income of One Hundred to One Hundred and Fifty Thousand Shillings (100,000-150,000/=), this will enhance the effective demand for household requirements like foods and beverages, medical care and education services regardless of the costs involved.

Increased Capacity to Effectively Demand for Public Services

The project will create a multiplier effect of employment opportunities and increased income among the community members. Accordingly, there will be effective demand for public services especially tertiary education since the government is already catering for primary education, and more recently, Universal Secondary Education.

Hence in the long run the project will lead to higher literacy levels in the district and ultimately the social-economic conditions of the general population.

Despite the availability of health centers which provide free health services, they are not adequately equipped to competently serve the local community. Therefore with the increased income among the locals they will have the capacity to access medical treatment at a cost.

Generally, the project will increase the purchasing power of the community, enabling them to access basic material and non-material requirements, and thus improving the standard of living. This further proves how beneficial the project will be to stakeholders.

Measuring Community Interests/ Opinions of the Primary Stakeholders

Negative Impacts of the Project and Possible Solutions

Some farmers who zero-graze their livestock will miss the peelings of Matooke, sweet potato and Irish potatoes. The study found that one of the reasons the zero-grazers were using the peelings was their limited capacity to grow elephant grass due to poor soils. In light of this problem, the project will avail cheap compost for the farmer to grow elephant grass and any other plants necessary for animal feeding.

Public-Private-Community Partnerships

Mbarara Municipality had a Public-Private-Community Partnership during a garbage management project in the Municipality funded by United Nations Development Programme (UNDP) with Living Earth Uganda. However, when the donors stopped funding, it collapsed largely due to lack of funds to facilitate transport of garbage to the sites. However, the different groups that were involved in garbage sorting still exist. Formation of a Public-Private-Community Partnership for the Mbarara Composting Project is crucial for sustained operation through informed participation. Therefore, these will serve the purposes of community involvement in the proposed project as well bring about a cleaner town due to a more participatory and sustainable approach to waste management.

Community: The target communities are categorized into two to include: Nyamitanga Sub-county with a waste management system of skips but with irregular waste collection and removal services. The second category comprises of two other Sub-counties (Kakoba and Kamukuzi) with waste collection skips. The communities shall actively participate in on-site sorting of waste and play a key role in monitoring house-to-house waste collection and paying Five Hundred Shillings (500/=) per month for the service.

Mbarara Municipality: The Municipality has acquired land for the project site. It will provide overall management of the project implementation which will involve placement of skips, contracting of commendable private companies to carry out waste collection and delivery to the Rwentondo project site for processing and production, as well as contracting of companies that will do the marketing. This project is designed largely to benefit the local community, and in so doing, the Municipality will invest over 70 per cent in social responsibility, specifically with a deliberate effort to enhance livelihood of the vulnerable groups (women, children, orphans, elderly, HIV/AIDS victims and the disabled) The project's management shall provide capacity building programmes to the work force effective and efficient service delivery. The management in conjunction with the Municipality shall conduct community sensitization among the main generator of wastes in all the divisions. This will bring about appreciation and harnessing of recommendable waste collection and sorting mechanism, which will be crucial for the project's success.

CBOs/Local NGOs: The different CBOs/NGOs like Rweibikoona Women's Group, Rweibikoona Tweyambe Group and Nyamityobora Anti-Garbage Group ensure effective sorting by waste generators and proper disposal of the wastes in the skip; while Living Earth, together with the Municipality, will be concerned with stakeholder sensitization on the need for community involvement in waste management. This will go along way in realising efficient waste management while keeping the Municipality clean. In addition, the NGOs or community projects involved in agriculture like the Area Based Agricultural Programme and forestry promotion will sensitize communities and recommend the use of the compost manure to restore soils nutrients that are lost through the severe soil erosion.

Private Sector: If deemed necessary, private companies, individuals or NGOs may be contracted to get involved in waste collection and transportation as well as in marketing of compost manure. For easy project implementation private companies will be will be contracted to market the compost produced at an agreed price to minimise any possibility of exploiting the clients. Contracting these services will lessen the Project responsibility and operation costs.

