THE OPEN UNIVERSITY OF TANZANIA

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SOUTHERN NEW HAMPSHIRE UNIVERSITY

MASTER OF SCIENCE IN COMMUNITY ECONOMIC DEVELOPMENT

(2005)

SOLID WASTE MANAGEMENT AND RIVER BANK STABILIZATION ALONG NALUNG'OMBE RIVER IN KINONDONI MUNICIPALITY DAR-ES-SALAAM

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A PROJECT REPORT SUBMITTED IN PARTIAL FULFILLMENT FOR THE REQUIREMENTS FOR THE DEGREE OF MASTER OF SCIENCE IN COMMUNITY ECONOMIC DEVELOPMENT IN THE SOUTHERN NEW HAMPSHIRE UNIVERSITY AT THE OPEN UNIVERSITY OF TANZANIA

BABYEBONELA TILOTWA WILSON

SUPERVISOR CERTIFICATION

This is to certify that I have gone through the project by **Babyebonela L.T. Wilson** titled, **"SOLID WASTE MANAGEMENT AND RIVER BANK STABILIZATION ALONG NALUNG'OMBE RIVER IN KINONDONI MUNICIPAL IN DAR ES SALAAM"** and found it in a form acceptable for the partial fulfillment of the requirements for the Master of Science Degree in Community Economic Development of the Southern New Hampshire University in collaboration with the Open University of Tanzania.

.....

Mr James L. A. Kisoza

Open University of Tanzania

Date 26 Sept, 2005

COPY RIGHT

DECLARATION

I **Babyebonela L.T. Wilson** hereby declare that this report is the result of my own work and it has not been presented for any similar award in any other Institution of High Learning.

Date. 26th SEP' 2025

Signature.....

DEDICATION

This work is dedicated to the Magomeni Development Association (MADEA'S) Community based in Magomeni, Tandale and Ndugumbi wards in Kinondoni Municipal in Dar es Salaam, whom I am really indebted to help as they are right persons who need technical, social and moral support for the purpose of getting rid of prevailing environmental hazards.

ABSTRACT

This report describes the project about training and implementation of solid waste management and river banks stabilization along Nalung'ombe river in Kinondoni Municipal in Dar es Salaam city. The project was conducted for eighteen months starting September, 2003 to January, 2005. A SWOT analysis and need assessment analysis followed by a community survey were carried out in the project area. The need assessment results identified three main problems: solid waste disposal and seasonal river floods and soil erosion along river banks. A community survey was conducted to establish the level and willingness of community to participate in solid waste management and river bank stabilization in the study area. Three data collection methods were employed these include questionnaire survey, participant observation and documentary review. The study results established that the local community had a low level of awareness on environmental degradation and low willingness to pay for solid waste disposal services. It was recommended that, the Magomeni Development Association (MADEA) management in collaboration with all local government authorities must emphasize on capacity building to these communities in order to improve community participation in environmental management. The implementation of recommendations include; project proposal for funding to support community awareness rising and participation in actual waste disposal exercise.

ACKNOWEDGEMENT

This research project could not have been what it is today without the co-operation received from several individuals who contributed in one way or another towards completion of this project.

May I express my sincere gratitude and appreciation to the program co-coordinator Mr. Michel Adjibodou who was directly responsible for research and evaluation method subjects, as well as co-ordination of the research projects.

It is an open secret that, I am indebted to Magomeni Development Association (MADEA) management for the welcome and cooperation extended to me as a host organization. MADEA provided with me all necessary supports throughout period of my research project.

Also I am highly indebted to my project supervisor Mr. James Kisoza for his guidance and competent assistance that led to my success. Really I commend him for his advises which were very resourceful towards accomplishment of this research project.

I also have a deepest and sincere appreciation, to Mr Kassimu Ali Nihuka who was the best resourceful person during the whole period of the study. I further highly recognize all contributions from my relatives and my family particularly

my wife Mrs. Praxeda Babyebonela and my daughter Lilian Abella for their material and moral support during this study.

Lastly, I also extend my sincere appreciation to all friends who supported me materially and morally during the whole period of my studies, and all other persons who assisted me in one way or another to the extent of accomplishing this course.

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LIST OF ACRONYMS

NGO	Non-Governmental Organizations
CBO	Community Based Organizations
TANGO	Tanzania Association of Non-Governmental Organizations
UNDP	United Nations Development Programme
REDET	Research and Education for Democracy in Tanzania
CED	Community Economic Development
NEMC	National Environmental Management Council
IDWE	Infectious Diseases Week Endings
OUT	Open University of Tanzania
SNHU	Southern New Hampshire University
SDP	Sustainable Dar es Salaam City Programmes
TOR	Terms of Reference.
SPF	Small Project Fund
NPES	National Poverty Eradication Strategy
NEP	National Environmental Policy
WCED	World Commission on Environmental and Development
ESRF	The Economic and Social Research Foundation
NEM ACT	National Environmental Management Act
TNL	Tanzania National library
URT	United Republic of Tanzania
UDSM	University of Dar es salaam
VDC's	Village Development Committees
LDC's	Less Development Countries
SWMRMC	Solid Waste Management and Resource Mobilization Centre
GTZ	Germany Agency for Technical Cooperation

S WM	Solid Waste Management
MHPP	Ministry of Housing and Physical Planning
DHUD	Department of Housing and Urban Development
SDP	Sustainable Dar es Salaam City
MRAN	Msimbazi River Action Network
EMT	Environmental Management Trust
LEAT	Lawyers Environmental Action Team
DAWASA	Dar es Salaam Water and Sewerage Authority
ENVIPRO	Environmental Professionals Organization

CHAPTER ONE

1.0 THE CBO BACKGROUND

1.1 Background Information

As part of master's study, the author selected to work with Magomeni Development Association (MADEA) a Community Based Organization located in Magomeni division, Kinondoni Municipal a as a consultant (Annex 1 and 2).

MADEA is a registered organization under section 317 of the Societies Ordinance (1954) with registration certificate number 9976 of 19thAugust, 1999. Its activities covers Magomeni, Ndugumbi and Tandale wards in Magomeni division (Annex 17).

The organization obtains its funding from member contributions, membership fees, fundraising activities and donor grants. For more details a current budget is attached, see Annex 5. The organization is run by 100 community members, including 7 executive committee members and 4 main actors. Other positions are administered either on voluntary or hiring basis during ad hoc project implementations as shown in the organization chart.

MADEA liaisons with only two organizations. These include African Youth Action (a Non – Governmental Organization) and Tanzania Association of Non – Governmental Organizations (TANGO) an Umbrella organization for all NGO's in Tanzania.

MADEA ORGANIZATION CHART

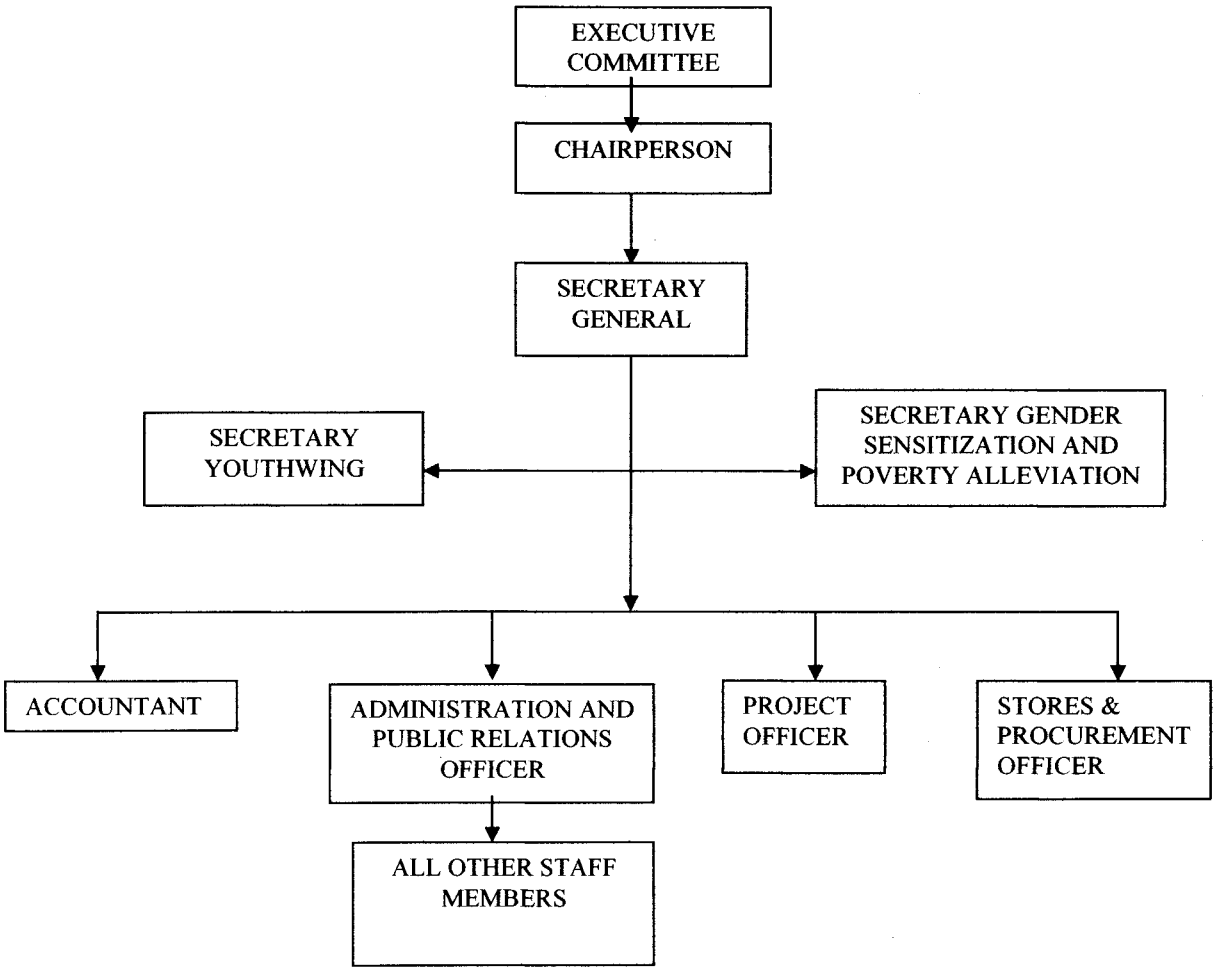


Figure 1: MADEA organizational structure chart

1.1.1 Mission statement and objectives

The MADEA mission is to promote economic and social development activities with a view of alleviating poverty among all residents of Magomeni ward in Kinondoni Municipal, in Dar – es – Salaam city.

Its focus is to attain the following objectives:

(i) A community with stable economy through creating members who are knowledgeable on environmental degradation activities;

(ii) Promoted and enhanced solidarity of all stakeholders in the economy by supporting and connecting unemployed and disadvantaged members of the society to the existing variables in micro financing ;

(iii) Ensured support to disadvantaged children, orphans and disabled, within and outside MADEA, whom are academically capable but whose parents were victims of calamities.

(iv) Ensured support to youths and women through education programs on issues like health, nutrition, family planning, sanitation, HIV/ AIDS and other diseases.

(v) Networked with similar CBO'S / NGO'S, local and International Community Organizations for the purpose of programs exchange and so on.

1.1.2 Programme and current activities

The following are programs currently being implemented by MADEA.

(i) Awareness creation on environmental protection and soil conservation which includes tree planting and solid waste collections.

(ii) Health and educational programme which includes drug abuse, adult education and children day care centers.

(iii) Civil and civic education programme.

(iv) Income generation activities, that is; self–employed in the micro – enterprises sector and priority is given to youth and women.

(v) Awareness creation on gender equality, equity and relation issues.