Sustainability

For long term sustainability of the project and in order to make it self-sustainable, compost and recyclables shall be marketed by specialized private companies. Furthermore, communities shall be motivated to pay Five Hundred Shillings (500/=) per month for house-to-house waste collection services.

Gender Concern and Employment Opportunity

Generally, women in Uganda have limited access to social and economic opportunities. Hardly do they have equal access to the benefits of social and environmental projects. Against this background, this project shall avail women with equal opportunity for employment specially in the process of sorting wastes. Twenty semi-skilled workers will be employed.

Community Mobilization and Participation

The core strategy for the Mbarara project approach relies on community mobilization and capacity building of the communities to manage their waste at local level and ensuring sustainability of the project. Community mobilization is a long term and time-consuming process. In order to achieve this goal, long term awareness raising and capacity-building programmes will be planned during the project period, involving the private sector, local NGOs, local government staff.

Recommendations

- Form village waste management committees
- Train waste management staff
- The municipality should enforce or ratify municipal waste management regulations
- A management team for the project should be recruited to report to the Municipality authorities
- Awareness campaigns among stakeholder should be regular, with the special aim of involving the private sector and the Civil Society Organisations
- Special programmes for the vulnerable groups like children, Women, elderly among others should instituted
- Extension of power and water pipes line in the project area
- The primary stakeholders should be given first priority when it comes to employment of semi-skilled and skilled personnel
- Capacity development of personnel should be emphasized for effective project implementation

5.0 IDENTIFICATION OF POTENTIAL IMPACTS AND MITIGATIONS

Potential environmental impacts of construction and operation of a composting plant are given in this chapter. An impact is any change to the existing condition of the environment caused by human activity or an external influence. Impacts, therefore, may be positive (beneficial) or negative (adverse). They may also be direct or indirect, long term or short term, extensive or local. Impacts are termed cumulative when they add incrementally to existing impacts. Both positive and negative impacts could arise during the site preparation and operation phases. Positive impacts should be exploited and enhanced. Mitigation measures have been suggested to minimise and/or eliminate negative environmental impacts.

5.1 Potential Positive Impacts

- Employment opportunities will be created during construction and operational phases.
- Indirect employment e.g. provision of accommodation and food will be created.
- Growth of the area and improved tax base
- Compost manure will increase soil fertility and improve agricultural yields. This will lead to higher standards of living for the surrounding communities.
- Mbarara Municipal Council will be clean and environmentally friendly hence attracting tourism and investments.
- Municipal Council revenue will increase.

5.2 Negative Impacts and Mitigation Measures

5.2.1 Impacts during the Construction Phase

Consideration of the construction phase impacts in the following section includes those impacts related to site preparation and clearance works.

Soil Erosion

Vegetation clearance and excavation works associated with the construction phase will expose soils in the affected areas leaving them vulnerable to erosion by surface runoff – a negative consequence bearing in mind that the proposed site is in on a hilly area.

Mitigations:

The magnitude of the impact will be minimal if the following measures are put in place:

- Construction should be done during the dry season when rains are less hence reduced runoff.
- The contractor should cover exposed soil with grass and other appropriate species as soon as possible.
- The contractor should monitor areas of exposed soil during periods of heavy rainfall throughout the construction period of the project
- The contractor should re-plant grass and trees around the proposed project.

Generation of Dust during Construction

Certain amount of airborne particulate matter (dust) will be generated by earth-moving equipment such as heavy trucks during transportation and offloading of construction materials. This situation will be at its worst during the dry and windy seasons.

Mitigation:

- Access roads to the site should be regularly sprinkled with water in a manner that effectively reduces dust emission.
- Stockpiles of fine material should be wetted or covered with tarpaulin during the dry and windy season.
- Workers on site should be provided with dust masks during construction activities and should adhere to Health and Safety Procedures. This should be accompanied by enforcement by the contractor to ensure that workers wear the masks.

Generation of Noise during Construction

The use of heavy equipment during site clearance and construction works will inevitably generate noise.