(vi) Lobbying and advocacy for favorable policies and various other development issues. The current activities includes mobilizing funds and construction materials for Makanya Foot Bridge,in which actual implementation will take place once the funds are available.

Furthermore it is involved in mobilizing funds for awareness creation on environmental protection, soil conservation and tree planting along Nalung'ombe River which cuts across Magomeni, Tandale and Ndugumbi wards in Kinondoni Municipal, in Dar – es – Salaam region. This exercise was permanent, as the river changes course from time to time. The future plans included preparation of teaching materials and information on civic education for her members and the general public living in Magomeni ward for the purpose of Tanzania general election to take place, in October 2005. It

continues with voluntary exercises on capacity building for poor women on self – employment creation for the purpose of economic empowerment.

1.2 The Needs Assessment, Problem Statement and Suggested Measures for Implementation

1.2.1 Background information

Rwekaza (2001) elaborates the term development as an achievement of a higher quality of life that is fairly distributed by making sustained and rapid alterations in a society's productive capacity and social organization. Development can also be understood to be both a goal and a process. It is a social, economic, technical and environmental process involving several key players and many inter-locking sectors that operate at all crucial administrative levels of society from individual and household levels up to the global level. Some of the outcomes of these processes are educational and organizational, livelihood and health development within communities. Key players include government agencies and, most importantly, individuals, families and groups in local communities. Key sectors include those concerned with organizing and mobilizing basic development resources, which include intelligence, materials, energy, space and time.

At the commemoration of the International Environment Day, the UNDP representative in Tanzania Hendra (2004), emphasized that, environmental

management, cannot be treated separately from other development concerns. In order to achieve significant and long lasting results, it must be integrated with efforts to reduce poverty and to achieve sustainable development.

Sustainable development means achieving a quality of life that can be maintained for many generations as it is socially desirable, economically viable and environmentally sustainable. Development therefore, is sustainable if it takes place within nature's tolerance limits, both in the short and in the longer-term perspective. The challenge for all communities is to recognize the various demands made upon their environment, and reconcile these in ways which seek to maintain and enhance it for the future. Equally the purpose of development is to improve the quality of human life. Also development is sustainable if it adequately addresses poverty in its broader sense as a composite index of human deprivation, extending from command over economic resources, access to all social services, energy needs, and to control the physical environmental quality.

It is from this view, therefore that, it is important to empower the poor communities to solve their problems, so as to sustainably manage their environment, and empower them in other areas as well. This will help drive the whole process of poverty reduction and push human development forward Yona (2001). To enhance sustainable development therefore, MADEA's management

and all community members, living along Nalung'ombe River in Kinondoni Municipal have decided to embark on solid waste management and river bank stabilization project. In order to implement this project, the management started to solicit funds from donors as well as community fund raising activities (Annex 3). This decision was reached by the community through a comprehensive and review of needs assessment forms (Annex 6). The project was implemented and closely supervised by the MADEA team of management under consultancy and facilitation of Community Economic Development Programme.

1.2.2 CBO strengths, weaknesses, opportunities and threats analysis

(a) Strengths

MADEA is a registered CBO and has a full legal status in Tanzania and elects her leadership democratically, according to the organization's constitution.

(i) MADEA's management had enough experience, influence, tolerance and capable to implement, supervise, monitor and evaluate every component or activities of the project.

(ii) Assistant facilitators had skills; enough knowledge and experience in public mobilization, animation and capacity building programs (refer biodata Annex 8).

(iii) Members were committed to the project by contributing human resources and material inputs for support of the project development.

(b) Weaknesses

(i) In the first place MADEA is gender insensitive as among leadership there is a big gender imbalances in which male are almost 95% and female 5%. This scenario implies the likelihood biasness in decision making.

(ii) MADEA is almost donor dependent and with less financial viability.

(iii) Financial constraints made the life of the researcher difficult because had to incur all related costs himself.

(iv) Lack of appropriate alternative waste materials dumping site.

(c) Opportunities

(i) MADEA had a strong relationship with local government authorities, because she enjoyed political support from all three wards which enabled smooth implementation of the project.

(ii) The project's significant inputs such as tree seedlings were cheap in terms of cost, availability and easy to acquire whenever needed.

(d) Threats

(i) No risk emerged during the implementation of the project, whether political, legal or spiritual.

(ii) The threat of material price changes due to inflation was overcomed when Kinondoni Municipal supported the project by providing all needed tree seedlings.

1.2.3 Statement of the problem

The Nalung'ombe River in Kinondoni Municipal in Dar – es – Salaam city is highly polluted downstream to the extent that, its water consists mainly of sewage. The reason for this level of pollution is that, most rickety pit latrines along the river course are drained into the river; also solid wastes are dumped directly into the river particularly during the rainy season. Consequently, the Nalung'ombe River is now highly polluted. This is exacerbated by high-density of squatter of (unplanned) settlements, municipal (domestic) waste dumping problems (Annex 18) and soil erosion around the river banks. Then, this has led to altered aquatic ecology and river flow regimes. The river is saturated with nutrients; toxic metals, industrial and farm effluents, and other pollutants picked up from small garages and horticulture activities upstream. Coupled with poor municipal waste management practices the water samples from the river have consistently registered very high bacterial contamination especially because of high degree of sewerage pollution, NEMC (2003).

This and other pollutants have rendered the Nalung'ombe river water, in the whole river system unsuitable and hazardous to human health. For example

there are high diseases outbreaks occurring during rain seasons including Cholera, Typhoid and Dysentery. These diseases are mainly water borne infections associated to poor sanitary condition prevailing in the area under this project. Thus, increased pollution of Nalung'ombe River poses increasing risks of disease transmission. Empirically, admission reported epidemic disease cases in 2003 are shown in table1.

Table1: Epidemic diseases reported in 2003 in Dar es Salaam city

Type of diseases	Number of admission case
Malaria	269729
Diarrhea	31133
Typhoid	789
Cholera	1060
Dysentery	6816
Total	309527

Source: *IDWE* Report, 2004.

On the other hand solid waste disposal also has become an acute problem due to unplanned rapid urbanization, which mainly contributes to the existing of "hotspots" of pollution particularly in the area under the project.

Nevertheless the situation is aggravated by the existing poor facilities for disposal of urban refuse, which are quite inadequate to meet the demands (Annex 15).

In this regard, the table 2 shows a problem of the solid waste disposal in Tandale, Magomeni and Ndugumbi wards, a principal area where Nalung'ombe River course cuts across to Magomeni River.

Table 2: Minimum performance levels for solid waste collection in 2003, Dar es Salaam

	Ward	Amount generated per day in Tons	Amount per day collected in Tons			Estimated average of uncollected amount in Tons per day.	In %	Uncollected amount in Tons per annum	Uncollected heaps in terms of trips per annum
			Within the 1st 3 months (50%)	After the 1st 3 months (60%)	After the 1st 6 Months (76%)				
	Tan	50	25	30	38	12	24	4,392	627
	Magomeni	19	10	12	15	4	21	1,464	209
	Ndugumbi	20	10	12	15	6	30	2,196	313
Total		89	45	54	68	22	75	8,052	1,149

Source: Kinondoni Municipal Solid Waste Data Collected Report, in 2003.

Thus the project management decided to embark on creation of community awareness and chart out strategies on how solid waste disposal and river bank destabilization problems along Nalung'ombe river banks could be controlled and sustainably managed (Annex 3 and 4).

CHAPTER TWO

2.0 LITERATURE REVIEW

The review is wholly based on theoretical and empirical papers where a number of books, publications and journal articles have been cited. Also articles (electronic) from the web-site were reviewed.

2.1 Theoretical Literature Review

2.1.1 The problems of solid waste management in the developing world

According to Arlosofoff (1991) half of the 1.25 billion urban dwellers in the developing countries live in cities and 500,000 to 1 million are inhabitants. By the year 2000 more than 50% of the world's population was living in urban, with a majority of individuals inhabiting in large cities. Municipal solid waste management in many cities in developing countries is very rudimentary at best to date.

Gross inefficiencies are commonplace with solid waste management accounting for 20% to 50% of available operational budgets for municipal services, yet only providing a service for 50% of the urban population and collecting only 60% to 70% of the refuse arising (Barton et al 1991). Waste management responsibilities are delegated down to lowly paid officials who lack authority and/or management expertise.

Uncontrolled landfill disposal of waste and open dumping are evident even in developing country cities where a waste collection service is organized. There is also a general failure to keep industrial, municipal and sewage waste streams separated. It has been estimated that in India, for example, around 39 million of sewage and industrial waste, together with about 50 million of solid waste, finds its way into the coastal of the Arabian Sea and Bay of Bengal. Solid waste is also often dumped as landfill materials in the coastal wetlands (Appasamy et al, 1993). This results in synergistic effects and intensified environmental damage and human health hazards. The latter problems are especially severe in sub-tropical and tropical climatic conditions. Solid waste poses several major problems for the developing worlds including; health hazards from uncollected waste; health hazards from collected but poorly disposed of waste and the economic burden of waste disposal on towns and cities. Data on waste a risings in developing countries are sparse (Cointreau et al, 1992).

2.1.2 An overview of solid waste management situation in developing world particularly in the Kathamandu valley in Nepal

Katmandu valley is the political, cultural, tourist, educational, administrative, commercial, industrial and financial centre of Nepal. There are three municipalities and 110 VDCs in Kathmandu valley. The pace of urbanization is very fast both in municipalities and VDCs. According to the 2004 census the Kathmandu valley had a total population of 1.12 million. A decade ago

Kathmandu was not so densely populated. Migration is an important component of population growths in Kathmandu valley, particulary in urban areas. The concentration of all social, political, physical, financial, institutional transportation and communication network in the Kathmandu valley towns and severe shortage of such facilities in other parts of the country is responsible for the rapid population growth and urbanization of the valley. People come to Kathmandu from different part of Nepal for either a good education or to find a better professional carrier .

Due to rapid urbanization of Kathmandu valley, government is unable to cope with the increasing demand for solid waste management which resulted into garbage and sanitation situation in a chaotic state. Uncollected waste can be found scattered inside communities, footpaths and along the streets. Management of solid waste is extremely poor and the recycling of sewerage and industrial wastes is practically no- existent. Inadequate disposal of solid wastes poses a risk to public health. Growing income and growing reliance on industrially processed goods have led to changes in consumer patterns. Therefore the composition of wastes is also changing from biodegradable to non-biodegradable. The survey conducted during 2004 revealed that in three municipalities; areas and in 34 urbanized VDC areas of Kathmandu valley generate about 480-500 ton of solid wastes everyday. Besides, there are hotels,

industries, commercial establishment and hospitals producing a large quantity of solid wastes.

In Nepal a waste managements system was developed over a decade ago in the Kathmandu valley. Implementation of organized solid waste management started in 1980 with the establishment of Solid Waste Management and Resource Mobilization Centre (SWMRMC). A waste collection system for the urban areas of three municipalities with a population of about 0.5 million was built up with technical and financial assistance from GTZ. Compost production and resource recovery was established at Teku in 1985, which was terminated in March; 1991 due to local resident's opposition on environmental pollution ground. A sanitary landfill site for the final waste developed in 1986 at Gokarna, northern part of Kathmandu city, which was also closed down in January 1994 due to strong opposition from the people. After that Shova Bhagavati along the Bisnumati River was chosen as temporary dumping site for one and a half year which also ended in 1995.

After a great effort from government and municipality, starting from 1996 another sanitary landfill site has been selected for waste disposal, at Okharpauwa, which is about 15 kms North – West of Kathmandu city. The Okharpauwa site has a landfill capacity of 4.2 millioni m2 with possible extension in Keraghari with addition 2.7 million m3. Assuming the Kathmandu

valley's current rate of waste generation remain constant at 480 mt/day (1200m3) it is estimated that the Okharpauwa site will have life of about 96 years which could be increased to about 27 years if 27 years if 40% of solid waste are composted (Source: Khathmandu: Regulating Growth 1994).

In July 1990, the GTZ assistance for SWMRMC ended and the solid waste management operation gradually slowed down as the central government could not provide sufficient fund to operate it. Since 1994, the three municipalities and the SWMRRMC share responsibility of cleaning collection and dumping of solid wastes.

Most of equipments, big container and skip vehicles belonging to SWMRMC need repair and maintenance; many of them are not in operation as to day. However, in the last two years Kathmandu municipality procured some equipment and vehicles mostly on donation from India.

Currently, the waste management service in Kathmandu and Latitpur municipalities covers about 40% to 45% of the total waste generation, the rest is left piled up around the corners of the town, settlements and open spaces. Percentage of unserved areas is increasing highly. The households which have access to round throw garbage into the road and who do not have access to road throw on many open space, causing hindrances for movement of pedestrians,

vehicles, creating unpleasant settlement characters, water pollution and chances of disease spread.

Waste Composition: Waste consists of inert materials, vegetable matter, metal, paper, cartoons, textiles, glass, plastics, rubber, leather, wood, bones and batteries. In order to acquire accurate information, a survey related to the waste generation and recycling conducted by SWMRMC in 2000 estimated that the waste generation in Kathmandu was around 480 – 450 ton per day. At this rate the amount of recyclable materials was 30% which include scrap metal, plastic, paper and glass at 7%, 6% and 10% respectively.

Total Waste Generation = 500 ton / day. Total recyclable materials = 500 ton x 30%= 150 ton / day or = 150 x 365 days = 54750 ton / year. Then the scrap metal, plastic, paper and glass generation per year is = 3832 ton / year; plastic = 54750 x 7 % = 3832 ton / year; paper = 54750 x 6% = 3285 ton / year; glass, bottles = 54750 x 10% = 5475 ton / year.

Waste Utilization System: Waste is not utilized for composting, recycling or bio-gas production either by SWMRMC or by the municipalities. The waste is allowed to be scavenged before transporting and dumping in to a landfill. Some households make compost in the backyard of their houses to be used in their farm or gardens. Treatment or recycling of industrial and hospital waste are

virtually unknown. Regarding the collection of recyclable materials in Kathmandu there are three processes being used:

(i) People visit door to door where they pay an amount to the householder for their crap metal, paper or for empty bottles;

(ii) Pick up the recyclable materials from the containers at collection paints, transfer stations and the composting plant (SWMRMC) and Collection of old cars, lorries, broken bottle and so on, from auctions advertised by officers, institutions and factories through newspapers and journals.

At the door recovery: At the door recovery of waste has become an established trade with fixed prices handled exclusively by the Terai-belt Nepalese or Indians.

Broken glass is not accepted. Paper is bought by weight and paid in cash but there are different prices for cardboard and newspapers.

Price of used bottles varies according to its size and trademark. In Nepal as there is no bottle manufacturing industry as yet, the industries which use bottles for packaging have to either import from India or from other foreign countries. Therefore some local industries recollect the used bottles and clean them for further reuse. As there is high demand and easy market for empty bottles in Nepal, waste collectors prefer to collect bottles of the local industries and sell them to the bottle dealers who further supply them to the related industries.

Mainly beer, squash, brandy, whisky and other spirit bottles are easily purchased by these waste collectors.

Scrap metal is bought in terms of weight. Price depend on the quality of metal and damaged aluminium utensils are exchanged with new ones. Plastics are however not recovered at the door at all. Used plastic bags are thrown away with other waste and collected by waste pickers. Although materials recovered from waste have increased in volume and in value, the process which is necessary for recycling is not adequate yet in Nepal. Because, only 25 % of the scrap metal is melted there while 75% is exported to India; all broken glass is exported to India because of unavailability of glass industry in Nepal and most of the polythene/plastics while waste papers are processed in Nepal.

Waste picking (scavenging): Waste picking (scavenging) is being done from the containers in the streets to the transfer station. In most cases many family members of some poor families do scavenging. But there are some orphans, run-away children, single women and old people working as waste pickers. They are mainly displaced, homeless, newcomers and unemployed people. They pick up only those materials which are saleable. Collected materials are sold to dealers as mentioned above that they are not specialized in one or two materials. Some waste pickers collect different contaminated materials at dumping sites too.

At auctions: At auctions the factories as well as institutions sell their scrap to Kawadies (dealers). Kawadies usually own junk yards where they dismantle whatever they have bought. These junk yards are not specialized in any one item but they deal in all recyclable materials. These kawadies are generally Indian's origin who separate these items and finally supply them to either local Nepalese or to Indian factories (Ibid).

2.1.3 Different institutions involved in SWM

A number of government, non government and donor agencies are directly orindirectly responsible for the improvement of the solid waste management services, environment, health and sanitation condition of Nepalese people.

At National Level: At the National level the Ministry of Housing and Physical Planning (MHPP) is the prime responsible government institution for physical planning of urban areas in the country and the Department of Housing and Urban Development (DHUD) under this ministry implements them. The Ministry of Local Development is involved in planning and management of municipal and VDC area.

Municipality: Municipalities are local government formed under the municipality act. The organizations although technically under the MHPP,

function autonomously with little interference from the government. Municipalities have the responsibility for sanitation in the towns. This is centered around the collection and disposal of solid waste, management of public toilets, emptying of septic tanks, construction and maintenance of town's drainage system.

Ward office is also an important component of the local organizational structure. In almost all public work and development activities, ward committee are responsible for identifying ward communities need, discussing the needs with the community members.

It plays a crucial role in facilitating community commitments to the project. Ward committee is a statute body. The Ward Chair is elected in a municipal election every five years. The Ward chair in turn nominates four of aides from the community.

Sectoral Agencies: Solid Waste Management & Resource Mobilization Centre is the only responsible organization in Nepal for the improvement of sanitary living condition through proper waste management system in the urban areas of Kathmandu valley. Though it is under a ministry of local development it works autonomously.

NGOs: There are more than 2700 registered NGOs in Nepal, with 150 at national level with district level networks. Another estimates puts the number at around 7000 registered NGOs both with the Social Welfare Council (SWC) and Chief District Office (CDO) in various districts. The numbers of NGOs involved in SWM are very few; many of them are involved in income generating activities and are working in rural areas. NGOs that are solely involved in SWM is estimated at 5 to 6, including the involvement of international NGOs.

Donor Agencies: Donor agencies such as UNICEF, the Word Bank, UNDP and the German Agency for Technical Cooperation (GTZ) all provide technical and financial support in this area to various SWM in Nepal for a longer period of time. Much of the progress in SWM system in the Kathmandu valley is the product to GTZ assistance.

Private Sector: Private sector involvement in SWM has so far been very limited. Some households compost the refuse in their backyard later to be used as fertilizer in the fields or gardens (Ibid).

2.1.4 The Nepal government policies on SWM

The existing management of solid wastes relies on an overly centralized approach. With a rapidly growing urban population, current institutions are

unable to provide an adequate level of service. The result is that piles of rubbish are left to rot in streets, presenting a particular health risk to children who often play closed by.

The traditional approach taken by the MHPP has resulted in people regarding solid waste disposal as the government's responsibility. With government nominally assuming responsibility, communities have the little influence over trying to improve services. There is still a need of environmental regulations that protect people from undue risk of exposure to environmental threats. For example the need for regulations governing hazardous waste and toxic substances such as the storage and disposal of unused pesticides. Beside this, there is a lack of laws households to separate their wastes at source and sanctions for nonpayment of local fees and laws to prevent open defecation in open area and rivers.

In recent years, His Majesty's Government of Nepal (HMG/N) taken a major step towards improving the SWM situation and formulated new national policy on solid waste management in order to provide a long term solution of the garbage problems arising from unplanned urbanization. It has duly taken into consideration of mobilization of local authorities and involvement of private parties in the arrangement of solid waste. New policy states that national and foreign private agencies will be invited to undertake the work of SWM. As per the policy, a concept of cleanliness suitable to the local technology and social

environment will be developed. Involvement of various NGOs in such campaigns will be encouraged. Solid waste will be used as resource to produce useful materials through recycling processes. It further intend to bring promising strategy to levy service charges to be paid by the public and it aims to introduce SWM a subject in the school and to develop non-formal education curricula. Besides this, it is determined to impose fines to those, who violate cleanliness regulations.

2.1.5 The general theory of waste disposal economics

Any nation to be successful in waste management policy should involve the following stages:

(i) Waste reduction at source up to a point where the benefits or extra source reductions are broadly equal to the costs of extra source reduction. Note that this implies that goals such as 'waste minimization' are potentially very misleading since they ignore the costs of reducing waste;

(ii) The optimal balancing of landfill, incineration and recycling (including composting) and landfill. On this bases other goals such as 'maximum feasible recycling' are also misleading and invite recycling efforts that are likely use up more resources than they save;

(iii) Management of uncollected waste, an issue of some importance in developing countries but not of major significance in the OECD countries; and

(iv) The choice of regulatory measures to secure waste reduction and optimal disposal. The relevant theory has been set out by Pearce et al (1993) to include optimal waste reduction at source and optimal disposal and recycling.

2.1.6 The theory of choosing proper instruments

Governments in both developed and developing countries have in some part to rely on regulatory instruments in their efforts to mitigate the problems of solid waste generation, collection and disposal. But there has been a growth interest in some countries in the application of economic instruments in order to improve the efficiency of the waste management process. In the developed countries the following economic instruments have at one time or another been under consideration, or have been implemented as part of a waste management strategy and these include:

(i) Recycling credits (to stimulate increased recycling activity);

(ii) Landfill disposal levy (to reduce the amount of waste being land filled);

(iii) Product charge (for example packaging tax, to discourage over-packaging);

(iv) Tax concessions (to stimulate reuse/recycling or other activities);

(v) Deposit-refund system (to increase the recycling of selected items such as batteries, or encourage returnable container systems);

(vi) Levy/tax virgin raw materials (to influence the relative prices of primary and secondary recycled materials); and

(vii) User charges (for example household waste charges; to discourage the throw away ethic and encourage reuse/recycling).

Such instruments could be applied in the waste management systems in order to raise finance and /or stimulate prescribed behavior via incentive. Thus financing charges (user charge) have been used to facilitate the collection, processing and storage of waste, or the restoration of old hazardous waste sites. Incentive charges (for example product charges) on the other hand, can among other things, be used to stimulate increased reuse/recycling.

In principle, one of the advantages of economic instruments is that, they provide a continuous incentive effect which stimulates waste generators to seek out the best-cost combination of disposal, recycling and reuse that is available to them. However, the efficiency and environmental effectiveness of such instruments is conditioned by the baseline institutional context into which it is assumed instruments are introduced. Many developing countries use an extensive, effective waste and pollution control system (legislation, facilities and infrastructure) and enabling agencies. In such an institutional context there is a high probability that any new substantial charging system, for example, will merely provide waste generators with an increased incentive for avoidance and

stimulate more 'illegal' dumping of waste. The end result will be a significant increase in costs, both in terms of increased health hazards and increased monitoring and enforcement costs, which developing economies can ill afford.

However, economic instruments also have other properties including a revenue raising capacity. This feature will be of particular importance in developing countries where there is a basic lack of waste treatment facilities and infrastructure. Revenue raised via a waste user charge (basic on collection and/or disposal costs) for example could be 'recycled' into new or improved waste collection, treatment and recycling facilities in the local area. A balance will need to be struck in terms of the level of charge that could be levied; so that meaningful amount of finance is raised but at the same time not at a charge rate that stimulates extensive 'illegal' dumping, or corrupt practices.