Mitigations:

- This negative impact will be short term (limited to the construction phase) and will not pose a threat to health or well-being of human beings.
- Construction activities that will generate excessive noise should be restricted to normal working hours.
- Workers operating equipment that generates noise should be equipped with noise protection gear. Workers operating equipment generating noise at levels greater than 80 dBA for eight or more hours should use earplugs. Workers exposed to prolonged noise of 70 – 80 dBA should wear earmuffs.

Sourcing of Earth Materials

Earth materials needed for construction (e.g. murram and sand) are normally obtained from quarry and mining operations. Conscious or unwitting purchase of these materials from unlicensed operations indirectly supports or encourages environmental degradation at illegal quarry sites and causes medium to long term negative impacts. When obtained from legally operating quarries, this provides income to operators of sand and stone quarries, which is a positive but short term impact.

Mitigation

Earth materials must be obtained from officially licensed and/or approved quarry operations or those that have acquired EIA Certificates from NEMA.

Impact as a Result of Transportation of Materials

Various materials required for construction and building such as steel bars, blocks and gravel will be obtained from off-site sources, and transported to the site. Transporting these materials, in typically over-laden and sometimes uncovered trucks, usually results in undue road wear-and-tear. In the case of fine earth materials, dust emission and spillages occur on roadways between source and site. Dust degrades local air quality and material spillages, especially of gravel, worsen driving conditions or increase the risk of road accidents. These represent indirect, short-term, reversible, negative impacts on public health and safety.

Mitigation

All fine earth materials must be enclosed during transportation to the site to prevent spillage and dust emission. Trucks used for this purpose should be fitted with tailgates that close properly and with tarpaulins to cover the materials. The cleanup of spilled earth and construction material on the main roads should be the responsibility of the contractor and should be done in a timely manner (say within two hours) so as not to inconvenience or endanger other road users. These requirements should be included as clauses within the contracts made with contractor or relevant sub-contractors

Impact of Oil spillages

Oils from construction machinery may spill during construction.

Mitigation

If construction machinery is to be fuelled on site, transportation of lubricants and fuel to the construction site should only be done in appropriate vehicles and containers such as sealed drums.

Water Use

The project will require consumption of water during construction and operation. If water is to be drawn from nearby wells, it may affect the quality of underground water.

Mitigation

Water to be used both during construction and operation of the project must be drawn from a NWSC Mbarara line or the proposed project should get permission from the Directorate of Water Development to use any nearby water source during construction and operation.

Material Storage

The improper storage of sand, gravel, cement, etc. at the construction sites could lead to fine materials being washed away during heavy rains into the drainage system, and ultimately into the nearby wetland. Hazardous materials such as paints, and solvents improperly stored and handled on site are potential health hazards for construction workers. Spilled chemicals would contaminate soil and inhibit plant growth in localised areas.

Mitigations:

- The stockpiling of construction materials should be properly controlled and managed. Fine-grained materials (sand, murram, etc.) should be stockpiled away from surface drainage channels.
- Low berms should be placed around the piles and tarpaulin used to cover open piles of stored materials to prevent them from being washed away during rainfall.
- Safe storage areas should be identified and retaining structures put in place prior to the arrival and placement of granular construction materials.
- Hazardous chemicals (e.g. fuels and oil paints) should be properly stored in appropriate containers and these should be safely locked away. Conspicuous warning signs (e.g. 'No Smoking') should also be posted around storage areas.

Displacement of People to Pave Way for the Project

There may be displacement of people and their property for project development.

Mitigation

There will be no displacement of people since the Municipality has already acquired the land and has all the legal documentation including the land title.

Construction Waste

Solid waste generated during site preparation and construction work will include cut vegetation and typical construction waste such as wasted concrete, steel, wooden scaffolding and forms, cement bags and waste earth material. This waste will negatively impact the site and surrounding environment if not properly managed and disposed of.