Other economic instruments which appear to offer some advantages in the developing country context are recycling credits, tax concessions and deposit-refunds. The first two instruments could involve fairly modest sums of finance but still increase recycling activities. Economic instruments should not be introduced in isolation, and will be conditioned by the institutional framework that exists and by the extent of market failure in the macro economy. The removal of existing price distortion and subsidies would, together with institutional capacity building, be an important precursor to the deployment of

selected economic instruments. Deposit-refund schemes may also play a useful if limited role in the management of hazardous components (for example batteries) of the solid waste stream.

2.1.7 The theory waste disposal economics in the context of developing countries

One may ask himself or herself, how does the application of the theory differ between developing and developed economies? Academically and in principles there are several major distinctions:

(i) Significant proportions of MSW are not collected in LDCs, probably in the region of 30-50%. As discussed before the results are health hazards from rodents, mosquitoes and other vectors, together with general unsightliness. Lack of collection appears to be mainly a function of inadequate revenues, and hence the revenues, and hence the revenue raising capability of economic instruments needs to be emphasized.

(ii) Waste that is collected is often disposed of to uncontrolled open and unlined landfill. Incineration plants have not proved to be successful because of the nature of the solid waste stream in developing counties which has a relatively low calorific value due to the high percentage of putrescibles; composting plants seem to be a better option. The result is further health hazards. This

suggests that payments to collectors should be made at controlled sites to encourage disposal to those sites only. But the design of incentive-compatible systems is complex.

(iii) Collection is often carried out under the informal sector but only to nearby illegal dumps Cointreau et al (1992) reports over 600 clandestine dumps in Baranquilla, Colombia in 1988 for example. Again, payments to collectors at controlled sites only could avoid much illegal dumping.

(iv) The informal sector can secure major employment by scavenging at landfill community in Cairo where some 12,000 people probably secure employment. The Zabbaleen work with the Wahis who originally purchased rights to refuse from higher income families in order to recover recyclable materials. In 1987 the Zabbaleen and the Wahis joined together to form a private company to extend collection to low income families. 'Rationalization' of informal sector collectors and scavengers therefore needs be handled carefully. Number jobs depend on the role that scavengers play and investment in some basic health care may be preferred to measures that displace often substantial numbers of people. In the developed economies collection tends to 'free' the sense that households are not charged directly for collection. In many countries user fees are charged for commercial waste collection and in LDCs oftenly involves these user fees. Thus, Jakarta residents pay a user fee to private sector companies. In

Sao Paulo for example collectors are paid on a per tonnage basis at landfill sites. Where there is a basic lack of waste treatment facilities and infrastructure. Revenue raised via a waste user charge (based on collection and /or disposal costs) for example could be 'recycled' into new or improved waste collection. A balance will need to be struck in terms of the level of the charge that could be levied; so that meaningful amount of finance is raised but at the same not at a charge rate that stimulates extensive 'illegal' dumping or corrupt practices. Other economic instruments which appear to offer some advantages in the developing country context are recycling credits, tax concessions and deposit-refunds. The first two instruments could involve fairly modest sums of finance but still increase recycling activities. Economic instruments should not be introduced in isolation, and will be conditioned by the institutional frame work that exists and by the extent of market failure in the macro economy. The removal of existing price distortion and subsidies would, together with institutional capacity building, be an important precursor to the deployment of selected economic instruments. Deposit-refund Industrial and commercial waste in Lagos is collected by contractors who receive a percentage of fees charged to the waste generators.

(v) Cointreau et al (1992) notes that MSW collection and disposal may often absorb 20-50% of municipal government revenues in developing countries. Opportunities to reduce costs are therefore important. While modern trucks and disposal methods can be introduced to many cities, in may others the

infrastructure would not be capable of door-to-door collection. Here some centralized disposal point can be used, such that trucks collect from a single point at pre-arranged times. But modern methods inevitably displace the often thousands of informal sector collectors and scavengers who are sometimes extremely well organized at the political level (Bartone et al, 1991). Scavengers can also raise costs by impending landfill operations at landfill sites. Problems of dealing with displaced informal sector workers can be formidable.

(vi) One other approach to cost reduction concerns privatization. The evidence from OECD countries is that private collection probably reduces costs by 10-40% (Cointreau et al, 1991) but the evidence for developing countries is unclear. (Bartone et al, 1991) confirm significant cost reductions in Sao Paulo relative to Rio de Janeiro because of introduction of private collections. In general there appears to scope for private operators given that economies of scale appear not to exist in collection and disposal beyond a certain point. Given the quantities and composition of municipal solid waste streams in developing countries the basic management choice will be between recycling (including composition) and landfill disposal. The introduction of selected economic instruments to improve the efficiency of the waste management process will be conditioned by the effectiveness (legislation, monitoring and enforcement activities) of the institutional system that is in place in any given developing country. Economic instruments such as user charges, provided they are set at

relatively modest rates in the first instance, can provide much needed finance for the enhancement of waste treatment facilities and infrastructure. Other instruments such as recycling credits and deposit-refund schemes may also play a positive if more limited role in waste management. Thus economic instruments should be seen as useful supplementary and supporting instruments embedded within the regulatory system. For many developing countries the immediate needs are more to do with institutional capacity building and augmentation (Ibid).

2.1.8 Sold waste management on site storage in developing countries

Solid waste management on site storage so for can be categorized at the level of individual house holds and communal storage methods as follows:

Individual household: The ideal arrangement is for each household to have container with a tight lid. Refuse should be removed regularly and frequently. In the humid tropics waste food can become putrid very quickly and consequently there should be daily collection, and it is rarely wise in hot countries to have less than two collections a week. The cost of frequent house to house collection is high and must inevitably be beyond the means of many municipalities even if it were possible (Gupta, 1996).

The storage volume which it is necessary to provide for domestic wastes is a function of generation, family size and frequency of collection. The following types of storage containers are available in most developing countries.

Plastic buckets with lids: Plastic buckets with lids have capacities from 7 to 10 litres, sufficient for the domestic wastes of family of six daily collections.

Plastic bins with lids: Plastic bins with lids having capacity from 20 from 30 litres, with steel drop down semicircular carrying handle which allows lid to be lifted, but prevents its removal, are suitable for a twice weekly collection.

Galvanised steel, or plastic with lids: Galvanised steel, or plastic with lids capacity 50 to 70 litre, are necessary when collection is twice weekly from high income ground, or for daily collection from shops. Bins of this size relatively more expensive than smaller sizes because, if they are to give long service, they should be manufactured to a high specification.

There are advantages and disadvantages of using paper of plastic sacks for house-hold storage of refuse. The advantages are improved hygiene and the elimination of double journey for collectors and the disadvantages are increased cost, increased volume, and damage to sacks by hot ashes and sharp-edged objects. The problems of providing or enforcing or enforcing the provisions of standard bins in the densely populated poorer areas should not be under-estimated. Difficulties include:

The organization and recording of distribution and of replacements if the bins are supplied by the municipality; diversion of bins from their intended use, for example, they could be used for storage of food or water; loss of containers by theft and residents move house. There should, however, be no difficulty in enforcing the use of standard bins of 50 to 60 litres capacity of the following types, which are often subject to inspection and control for other purposes, at most shops and market stalls, For multiple dwelling units, as communal container and in appropriate numbers at schools, hotels, offices and small industrial premises. One of the strongest arguments for imposing a standard in the circumstances, where its volume is justified by rate of generation, is that it is a necessary foundation for the achievement of maximum productivity of labour and transport in manual collection (Ibid).

Communal storage methods: The development pattern of a refuse collection service is as follows:

First, all wastes are thrown indiscriminately in the street, late, later specific locations at which house-holders deposit their wastes evolve or are imposed. These communal storage sites are a nuisance the people who live adjacent to them, but they could be eliminated only by the universal use of household bins, a solution which may not be practical in some areas. There are many different methods of partially or wholly enclosing wastes; depots; enclosures of timber, steel, brick or concrete, 200 – litres drums and portable steel bins.

Depots: They consist of single-storey building about the size of a garage, or the ground floor of a multi-purpose building, are commonly used for the storage of wastes at large markets; they have also been adopted for the storage of domestic and trade wastes in a number of Asian cities. Such deports do, however, solve some of the problems normally associated with communal storage; the wastes are protected from rain and domestic animals and scavengers can be prevented from gaining access to them because the size of the installation is efficient to justify placing a labourer to exercise continuous control over it. The most difficult problem, and one that has to be squarely faced, is that of acquiring for storage depots; the area occupied by those described is equivalent to a large shop, and the location must be a road wide enough for vehicle access. Such sites are often very costly to acquire.

The major criticism of the depots that have been observed the manner in which they are operated: usually all wastes are dumped on the ground, and thus the process of collection involves filling baskets which are then carried to a vehicle. This is a dirty and unhealthy procedure for the collectors, who are brought into close and continuous contact with the waste, and also for people who are passing the depot during, on whom dust often falls (Ibid).

Enclosures: An enclosure is probably the most common communal storage method; its essential feature is a wall of timber, corrugated iron, brick or concrete, with creens and containers of the wastes. They have been observed with capacities from 1 to 10 cum. One having an average throughout of 2 cu. m/day would serve 2000 people at the minimum rate of generation. They are usually sited on a roadside verge, or at the boundary of an open space.

The screen is usually designed to have one or more openings through which people walk to throw their wastes on the ground, and through which the wastes are removed, in baskets, by the collectors. The objections to this type of storage are:

Wastes tend to be thrown just inside the entrance where a heap builds up, ultimately blocking access to the main area, while wastes overflow from the entrances; rain animals, flies and scavengers have free access and the collection process is dirty and unhygienic; defecation, increasing the risks to the health of workers (Cointreau et al 1992).

Fixed storage bins: This type of container is usually built from blocks. It differs from the screened enclosure by having no entrance: the walls are of a suitable height for wastes to be dropped inside over the wall (1-2-1-5m). Capacity is rarely more than about 2 cu. M. In one wall an opening, covered by a flap, is provided through which the wastes are raked out by the collectors. Similar

structures of steel, rectangular or cylindrical, have been observed, the smallest ones, of about 300 litres, having hinged lids on top and an extraction at the bottom. These latter go a long way towards meeting the main objections to communal storage: animals, insects and rain are excluded; not scavengers, however. The real objection to all these containers is the extraction by rake through an opening at ground level (Cointreau et al 1992).

Concrete pipe sections: One of the problems of communal storage is that of balancing storage volume, which is a function of population density, against an acceptable walking distance for residents. It is reasonable to assume that unless sites are spaced at a reasonable distance, say about 250m apart, people will be tempted to dispose of their wastes in an unauthorized location which is nearer to their homes. For area of low population density, therefore, there is a need for containers for comparatively small volume and low cost. The most common size is about one metre in diameter, the length being of similar or shorter dimensions. This provides a volume of about 300 litres when the pipe is place upright on a pavement or a grass verge.

200 – litre volume: It is probably that the type of wastes container which is most widely used throughout the word itself a waste product: the 200 – litre drum used for the distribution of oil, liquid fuel and similar products. There are two strong arguments in its favour: it is cheap, and within limits, it is portable.

Where 200 – litre drums are used as communal containers the problems spring mainly from human behaviors are wastes thrown around but, not inside and drums are deliberately overturned by scavenges who want to search the contents for saleable materials, or by herdsmen who want to expose the food wastes to their goats.

A few cities have demonstrated that it is possible to sue 200-litre drums with reasonable success, and in all these cases the standard of management by the local authority has been very high. Because the drums have been painted inside with bitumen paint to preserve them and on the outside with high glass paint in a bright colour; locations have been carefully selected and where necessary paved and provided with partial fencing; excess capacity has been provided to avoid overflow at peak period of wastes generation, damaged bins are quickly replaced and collection is at daily frequency.