Mitigations:

- A Site Waste Management Plan should be prepared by the contractor prior to commencement of project. This should include the designation of appropriate waste storage areas, a collection and removal schedule, identification of an approved disposal site, and a system for supervision and monitoring. Preparation and implementation of the plan must be made the responsibility of the building contractor with the system being monitored independently. It is important that the District Environment Officer is informed about this plan and his views captured, especially on where and how to dispose of construction waste.
- Special attention should be given to minimising and reducing quantities of solid waste produced.
- Vegetation and combustible waste must not be burned on the site but can be composted and be used in the tree plantations as manure.

5.2.2 Operation Phase Impacts

Consideration of the operation phase impacts in the following section includes those impacts related to the operation and/or functioning of the composting project.

Contamination of Surface Water and Underground Water

During operations, wastewater in the form of leachates may be generated. This may be a result of heavy rains mixing with solid wastes on site. Underground water and surface water may be contaminated as a result of leachate discharge from the compost site. Leachates may reduce nearby surface and underground water quality with impacts on human health, particularly where water is used for domestic purposes within the local community or for public supply. It may also have a negative impact on aquatic life.

Mitigations:

- Reduce leachate discharge by adopting cleaner production methods such as recycling of water.
- Leachates should be treated before discharge, followed by continuous monitoring against the National Environment Effluent Standards in order to determine the environmental performance.
- A leachate collection tank should be put in place to collect any leachate before discharge.
- It is important to note that leachate should not be discharged into the environment untreated as this may lead to pollution of water bodies and may trigger a conflict between the proposed project and the community.
- Divert surface water and storm water from active areas.

Generation of Wastes during Operation

Toxic Waste and Other Solid Waste

Toxic waste and other solid wastes in the form of polyethene wastes and medical waste that may contain toxic compounds may end up at the compost site. This may be a result of improper sorting of waste at the source. It may also be due to lack of monitoring at the source to see that medical waste is not placed in municipal bunkers. This can have an adverse impact on the environment, particularly on water and land. Also, the quality of compost to be sold may be affected.

Mitigations:

- Monitoring of waste sorting at the source should be done so that it does not end up at the composting site.
- Appointment of supervisors to monitor waste sorting at the source of waste generation should be done. If a sub-contractor is assigned to handle waste from the plant, he should be an approved and licensed operator.
- The MMC should involve all medical practitioners within the Municipality and carry out sensitization on the importance of separating medical waste from other biodegradable waste.
- The MCC should continuously monitor all the medical centres and see that all medical waste is incinerated according to the Ministry of Health Guidelines.

Noise during the Operation Phase

Noise may be generated during operation phase. Operation noise includes noise from vehicles, electric generators and movement of conveyors. Noise being a form of energy, has impacts that not only depend on its level but also on its duration. Noise has various impacts on humans and animals.

Mitigations:

- The developer should provide appropriate protective gear to all workers who are involved in operational areas that generate noise.
- The project should enforce regulations requiring the worker to wear protective gear.
- Install silencers in machinery that generates a lot of noise
- Conduct annual audits in order to determine the noise levels and suggest mitigations for continuous improvement

Accidents Related to Increased Traffic

There will be an increase in the number of vehicles especially trucks and excavators. Some of these might belong to people not directly associated with the project e.g. suppliers and customers. These people may not be careful especially in areas where the road curves around hilly corners. They could therefore cause accidents resulting in injury or death of humans and domestic animals.

Mitigation

A Road Safety Policy should be developed, implemented and enforced including safety requirements for suppliers and contractors. Drivers should be periodically tested therefore enhancing road safety.

Social-Economic Issues

Social issues such as spread of Sexually Transmitted Diseases (STDs) in the communities may increase as a result of the influx of new people (workers /expatriates) in the area. This may get worse when workers earning high incomes take up residence in such low-income communities.

Mitigations:

- STDs awareness programmes will be promoted in the area and they will involve

local leaders.

- NGO s should be put on board to sensitize communities about HIV/AIDS

Other social mitigations have been suggested.

N.B Please refer to Chapter 4 of this report regarding mitigations on social issues.

6.0 EVALUATION OF ENVIRONMENT AND SOCIO-ECONOMIC IMPACTS

This section considers and evaluates significant environmental and social impacts of the construction and operational phases of the proposed project. It is worth noting that the evaluation of the actions and mitigation measures will take into account the project's sustainability and the integration of environmental and economic considerations, as well as compliance with regulatory requirements.

6.1 Effects of Extraction of Raw Materials for Construction

All materials required for construction purposes will be purchased locally from shops and private dealers who are responsible for off-site effects such as extraction of sand. The impacts of extraction of these materials from off-site sources will be catered for by these dealers, and therefore, it will not be the responsibility of this project. However, project management should endeavour to purchase from those suppliers and contractors who put environmental considerations in their business or from suppliers who possess a NEMA Certificate.

6.2 Effects of Solid Waste Generated During Construction/Operation Phases

The exercise will not generate a significant amount of construction debris. However, some debris will be generated while undertaking excavations. Construction debris will be properly disposed of from the site or will be reused to backfill pits. Any waste which is not toxic will be used to backfill the quarry pits. Toxic waste should not reach the compost site.

6.3 Effect of Toxic Waste

Management will ensure that the toxic waste does not reach the compost site. Monitoring of medical waste generation and incineration should be done in collaboration with the District Environment Officer and the District Health Inspector.

6.4 Waste Water from the Compost Site

There is a risk of polluting the neighborhood and nearby water bodies if proper measures are not taken.

A Leachate management system will be put in place. This system will focus on avoidance of leachate generation by covering waste and compost so that rainwater does not seep through; recycle of leachate and treatment of leachate before discharge.

6.5 Wastes Generated by Service of Trucks

Operations such as servicing of the trucks will be sub-contracted to a specialized mechanic who will handle all wastes generated by his operations. The contractor will ensure segregation of these wastes using marked dustbins. Oil sumps and waste oil storage containers will be put in place to ensure that any spillage of lubricants is contained and properly disposed of. Sound housekeeping practices will also be encouraged as these are sure means to minimise and control the impact of wastes on the environment.

6.6 Increased Rates of Soil Erosion

There may be increased runoff. However, rain water will be harvested into tanks leading to minimal discharge of storm water into the immediate neighborhood. A drainage system should be constructed and constantly de-silted to properly direct storm water and thus prevent the formation of gullies.

6.7 Biological Environment

No significant change in biological environment on the project site is expected (the top soil will be removed and will later be used for backfilling). There are few crops and significant vegetation cover existing in the vicinity.

6.8 Aquatic Ecology

The proposed project site is located near a wetland. Mitigation measures for protecting the wetland have been proposed in Chapter 5.

6.9 Socio-Economic Environment

Social-economic issues have been dealt with in Chapter 4 of this report.

6.10 Effect of Air Pollution as a Result of Ambient Dust

The issue of dust has been discussed in the mitigation plan.

6.11 Risk of Fatal Fire Accidents

Accidents may occur during construction and operation of the project.

The company has to put in place a safety management system that all suppliers and contractors will be required to comply with. This will help to reduce or eliminate any such accidents, and if it does happen, such an accident will be dealt with.

7.0 ENVIRONMENTAL MANAGEMENT PLAN

7.1 Monitoring Plan

Monitoring is required for all projects that are subject to Environmental Impact Assessment. Therefore a monitoring plan shall ensure that mitigation measures and actions as approved through the EIA to protect the environment are adopted and implemented. Management shall undertake self-monitoring and keep all records and report to NEMA at least once a year or whenever requested by NEMA. The monitoring plan will show key monitoring indicators to be followed during site planning, design, construction and during project operation. It will outline ongoing environment management options that can be incorporated with the proposed compost plant, and it will also show key responsibilities and monitoring indicators.

7.2 The Inspection and Monitoring Team

The inspection and monitoring team will include appointed NEMA Officials, Mbarara Municipal Officials (mainly the Municipal Environment Officer), Mbarara District Environment Officer and District Engineer, the Consulting Engineer for the project, the Contractor, and the representative from the Public-Private Partnership. The inspections and monitoring will be done during construction and operational phases. In order to ensure sustainability of the mitigation measures the following monitoring and management plan is recommended.