Capacity margins: For all kinds wastes containers it is necessary to allow a margin of capacity over the average rate of wastes generation because the cycle of production may vary from day to day. Trade wastes may be greater on Saturdays when people have more time for shopping than on other days. Domestic wastes may be more on Sundays than on weekdays. Holidays and feast days may give rise to significant surges in wastes generation. To avoid containers overflowing, it is advisable to allow up to 50% excess capacity above

average generation rate when collection takes place every day of the week. If the collection service operates only six day/week at least 100% over-capacity is necessary to contain 2 day's wastes production. In the case of communal containers it many be prudent to provide a 100% margin even for a 7 day/week service. Such a policy is particularly helpful where 200 – litre drums are used, because the average drum will then be only half full on most of the occasions that is emptied. This reduces the effort required to the collectors, and it also minimizes exposure of the wastes to view or to interference (Ibid).

2.1.9 Solid waste management on sites storage in Tanzania particularly in Dar es Salaam city

The bin systems: This includes open metal bins that is dust bins with lids and oil drum without lids. This is the common type of on – site storage in Dar es Salaam city. Bins of various sizes are located either within or near the houses in the yard or ground floor of apartment blocks to serve as final storage prior to collection. But the main problems with the bin systems are as follows:

(i) They are not sufficient in number and size to store the total volume of refuse produced within the collection period of 5 to 7 days (which is always not the case any way).

(ii) Most bins are not equipped with tight closing lids to prevent escape of foul odours and entering of flies, rats and so on.

(iii) Some of the bins are made of unsuitable materials and

(iv) Only few storage sites are cemented at the bottom.

Enclosures: (normally masonry or concrete) with or without roofs and open pits, because when the pits are full are the wastes burnt or covered for the wastes to decomposes. In the city, the commonly used containers are galvanized steel with lids, and discarded drums-these seldomly have lids, they are attractive to flies, birds, and small animals (Kaseva, 1996).

Problems of the on- site storage in Dar es Salaam: In Dar es Salaam for example includes, overfilling of the dustbins; dumping of refuse outside the refuse receptacles Access to birds, dogs, goats and scavengers and refuse bins are generally supposed to be emptied on a weekly basis. However, shortage of collecting vehicles, owing to break-downs, often prevents much frequent service (Kaseva, 1996).

Human health aspects and on-site storage site: Of all the phases and process in solid waste management on-site storage creates the most dangerous risks to human health because: the distance between people involved and waste is very short and on site storage is done by untrained people, who are not aware of the dangers involved. On site storage is everywhere and thus difficult to control. Risks involved insects are mosquitoes can travel several kilometers, but the shorter the distance the largest risks. Refuse is main source of good, for example

rats and other rodents which are reservoir for many diseases plague, tyhus, leptospitosis (Kasiva, 1996).

2.1.10 Learned lessons

Notably recycling of wastes is an environmentally friendly technology since it reduces waste transport costs, prolongs the life span of sanitary landfill and reduces pollution to environment through leachate. The potential for recovery of useful materials from solid waste is currently not being fully exploited. It is believed that this can be expanded to about 5-times (from 11% to 55%). Recycling of wastes material, if organized and managed properly can lead to gainful employment. The government of Tanzania should therefore initiate a strategy for improved solid waste management through greater involvement of private sector in waste collection, transportation, transportation and recycling. The strategy should aim at establishing a public/private partnership through the support of community based and individual wastes handling and dumping facilities. A scientifically planned and operated resource recover process from solid wastes in Dar es Salaam for example apart from being an environmental friendly technology for solid waste management, would not only provide better working environment for scavengers but would also prove as an effective source of employment for the unskilled work force in the city from day to day.

2.1.11 The scope of solid waste management in Tanzania

Solid waste in Tanzania is one of the important pollutants of natural resources like soil, air and water (both surface and ground) especially if it is not properly managed.

Tanzania Census 2002 reported that; looking at rural and urban distribution, 23 % of the total population lives in urban areas. It reveals that, there has been a high increase in the size of the urban population between 1988 and 2002. The urban population for Tanzania Mainland has increased from 18 % in 1988 to 23 % in 2002. For Tanzania Island urban population has increased from 32 % in 1988 to 40 % 2002. In this regard therefore, urban authorities in Tanzania have failed to cope with the problems of rapid urbanization. One major area where the urban authorities appear to have failed to fulfill their duties is in waste management. In most urban areas, only a fraction of the waste generated daily is collected and disposed of by the authorities. In Arusha, Mwanza, Mbeya, Moshi and other towns in the country, it is estimated that only 20-30% of the urban solid waste generated was collected and disposed of. In Dar es Salaam an average of only 13% - 15% of solid waste generated by the city is collected daily (Maira, 1998).

Collection is usually confined to a few areas usually, town centers and high-income neighbor hoods and even here, the service is usually irregular. Most

parts of the city never benefit from public waste disposal services, and therefore have to bury or burn their waste, or dumped haphazardly. The sight of heaps of uncollected waste and waste disposed of haphazardly by roadsides, open spaces, and in valleys and drains, is a common feature of our urban areas (Maira, 1998). According to Baya (1996) the problems of urban solid waste management in Tanzania are attributed to a number of factors, including ignorance, lack of funds, and lack of planning and management skills. Ignorance of the impact of solid waste in the environment as reflected by improperly managed or lack of solid waste disposal sites in many towns. Urban authorities seem to subscribe to the out-of-site syndrome whereby solid wastes are disposed of away from the sensitive areas without caring what will be the fate of the environment and people residing in the make shift disposal sites. Meager funds allocation for solid waste management by urban authorities has been exacerbated by rapid urbanization and high population growth rates. The rapid growth of population and the alarming rates of urbanization have caused high waste generation with which the urban authorities have failed to cope due to limited resources in terms of finance and qualified personnel.

Rapid urban population growth is one of the big problems which cause the increase in the waste generation amount in urban areas is rural to urban migration. Many people are moving from rural areas to urban centers looking for various social services and this has resulted into rapid population growth

which does not correspond to the rate of collection of solid waste generated per day. For example, the present waste collection rate in Dar es Salaam is only 10% of the total waste generated. The rest of waste is disposed off through other means like self-disposal, recycling and normally illegal dumping(Swai, 1996). Lack of good decision-making, inadequate planning, lacks of managerial and technical skills pertaining to solid waste management, had also lead to poor service delivery.

Lack of equipments is another problem which is common as most urban authorities lack the equipments, spare parts and fuel; which is closely related to institutional problems. In Dar es Salaam City while the population in Dar es Salaam has increased by 1.6 times and average waste generation per capita per day has increased by 1.85 times from 377 g/capita per day to 698g/capita/day from 1989 to 1996, the only equipments procured during this period was 6 compactor trucks donated by Italian government. However, most of these were out of order within 6 months of their arrival due to their unsuitability for use under Dar es Salaam conditions. The main reason being inferior road conditions and the non-existent technology of maintenance and repair for equipment (Maira, 1998).

Waste disposal sites are the source of complaints from residents about nuisance occurring as a result of offensive odorous and fires which in the final analysis

cause air pollution. For example, in Dar es Salaam City the Tabata disposal site was closed due to complaints by local residents of objectionable odors and risk of fires. The local residents of Tabata filed a court case and the decision was in their favour.

This was not the only complaint which hindered the disposal of solid wastes. Originally the people at Kunduchi Mtongani filed a suit against Dar es Salaam City Council, now the City Commission that, despite the fact that the disposal site is located about 20 km. Away from the City center but, this was also closed after the court order. Then on temporary basis the Vingunguti site, at a distance of about 10 km with very poor access roads started to be used as an alternative. But, it takes a lot of time for haulage. Through these cases, it proves that also finding disposal sites is one of the main problems (Maira, 1998). Similar objections to locating disposal sites were experienced in many other towns all over the world.

2.1.12 Important issues to be observed in Tanzania to day

Mato *et al* (1996) elaborates a number of key issues which must be observed in order to attain proper solid waste management in Tanzania. The issues include the following:

Cleanliness habit: Solid Waste Management cannot succeed if (the people) solid waste producers are not sensitized on the issues of cleanliness. The

community therefore, should be educated that Solid Waste Management is an individual's duty and not some other organ's (e.g. government). The general attitude that the Government should take care of the environment should be changed to community self-reliance. Solid Waste Management in a community should be a result of individuals' efforts in cleaning his/her environment.

Poverty: The contribution of poverty towards improper Solid Waste Management was explored. It was revealed that poverty contributes greatly into improper Solid Waste Management as poor people have limited time and resources to invest in the waste they produce but they would rather devote much of their time to struggle for survival. Hence, the states of underdevelopment circumscribe the limits of resources available for environmental protection.

Plastic Wrappings: It is observed that the increased use of plastic wrapping bags in the shops; markets and supermarkets pose a potential problem in Solid Waste Management since these plastics do not undergo decomposition. It is proposed that recycling methods of these plastics should be sought.

Data and information: These relate to the information concerning Solid Waste Management disposal. It is again observed that data banks should be started within Municipalities to facilitate the planning and implementation of Solid Waste Management programme. Data such as how many people, markets, institutions, waste generated, income tax, prevalent diseases (endemic and

epidemic) and so on. This should be collected in each municipality and stored. Due to lack of data no proper allocation of meager resources available to issues of priority; such as solid waste management.

Co-ordination of Solid Waste Management: This is a multi-disciplinary activity that requires proper integration and co-ordination, which involves several expertise, for example, Civil engineers, Environmental engineers, Mechanical engineers, Chemists, Planners (land use planners) and Politicians to mention a few. These different disciplines should be well co-coordinated for Solid Waste Management to succeed. It is known that solid waste is an issue of the environment and that apart from its relation with disease it affects air, soil and water resources.

Gender involvement: The issue of gender dimension in Solid Waste Management was also studied carefully. It was pointed out that problem of Solid Waste cut across all genders hence all genders should be involved in planning for Solid Waste Management from the point of generation to disposal.

Town plans: The authors further observed that solid waste management systems are by en large affected by town/city plans and that the on going trend of unplanned housing in towns/municipalities poses a future environmental catastrophe. It was further observed that proper waste disposal systems should

take precedence in plots allocation in urban areas. City/Town planning should accommodate Solid Waste Management interests, that is, width of the streets and location of various functions such as markets. Narrow streets and (unplanned) squatter settlements greatly hamper easy movement of Solid Waste collection vehicles. Location of markets in the heart of the city pose serious Solid Waste problems as vehicles have to go through long queues to ferry solid waste with inadvertent reduced efficiency.

Political awareness: This is important in such a way that the politicians must be sensitized on Solid Waste Management and be well informed about the role it plays in the environment and public health. In order the population to have a sense of responsibility, the beneficiaries of Solid Waste Management programs should contribute for the services rendered and the money collected should be spend for development (improvement) of the services. Free service should be discouraged as this erodes the spirit of individual responsibility. And therefore the following measures must be of very much concern (Swai, 1996). According to World Bank (1991), involvement of a private sector in solid waste management, will improve efficiency and accountability, the private sector should be involved through contracts in every Municipal and Municipal authorities should in turn assume a supervisory role (act as a client) who should represent the people. The contractor either, should be allowed to collect revenue or should be paid by the municipal authority.

Change of attitudes of communities and minds toward solid waste management to accommodate new ideas should be changed through continuous public awareness and campaigns. It is observed that people do not cherish improper solid waste management but rather they lack a leader with proper vision, for example, experience has shown that people are ready to contribute towards solid waste management when well educated.

Decision makers such as politicians should be well sensitized and educated since the decisions they make affect solid waste management programs. A change of perspective towards active population involvement is also important; to it must be inculcated to leaders.

Waste recycling is important in solid waste management as a mean of reducing the bulk of solid waste. Recycling is not only for an income generating activity but it also makes an employment opportunity and conserves the environment. It is however, cautioned that though recycling is to be fostered it should be controlled to minimize health risks (Ibid).

Environmental impact assessment for solid waste management problems which are often a result of unforeseen planning and lack of mitigation measures in many projects must be considered. It is in this understanding that, while many

projects are started with a goal of improving the economy, the effects to the environment are always left in oblivion. As a step towards sound environmental management it is proposed that no project should be allowed to start without having an environmental impact assessment. Statement endorsed by an authorized body (Ibid).

2.1.13 Major types of solid wastes

Municipal Domestic Solid Waste: These are waste arising as a result of domestic activities including food preparation, sweeping, cleaning, fuel burning, gardening and recreation. It also includes junks such as old clothing, old furnishings, obsolete appliances packaging and reading matter.

Hazardous Solid Wastes: These cover a wide range of chemical and biological wastes. Mostly originating from chemical substances in industries, pharmaceutical expired and obsolete chemicals, and in hospitals.

Industrial solid wastes: Wastes from processing, manufacturing and non-manufacturing industries and utilities. The waste type ranges from packaging materials, food wastes, scrap metals, plastics and textile.

2.1.14 Generation of domestic solid wastes

Knowledge of the sources and types of solid wastes, along with data on the composition and rates of generation, is basic to the design and operation of the functional elements associated with management of solid wastes (Maira, 1996).

All decisions on solid waste collection, transportation and disposal cannot be made without knowledge of generation, density and composition, because collection, transportation and disposal of solid waste depend on each other.

Collection: Most of cities and towns in Tanzania are facing problems of a similar nature on solid waste collection system. Facilities for collection are few and of poor quality. There are not adequate dustbins, waste bags and other collecting equipments. In places where these equipments are found, still they are not in proper shape for use. In some areas like market places, the generation rate is far greater than the collection capacity of vessels, which in turn lead to overload and re-scattering of waste. Increase of transportation and collection vessels' capacities are the alternatives to address such situation. There had been a problem in maintaining collection vessels. Once installed at a point, no one cares for their maintenance, resulting into collection vessels being stolen, destroyed and later abandoned. The waste collectors lack some protective gears. Folks, gloves, face masks boots and proper garments are not supplied to solid waste collection labourers. The labourers are at a risk of contracting dangerous diseases like diarrhea, tetanus and others. A little amount of solid waste is being collected. This is due to limited collection facilities as well as transportation facilities as it was said earlier above (Ibid).

Transportation: The wastes that have been collected are supposed to be transported to secondary collection point and later to disposal sites. Transportation of waste in urban centers has been a problem for many years. The waste trucks are few and not all are in operation. The maintenance cost of trucks is high and most municipal centers cannot afford to maintain such trucks. For instance Dar es Salaam has got about 30% of its waste trucks in operation. The collection and transportation of waste are not sustainable activities in most municipal centers. Trucks are deteriorated and abandoned without replacement. The services for vehicles such as spare parts, fuel and other charges are not available. The poor condition of our roads contributes highly to deterioration of the trucks. Roads in many towns are rough with severe bumps and potholes. These roads are not proper especially for heavily loaded waste trucks. In some unplanned areas, the trucks cannot even penetrate easily to where wastes are collected. The trucks being used for other business could as well contribute in magnifying the problem. The proper co-ordination of the trucks is the basis of efficiency in the first place (Ibid).

Disposal: The waste disposal sites have become a problem in many towns in the country. Waste is dumped in haphazard manner rather than disposed according to their nature. The disposal sites accommodate all types of waste from the town irrespective of the nature of that particular waste. It is common to find a mixture of hazardous waste, say obsolete chemicals dumped together with

normal domestic waste. In many cases, even hospital waste is dumped together with domestic waste. In principle, there is a great need of separating and treating different types of waste differently at disposal sites to avoid dangerous environmental disasters that may be relegated. Dumping sites are often infested with a number of scavengers. Scavenging is done in poor conditions; there is no adequate protection to scavengers (Ibid).

In that case the risk level of contracting diseases is quite high. The general factors causing the operational inefficiencies include; inadequate and inefficient waste's loading/unloading facilities. Solid waste collection is done manually using shovels and collected by worn out basket wickers "matenga" made locally from wood sticks or similar materials. This problem can be reduced if the community collects wastes in small containers of about 50 – 100 litres that can easily be emptied to reduce the collection time. The organization of such systems depends on community education by the municipal council particularly in residential areas. In markets, business and industrial centers large containers are preferable for example, the mechanized hauled container system. Few hauled container systems were introduced in the past for collection and transportation of wastes in market areas but due to poor management the systems collapsed even before their efficiency could be evaluated (Mwanundu, 1994). Lack of incentives and protection gear such as boots, gloves, etc. to

refuse handlers escalate the problem. According to some solid waste collection crews the supply of most of the protective gears ceased far away back.

Narrow access road to waste storage places, especially in city centers is also a major problem in the most sensitive areas. With the traffic congestion during the day compounded by poor road conditions, the collection of wastes is rather difficult and takes a long time. It would have been easier to collect wastes during the night and where feasible during weekends because these are periods of low traffic. Collection of solid wastes in the night may also face serious opposition from the residents on security grounds, and this factor is further compounded by lack of street lights in most parts of the city and none at all at the dumping site (Mwanundu, 1994). Putrescible organic wastes however, require frequent collections of every 2-3 days particularly in tropical climates where wastes ferment quickly and then stink. Weekly collections are feasible only for inert wastes.

Another feasible option is the use of small size trucks such as 5 ton compaction type truck which is relatively easily maneuverable than large trucks currently in use. This means that the relative distribution of type of collection truck is also important (Katyega, 1993).

There are too many small collection points in towns; which needs much time in maneuvering collection trucks between storage stations. Irresponsibility is in

most cases a reason for operational inefficiencies. It is not uncommon to see solid waste collection trucks being used for other campaigns unrelated to solid waste management while solid wastes are left piling up in town streets. Storage containers are simply lacking in most parts of the urban centers and thus creating the atmosphere that forces inhabitants to throw garbage randomly. The consequences of inadequate collection containers are mainly, crude storage of solid wastes which is case of organic wastes poses a risk of spreading gastrointestinal and parasitic diseases, primarily caused by proliferation of insects and rodents. The environment near the refuse storage site becomes an eyesore to the community. The insects and rodents around the collection point particularly flies will create the environment that is not conducive to refuse collection crew, who in most cases do not have any protective gear. The provision of refuse collection containers is primarily not the responsibility of the municipal authorities except in special locations such as streets, markets, schools, hospitals, bus stand and areas under the authority of municipal council. In other places it is the responsibility of the owner of the premises to provide suitable container(s) for collection of refuse. However, municipal councils must provide transfer stations and must oversee that inhabitants provide suitable bin(s), containers(s) to enhance efficient collection of refuse.

2.1.15 Solid waste management experiences and challenges in Tanzania

In Tanzania, the problem of solid waste management poses serious challenges. These challenges are escalated due to the existence of the following elements;

Cultural habit: Past solid waste surveys have often proven that various regions in Tanzania, and different areas both rural and urban, the type of food eaten by the inhabitants of those places determines the kind of waste generated. It is for example common in rural areas to use yams or cassava or bananas for breakfast, rice or "ugali" maize paste or bananas for lunch and dinner. This implies that, most of the waste to be expected from those localities is of vegetable nature. The levels of waste production per capita per day need to be established (Kironde, 1998).

Living environment: The pattern of consumption of resources in communities varies with the living environment. For example, in the northwestern part of Tanzania banana is used as staple food and hence, a number of banana plantains are common feature of the area. The southern part of the country use rice and banana as staple food. Rice and banana farms are widely present in that part. The central, north-eastern and eastern part consume mainly maize and therefore, the agricultural activity persistent in those areas is maize production.

The kind of environment people live in, automatically affects their food consumption and agricultural activity patterns and therefore, the type of waste produced. It is not uncommon to find people who have migrated from one area to another, changing their consumption pattern due to the influence of the new environment they reside in. In a city like Mwanza and Dar es Salaam, a mixture of patterns is available due to the fact that, many people who live in the city are

migrants from up-country, and this place is a business center. It attracts various food stuffs from all over the country (Ibid).

Psychological effects: Furedy (1992) said, "a new philosophy of resource management is beginning to transform solid waste management world-wide. It is grounded in what can be called "resource recognition". The transformation aspect of managing waste calls for a change in attitude which is psychological. If one happens to compare the attitude towards waste in developing and developed countries, it is clear that, inhabitants in the western countries value the clean environment than in developing world. There are however many factors which have contributed to such a situation. Since birth, in the developed world, the surroundings are kept clean with very strict conditions of service. Psychologically, those people cannot reverse the situation and hence, continue to live in clean environment. Everybody feels responsible to keep the environment clean. It is psychologically built in people's blood. In order to achieve the same status in developing countries like Tanzania, psychologically people's attitudes should be dealt with. It might be a slow process but an important one.

Inculcating cleanliness habit: Cleanliness is a habit that needs to be inculcated in the lives of all Tanzanians. This is true and it has been proven in quite a number of places / localities in Tanzania. Where solid waste or even liquid

waste used to be dumped haphazardly, if it happens that, in that locality, people are taught about the importance of cleanliness of the environment, the situation reverses its direction. That is, they change from dirtiness to cleanliness. This is especially true when say, the opportunity of haphazard dumping of waste is denied. Supplying the area with proper drains and even change of use of space which entices people to throw waste in an unplanned manner is one way. To cite an example, there is a big garden space a certain house which was planted sugar-cane and yams. Within a metre of those crops, there is a water tap which is hardly two metres from the border with the neighbour. People used to throw solid waste in that space despite the crops. The major problem used to be unsightly plastic wrapping bags thrown in disorganized manner. Stopping the practice by verbal words could not help. The lasting solution was to change the type of crops therein. The area was cleaned nicely and vegetables were planted instead. This idea changed the scene completely. Nobody was attracted to throw waste in that place and the area is quite clean. It has saved the headache of saying a lot of words which could bring social unrest with the neighbours. Solutions of this type can help quite a lot. It is an inculcation of cleanliness habit by denying people the opportunity to dirty practices (Plintoff, 1984).

Level of environmental awareness: The public awareness on environmental issues is an important aspect which cannot be overlooked. This is because, for sustainability purposes solid waste management, the first stakeholder is the

producer of the waste. In order for anybody to discharge the required talents or capacities he /she has, knowledge (awareness) is necessary and should be given its due weight. For example, Dar es Salaam is believed to have 3 million inhabitants at present; it has 161 primary schools according to Kyessi (1993) and a total off 200, 649 pupils. Adopting the master plan concept (1979), one primary school is required for every 5,000 inhabitants; this implies that 600 primary schools are needed in order to suffice the cities' demand. The resources to provide for such facilities are not forth-coming however. Such a situation ends up in illiteracy of some residents. This situation poses problems to awareness of environmental issues. The level of education of the people facilitates the understanding in solving the environmental concerns. If people are illiterate, it is rather difficult for them to digest some concepts which are necessary for waste management. Deliberate efforts where resources allow should be paid to raising the environmental awareness of the people. When the community understands the issues, they are ready to participate in developmental undertakings whole-heartedly. If they are willing to be involved fully, the sustainability of the project is envisaged. They will be in a position to guard their environment, challenge any system of waste management they think does not suit their area and give positive or negative ideas as necessary.