- Monitoring of leachates mainly by taking water samples from the nearby surface water bodies and wetlands for analysis for the following key parameters: Biochemical Oxygen Demand (BOD), Dissolved Oxygen, pH and conductivity.
- Health, Safety and Environment Management manuals developed should be given to all section heads and process owners and should be monitored if they are used.
- Fire fighting equipment on the site should regularly be serviced and tested or calibrated.
- Environmental audits of all operations and equipment should be done at least annually or as the Executive Director NEMA may ask such an audit to be done.

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- The quality of leachates coming out of the plant should regularly be analyzed for key parameters such as Biochemical Oxygen Demand (BOD), Dissolved Oxygen, pH and conductivity.

7.3 Environment Monitoring Plan Matrix

Impact to Monitor	Monitoring Indicator	Responsibility	Schedule
Soil erosion	Presence of gullies and removal of top soil around the project site. Increase in the presence of silt in the nearby river	Contractor/ MMC	Continuous
Construction noise	Presence of silencers and provision of noise protective gear	Contractor /MMC	Continuous
Sourcing of earth materials	Provision of documentation from licensed or certified suppliers of earth materials	Contractor / MMC	During construction
Material storage	Presence of any material leakages in stores	Contractor / MMC	Continuous
Construction waste disposal	Improper construction waste management practices observed on site throughout construction period. Containers for construction waste collection provided.	Contractor /MMC	During construction
Noise and oil spills from standby generator	Check presence of silencers and oil leaks and also check if there is a generator house	Contractor/ MMC	During construction

Impact to Monitor	Monitoring Indicator	Responsibility	Schedule
Operation Phase			
Generation of dust during operation phase and air pollution by gaseous emissions	Measure emission levels to determine whether they conform to the air quality standards	Project Management	During operation
Contamination of underground water and surface water by leachate from the plant	Determine the level of pollution in relation to the Effluent Standards. Sample both ground water and nearby surface water	Project Management	During operation
Noise during the operation phase	Presence of protective gear such as ear muffs provided to all workers who are exposed to high noise levels	Project Management	During operation
Accidents related to increased traffic	Liaise with the Ministry of Works and Transport to put up warning signs along the Kampala-Mbarara Road. Road safety policy and procedures	Project Management	During operation
Injury of workers	Presence of protective gear e.g. gloves and gumboots to all workers and First Aid kits	Project Management	During operation
Waste disposal	Presence of a landfill for unwanted waste which has been separated from the waste to be composted.	Project Management	Continuous during operational phase

It's important to note that a leachate monitoring system should be put in place to monitor the following parameters

- PH values
- Electrical conductivity
- COD
- BOD
- TOC

8.0 SITE RESTORATION / DECOMMISSIONING PLAN

All projects end and there comes a time when they have to be decommissioned. This section describes procedures and plans for closure and post operation, so that the environment is restored, as much as possible, to the No-Project status.

On completion of the project, the site should be rehabilitated. This will involve rehabilitation of the entire composting yard sites and the general plant. Before decommissioning of the plant, the equipment must be inspected and tested to ensure that it does not pollute the environment when disposed of. Any contractor assigned to undertake the decommissioning works should involve competent staff of the following professions. Infrastructural Engineer, Environment/Waste Management Specialists, Sociologist, and at least one specialist in Occupational Health and Safety who will implement the Environment, Health and Safety procedures of the company. These will include the following:

- Inspect and evaluate the equipment on site before dismantling it so as to identify and analyse any potential pollutants
- Inspect and evaluate structures and equipment of the plant before dismantling them
- Disconnect all services such as electricity, water, and telecommunication. Make sure that the authorities concerned with these utilities are informed. These include UMEME, NWSC, telecommunication companies, NEMA and the Mbarara District Environment Officer.
- Dispose of all wastes in an area approved by NEMA or the District authorities
- Backfill all open pits and ditches
- Plant trees and grass to restore vegetation cover so as to reduce soil erosion
- The developer should make sure that he clears all the hanging and unstable equipment that may fall when the site is closed.
- The developer should make sure that he creates a safe place that can be put to another land use.
- All recyclable materials can be reused. These include steel bars and machines that have the potential to be reused.
- It is important that the developer fences off all the pits and ditches that are not covered and put a signpost warning of the dangerous pit(s) ahead.