The Colonial mentality: During the colonial era, given other factors obtaining at the time, the provision of services was such that, government received aids

and grant, chooses implementers of an envisaged project and off to site for execution purposes. Such a condition crippled the minds of the people and built in the idea that, the government will provide for them the entire infrastructure they need. Unfortunately, "time is the best teacher," it did not take long to realize that, it is practically impossible for the government alone to provide all the needed facilities. It did not have enough resources to fulfill the purpose, and therefore, a change in policy was envisaged. That is, the government should assume a facilitator's role instead of a provider of services. With this approach slowly the changing mentality develops that, residents participate fully in caring for their environment and not the government (Kyessi, 1993).

Criticism: There has been a growing habit of throwing a lot of criticisms to various people in different positions dealing with solid waste management in Tanzania. It is not a bad idea at all but what does the criticizer offer in order to reverse the situation? It is healthy to criticize and at the same to offer a way out of the problems. A higher degree of participation in solving the difficulties is required. This question is however good to be posed, "criticism, is not always a solution" (Kironde, 1998).

Technology transfer in Solid Waste Management: The rapid change of the Tanzanian environment from rural to urban (urbanization), calls for a necessity to have technology transfer from developed countries. This does not mean at

any rate "whole sale" transfer. Other countries of the world are quite advanced in the solid waste management technologies. It is difficult to have enough resources to duplicate their efforts, in this world of international co-operation; it is worthy using the existing facilities. It will be quite costly to start for example a solid waste vehicle's production factory in Tanzania, while they already exist elsewhere in the world. It is by far cheaper to offer them some alterations which might deem necessary for the vehicles we need to suit local conditions rather than setting an industry for the purpose.

It is however very important that local conditions are well studies so that, the technology we require to be transferred from wherever in the world is appropriate to our local conditions. Significantly, ordering a compactor truck for domestic waste produced in Tanzania will be wastage of resources. The density of the domestic waste in this country is approximately equal to the compacted density by compactor truck, so, this type of machine is not suitable for the mentioned kind of waste (Ibid).

Information as power: For development in any sector or area to occur, a plan which has realistic goals should be set. Information is needed on various issues which contribute to the intended plan. People have interesting sayings regarding information like;

- Information is power
- When someone has given you an information, he/has given you kingdom.

Both of these sayings emphasis the need for having enough information for the appropriate decision making. The importance of getting information requires good attention at all levels of management in Tanzania. This is because, data has to be collected, processed and stored, ready for retrieval whenever needed. These steps call for proper handling and a safe place of storage. In order therefore to arrive at appropriate solutions for solid waste management problems, gathering and storage of data should be given priority. The kind of data varies from household level to high ranking political decision levels. An information center should be developed for the purpose. A suitable area should be set through discussions, meetings and agreements. At present, National Environment Management (NEMC) has started to set up a library to suit that purpose at national level. Other are however essential at lower levels to suit the purposes at those places (Ibid).

Clear Roles of Solid Waste Management Agencies: Where a solid waste management agency engages or is engaged in the system, clear stipulation of their roles should be set and known. The contract documents should be prepared in a careful manner. It is always safe not to take things for granted but, engage a legal or knowledgeable or experienced people in drafting the documents. In case the documents have been prepared for the managers, it is safe to read all the contents thoroughly and raise any issues of concern before engaging an agent for the work (Ibid).

Inter-relationship of agency and beneficiaries: The focus of good solid waste management system is not only towards the implementing agent but should be a joint effort. It has to encompass producers of waste, technocrats and municipal management agencies. In small scale, community –level initiatives should be designed in such a way that they go beyond clean-ups and must have some general social and ecological goals and a potential to change the simple collect transport-dispose organization of waste services. These broader goals call for "resource recognition" to social betterment and attitudinal change at the local level. In order to achieve the changes, inter-relationships plays a very big role. When engaging the agents in Solid Waste Management (SWM), it should be clearly understood that, there are conflicting interests in that undertaking. On one hand, the producers of waste do not want to be bothered by the waste they have generated. They would like it to get out of their way using minimum cost or at no cost if possible and to have clean environment if allowed handled by someone else. The reality is however different, in order to have a clean environment, the waste generators should input resources; funds and human labour in a co-coordinated manner for good results. The changing consumption pattern from individuals, households and society at large can be handled if good arrangements are sought for the purpose. The community should be seriously and vigorously involved in the whole or some stages of SWM. Even if they are partly included in the process, they should be made aware of the whole systems

and the implications of all stages of work. It is a well known fact that "a problem shared is a problem half solved" (Nyangech, 2001).

System view of management: Management is the task of getting things done through other people for the achievement of goals or objectives. The crucial thing in management is planning which is dealt with in another section of this course. So a system view of management in solid waste management in Tanzania is still requires to attain that level (Ibid).

Development of Plastics bags and papers technology: According to studies conducted by JICA and UNIDO in 2001; large amounts of solid waste in Tanzania contains plastic scrap and waste papers. For example, plastic and paper waste constitute around 12 percent of over 2,800 tons of solid waste generated per day in the city of Dar es Salaam including the infamous plastic thin-film bags that are an eyesore. Apart from clogging drainage systems, thin-film plastic bags also make the work of waste collection and disposal more difficult. Waste disposal sites have become a serious problem all over the country.

Thus, same study continues to narrate that, the direct hazards cause by plastic bags and papers in Tanzania are in four folds;

(i) Large amounts of plastic and paper find their way to dumpsites and transfer stations, causing problems with transportation and a serious burden on dumpsites;

(ii) Plastics which are mostly non-biodegradable and easily noticeable, remain littered on streets, along the shore and other pubic places; animals and children can also be affected by plastic bags;

(iii) Plastic materials also emit hazardous fumes when burnt, as is the case with dumpsites;

(iv) Plastic factories in urban especially in Dar es Salaam city are reluctant to consume plastic scrap from individual vendors due to lack of reliable quality and sufficient feedstock's and, hence many heaps of garbage's in street.

Learned lessons: It seems that, *n*obody can escape, in any society, the generation of waste whether liquid or solid. It is clear from this fact that, we cannot avoid the management part of waste generated if we want to live in safe and clean environment. An environment that is free from diseases caused by solid or liquid waste. An appropriate SWM system is not a result of an individual effort but rather, a co-coordinated activity which gets contributions from everybody in the society. For positive participation, community awareness campaigns should be part and parcel of the SWM game. This is especially important where a solid waste management agent is involved in the work. Cleanliness is an important culture which requires community enlightening and

effort in inculcating it into the society. Additionally, the required resources for the people need to be mobilized. Financial as well as human resources.

2.1.16 Solid waste management experience and challenges in Africa

Integrated management of solid wastes generated from both land-based and industrial based activities and operations requires thoughtful and conscientious coordination and consolidated of public sector and private sector mandates, interests, needs and strengths, including technical and scientific capabilities in Africa. As such in developing national programs four distinct but related components are required; namely: regulation/legislation; enforcement and compliance; facilities; infrastructure and support services. In addition, the national programs need to include capacity building and sustainable financing strategies and procedures. In that respect therefore, the present general state of solid waste management programs in the African continent can be summarized as follows:

Enforcement and compliance: Enforcement and compliance programs in Africa have been hampered by inadequate regulations, diffuse authorities among government ministries and departments, limited resources (both skilled human resources and finances) and supporting laboratories and equipment. There is an urgent need to improve the management and administrative infrastructures across and among levels of government, strengthen and develop human

resources to provide the necessary scientific, technical and operational skills for solid waste management and emergency preparedness and response, among other activities. Such programs should be developed to meet both public sector and private sector needs (Ibid).

Facilities and services: Many basic facilities and services which affect solid waste management in port towns and cities in Africa, including shore reception facilities and oil spill response equipment and service, are unavailable or under-capacity. It is not possible to enforce national regulations and controls, or to comply with international conventions and agreements, without access to facilities or services that allow compliance. Sub-regional, national, and local government programs need to include measures which encourage the provision of facilities and services to strengthen and develop the solid waste management infrastructure, taking advantage of expertise and services available from the private sector, and focusing on practical " African" solutions to move forward (Ibid).

Infrastructure and support services: The capabilities of national infrastructures and support services in many African countries vary significantly. It is not practical or cost-effective to build highly complex solid west prevention, management and control systems when the legal, technical, scientific and administrative infrastructure to support such systems is limited. Proposed

measured to strengthen and re-orient systems need, firstly, to assess existing capacities of infrastructure and support services at Sub-regional, national and local levels, including city authorities, industry, private enterprises, civil society organizations and academia, and seconded by their development over time (Ibid).

However there is widespread recognition of the need to strengthen the above indicated components, in an integrated fashion, with due consideration of the various activities and sectors that are contributing to and/or affected by solid waste generation and disposal practices, both on land and in the coastal and marine environment. It is also recognized that the development and application of financial mechanisms which will allow these programs to function in a sustainable, self-reliant manner are essential to the success of solid waste management programs in the region over the long-term.

2.1.17 Briefs on solid waste management situation in Mombasa in Kenya

In this research paper therefore, Mombasa municipal represents the industrial and largest business centers in Kenya. According to Kenya census 2002, the population of Mombasa estimates was around 612, 390. A part from low rate of population growth the municipal solid waste generation is exorbitant but disposed by dumping at landfill sites. The estimated quantity of refuse dumped at the Kibarani sites is about 54,750 tonnes annually. The per capita refuse

generation rate in Mombasa therefore is between 150 to 200 kg/year, suggesting a total refuse production rate of 77,000 to 103,000 tonnes per year. This implies that the average quantity of refuse collected and at Kibarani only is 60% of the amount generated. But all types of waste including solid and liquid domestic, industrial, and hazardous are disposed off without separation at the Kibarani landfill site. And this has been the common practice in many municipals in Kenya. In some of the areas which are not serviced by the municipal waste collection system, domestic waste is buried on sites. This practice also occurs in some industrial estates and in other towns, municipals and in Nairobi city in Kenya. At the Kibarani landfill site, large amounts of refuse burn uncontrolled and scavenging is common (Owaga, 2002).

General Municipal waste collection: The system of waste collection in Mombasa is constrained by unique architecture. The streets in the old town are so narrow that large vehicles cannot reach many houses. This has created the need for two-tier waste collection in Mombasa.

In the old town, waste is collected manually from individual houses with trolley and drums, and transported to central points, where it is picked up by municipal vehicles. This manual collection system currently employs about 400 persons. The rest of the areas are served by not more than 18 municipal vehicles, by collecting refuse from dustbins. The Municipality charges a small monthly fee

through water bills for the collection of waste from domestic sources, currently stand at 20 Ksh per household. Charges for private enterprises are individually determined and some private companies choose to organize their own system of solid waste collection. This includes sectors of the beverage industry and some beach hotels at the coast north and south of Mombasa.

The frequency of collection depends on the area, and is highest in Mombasa Island.

In some parts of the municipal, including some industrial areas and squatter settlements on the mainland are not serviced at all (Ibid).At this juncture, it can be concluded therefore that, almost in all African countries solid waste management is at the infant stages. Thus it is high time for deliberate "pre investment" steps in order to improve urbanization solid waste management in Africa.

2.2 Empirical Literature Review

2.2.1 The existing situation in Dar es Salaam city

Dar es Salaam city is estimated to accommodate about 6% of the national population and by the end of next three decades about 10% of Tanzanians will be living in Dar es Salaam if the trend remains uncontrolled. The population of Dar es Salaam has been doubling every 10 year. More than 50% of urban dwellers live in squatter settlement with very little basic amenities such as

proper sanitation facilities, access roads, solid waste disposal facilities and so on (Mdee *et al.* , 1994).

Solid waste generation rate: Dar es Salaam city is estimated to generate solid wastes at the rate of 2200 tons/day. About 62% of these wastes are generated in residential area and another 15% from market areas. The remaining fraction is generated by the industries, institutions, commercial centers, hospitals, construction and demolition works, street sweeping and car wrecks. The major fraction of the wastes is vegetables and putrescible matter, which accounts for 62% of the total wastes. These wastes contain organic matter that stinks when wastes decompose and must therefore be collected regularly (Mdee *et al*, 1994).