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- The sites can be turned to another land use provided that an Environmental Impact Assessment is undertaken and approved by relevant authorities

CONCLUSION

The Environmental Impact Study for the proposed project has identified a number of environmental, social and safety issues that need to be addressed during the construction and operational phases. These include:

- Safety at the work place
- Transportation of the raw material during construction
- Soil erosion
- Leachate generation
- Noise pollution
- Air pollution
- Neighborhood relations
- Water abstraction and permitting issues
- Social-economic issues

Consultations were done during the study. The community is ready to work hand in hand with the project manager. The project manager should therefore ensure that the compost plant works in an environmentally friendly way. Mitigation measures have been suggested and a monitoring plan has been developed. The study team recommends that NEMA approves the EIS.

GENERAL RECOMMENDATIONS

- Form village waste management committees to monitor waste collection at the bunkers, waste sorting and proper dumping of waste in the designated bunkers
- Purchase more waste collection trucks to transport waste from the bunkers to the composting site
- The Municipality should enforce Waste Management Regulations and Waste Management by-Laws.
- A management team for the project should be recruited to report to the municipal authorities.
- Awareness campaigns among stakeholders should be regular, with the special aim of involving the private sector and the CSOs.
- Sufficient supply of waste will depend on regular collection of waste from the Municipal Council. It is important to note that all this waste has to be sorted before it is delivered to the composting site. However, in case the Mbarara Municipal Council waste is not sufficient, neighboring trading centres can feed their waste to the compost yard on terms agreed by the municipal authorities and the respective trading centres.
- Medical waste should be strictly prohibited at any bunkers. This calls for the involvement of all medical practitioners to be part of the monitoring team.
- If the proposed project implements the following recommended training and operational Management Systems, problems of record keeping and documentation will automatically be solved.

The following is the recommended training module for the composting project.

Module 1: Municipal Waste Management (5 Day Training)

Target group: Municipal Technical Planning Committee, NGOs in the Municipal Council, operators of the composting project and any other key stakeholders

- Policy, institutional, legal framework for municipal waste management
- Classification of waste and hazardous waste management
- Waste management

Module 2: Quality Management System based on ISO 9001-2000

Target group: Project Operators and Managers

Topics will include:

- Introduction to QMS based on ISO 9001-2000
- Process approach and the model of a process-based quality management
- Compatibility with other management systems
- Quality Management Systems requirements
- Implementation and operation
- Check and corrective action
- Management Review.
- ISO 9001-2000 Certification Process

Module 3: Environment Management System (EMS) ISO 14001: 2004.

Target group: Project Operators and Managers

Topics will include:

- Introduction to EMS based on ISO 14001:2004 and Gap Analysis
- Environmental Policy
- Environmental Legislation in Uganda
- Environmental aspects and impacts and applicable legal and other requirements of the organisation,
- Set environmental objectives and targets
- Developing an Environment Management Programme
- Implementation and operation

- Check and corrective action
- Management Review.
- ISO 14001: 2004 Certification Process

Module 4: OHSAS 18001 Health and Safety Training for (5days)

Target group: Project Operators and Managers

Topics will include:

- Introduction to Health and Safety principles
- Safety Legislation
- Hazard Recognition and Control, Emergency Preparedness, Response Plans and Fire Prevention
- Occupational Hygiene and Ergonomics
- Workplace Inspection and Accident Investigation
- Introduction to OHSAS 18001
- Elements of the OHSAS 18001 Specification
- Programme Development and Implementation based on OHSAS 18001 Specification
- Check and corrective action
- Management Review.
- OHSAS 18001 Certification Process

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APPENDIX 1: PEOPLE / ORGANISATIONS CONSULTED

It's worthy noting that Mbarara Municipality carried out a consultative meeting with the communities regarding this proposed project. Attached is a list of people consulted and the minutes of the meeting.

APPENDIX 2: WATER SAMPLE FROM THE WETLAND