Efficiency of solid waste transportation system: Several reports have shown that only about 17 – 36% of solid waste collection trucks are usually in operation at any given time.

The number of daily trips made by collection trucks to solid waste disposal site was 2.35 trips per truck per day in 1988, 1.30 trips per truck per day in 1992 and 2.51 trips per truck per day in 1996. A container truck was making 7.5 trips per day in 1988. To date the situation must have been more improved. Number of truck trips was low primarily because of loading time and round trip travel time *(Mdee et al. ,1994).*

As a result only about 10% of the generated wastes were collected. This could be improved to 30% with the same number of trucks if the available capacity is effective utilized. Solid waste collection workers were loading 547 kg/grew/day. As such one solid waste collection crew in German is doing a job which was done by between 8 and 32 DCC sanitary workers (*Mdee et al. ,1994*). Solid waste collection crews did not have facilities required for handling solid wastes such as protection gear for example gloves, boots and so on. According to some solid waste collection crews the supply of most of the protective gears was stopped in 1973. Incentive to workers was very low. Some workers say that they would work better if they receive monthly salaries of Tshs. 40,000 to 50,000/=. This was still below the proposed minimum wage of more than Tshs. 140,000/= (*Mdee et al. ,1994).*

Disposal of solid wastes: Dumping of solid wastes to date is still done in a poorly located site with inadequate facilities that are required for proper disposal of solid wastes.

Acquiring a land for sanitary disposal of solid wastes requires an extensive search, procedures and studies, which was not done at all for the existing dump site. The former dump site at Tabata was "closed" after Tabata residents took their case to the court and won it in 1989 *(Mdee et al. ,1994).*

Hazardous wastes (e.g. heavy metals) and hospital wastes (e.g. syringes) are frequently disposed of haphazardly at the dump site. For example the concentration of cooper, zinc and lead found in the leachate from the former Tabata dump is higher than those of industrialized cities such as South Essex in United Kingdom and Hong Kong. Tabata dump has not received any attention since dumping of wastes shifted to Vingunguti. Vingunguti dump site is located close to residential areas, which may cause potential risk to health of nearby residents. Emergency clean-up campaign is again another method-which should be adopted. This type of strategy proved success in 1992, where the then Dar es Salaam city council increased the removal of solid wastes amount to more than 400 tones per day. But then, the success came out because of good participation from the city authorities and residents together with the government motivating and giving orders for the residents to fulfill their responsibilities *(Mdee et al. ,1994).*

Law enforcement is applied as a strategy and is used as a last resort. In fact, law is used to regulate the society behaviour by using expressly rules of conduct and good planned sanctions for nor compliance with those rules. For a programmed social change, law is a very important device to facilitate such changes for example; government policies can only be implemented effectively when backed by legislation with explicit rules and regulations.

2.2.2 Coastal waters and river pollution in coastline cities including Dar es Salaam in Tanzania

The combined population of the nine countries residing within coastal regions was estimated at 25million, of which Kenya, Mozambique, Tanzania and Madagascar constituted over 95 percent. The population growth rates of the mainland states, the Comoros and Madagascar are generally high, particularly in Kenya (3.3 percent) and Tanzania (3.7 percent). Growth rates in the large coastal cities such as Dar es Salaam (7.8 percent) per annum, Maputo and Mombassa, are even higher due to rural-urban migration (UNEP, 1998). The major coastal urban centres in Tanzania are Dar es Salaam and Tanga. Most of the domestic sewage in the coastal urban centres is discharged into surface waters with little or no treatment.

Most of urban centres lacking central sewerage system, mostly use septic tanks with soak away, traditional pit latrines and to a small extent ventilated improved pit latrines. The average national sanitation coverage in the urban centres is estimated at 70 percent and about 20 percent of the urban population (including those using septic tanks and soak pits) use the pit system (TCMP, 1998).

In Dar es salaam city 13 percent of the population is served by a central sewerage system, about 11 percent is served by septic tanks and the rest of the population use pit latrines. Sewage from the central business area is discharged directly into Indian Ocean without treatment. Most of the septic tanks and pit

latrines used in the City are disluged using vacuum emptier trucks, which finally empty the sludge into waste stabilization ponds or directly into the Indian Ocean through the sewer sea outfall. It is estimated that about 11,681 tonnes of BOD and 12,641 tonnes of suspended solids(SS) are discharged from domestic sources in Dar es salaam annually (UNEP, 1999). In Tanga the central sewage system, serving 13 percent of the population in Tanga, discharge untreated sewage into the Indian Ocean. It is estimated that 2,287 tonnes per annum of BOD and 971 tonnes of SS per annum are discharged from domestic sources in Tanga town.

Zanzibar coastal area is emerging as a major trade, industrial and tourist destination for the country. The population in 1998 was estimated at about 1,000,000 people living in various coastal towns and villages. Sewage is poorly treated and disposed off. Domestic sewage infrastructures are poorly developed in Zanzibar and this is considered the major source of pollution to near shore coastal waters (UNEP, 1999).

In Kenya, domestic sewage and storm water run-off in Mombassa are reported at 4369 tonnes per year of the total BOD and 3964 tonnes of SS. Currently, no sewage treatment facilities are operational in Mombassa resulting in the release of untreated domestic sewage and microbial contamination of waters in Kilindini, Port Reitz and Tudor Creek. In Mombassa, only 17 percent of the

population is served with sewerage system, 23 percent of the population use septic tanks while 60 percent use pit latrines. Domestic sewage from urban centres is discharged into the sea with little or no treatment (Munga et al, 1997).

In Mozambique, Maputo is the only city with a central sewage system for collection and treatment of domestic sewage. However, it is estimated that only 50 percent of Maputo's sewage are treated. About 70 percent of the population uses septic tanks and pit latrines. Maputo area produces 71 percent of the total domestic sewage. The sewage is emptied into rivers that empty into Maputo bay (UNEP, 1999).

In Mauritius, the two large urban centres have sewerage systems, although the system in Plaines Wilhems constructed in 1960 is inadequate to deal with peak flows during heavy rainfall resulting in frequent discharges of raw sewage to surface water courses. The remainder of the population generally use pit latrines, soakage pits or septic tanks. There are no centralized systems for the collection and treatment of domestic sewage in the In Comoros, the majority of the population use septic tanks or soakage pits (79 percent), and there mainder pit latrines. Pollution load contributed by domestic source is estimated at 3248 tonnes/year of BOD and 7533 tonnes/year of SS. Hotels contributed about 2.23 tonnes/year of the total of domestic sewage. Sewage is the major source of land-based pollution in Seychelles. The 1994 census revealed that 74 percent of the

population in Mahe was served by modern sanitation systems. Sewerage discharged from the Greater Victoria area, including discharges from industries and public buildings are estimated at around 9000 m 3day, and only 1700m 3/ day (19 percent) are collected by a public collection system, and treated before discharge at sea. The North West Bay area has a total population of about 7,300 people, with sewage effluents discharged estimated at 900 m3/day.

Few of the larger coastal towns in Madagascar have extensive sewerage systems, with the exception of Antananarivo where 40 percent of the population is served. However, the sewers empty waste directly into coastal waters and are poorly maintained, resulting in a blockage and stagnation of effluents in surface canals. About 40 percent of the population use pit latrines in the coastal towns. Domestic sewage accounts for the majority of the total BOD and total suspended solids (TSS) loads to the coastal zone in Madagascar, 79.9 percent (10,368 tonnes)/year) and 84.6 percent (15,068 tonnes/year) respectively. Various studies conducted in Tanzania highlight the impacts associated with sewage pollution which include; eutrophication of coastal waters, loss of valuable species, contamination of sea food, decreased marine production, risk of public health, loss of recreational sites, and introduction of heavy metals and toxic substance to marine environment. For example, the Msimbazi river in Dar es salaam is considered to be highly polluted due to discharge of untreated sewage.

Mohamed (1997) reported that the majority of drinking water sources in and around Zanzibar town were unsuitable for human consumption according to WHO guidelines due to the presence of coliform bacteria. Eutrophication associated with the release of inorganic nutrients (phosphate, nitrate and ammonia) into coastal waters from domestic sewage around Zanzibar was identified as the possible cause of the decreased cover of coral reef building algae (UNEP, 1999).

Limited studies in Kenya indicate that water quality in creeks around Mombassa is degraded and faecal coliform in some cases exceeds safe limits. Increase of incidences of typhoid has been reported because of the increased faecal coliform contamination of surface and ground waters. Recreational use of littoral zone also diminishes due to foul smell and eutrophication leading to algal blooms. Considering the short coastline of the Mombasa district with the high concentration of socio-economic activities, the district experiences a greater risk of localized marine pollution effects and environmental degradation. Preliminary findings have shown elevated levels of faecal coliform inshore waters in Mombasa, especially in the vicinity of sewage outfalls in the Kilindini and Tudor creeks. The mentioned problems are linked with the discharge of untreated or partiallytreated sewage (Mwangumi *et al,* 1997).

Studies in Maputo bay in Mozambique have revealed that faecal coliforms, faecal streptococci and Escherichia coli were detected in marine water and shellfish tissues. The levels in shellfish tissue were consistently high. The levels of faecal coliforms have been increasing over the years.

Pathogens causing severe gasto-intestinal infections have been increasing over the years. Discharge of untreated sewage has been the main cause of the above mentioned environmental problems (UNEP, 1998).

In Mauritius, around Port Louis there is evidence of pollution of underground water used for both domestic and industrial supplies by bacterial and inorganic constituents, which pose a direct threat to human health. Surface water is also polluted principally by the inorganic nutrients, and phosphates, which encourage growth of algae in the lagoon thus prohibiting coral growth. There is also substantial evidence of pollution of the lagoons around Port Louis and at isolated places. Additionally, there is faecal contamination of popular bathing beaches particularly in Port Louis and Grand Baie areas, with concomitant risk to health from viral, bacterial and other pathogens as well as aesthetic nuisance.

2.2.3 Deterioration of public health and sanitation a sewage major problem

In urban areas all over the world, rapid population growth and expansion of industrial activities have created numerous public health problems, the Eastern African region is not an exception. People in the urban centres are exposed to a

variety of physical and social stress and, pollution as well as general deterioration of environmental conditions. These cause health problems, ranging from communicable disease and malnutrition to chronic respiratory diseases.

Pollution of freshwater due to discharge of untreated or partially treated sewage is causing recurring of epidemics and high mortality rates. Some of the reported diseases common to the region include typhoid, cholera, salmonella, poliomyelitis, and may other parasitic disease. In 1980 there were about 5200 reported cases of cholera in Tanzania, 4500 causes in Kenya, and 3000 cases in Mozambique. In 1997 there was another outbreak of cholera in Tanzania which resulted into 3000 hospitalized patients with 1000 deaths (Martinez, 1998).

In Kenya, diseases related to sewage pollution are the most prevalent. Of late typhoid has been the most devastating. Cholera is a seasonal disease, oftentimes coming with the onset of the rain period. Mortality rate under 1 year is 74/1000 and 112/1000 for those in the age bracket 1-5 years, and is mainly liked with the prevalent of water borne diseases.

Hence, efforts towards public health and sanitation services will be frustrated in all countries in the region if the problem of sewage is not adequately addressed (World Bank, 1995).

2.2.4 Socio-economic benefits gained by effective sewerage management

The immediate and one of the most beneficial impacts of addressing the problem of sewage adequately, for example, by constructing wastewater treatment plants in the coastal urban centres is reduction of organic loading into the nearby water bodies. Reduction in organic loading will result into an increase in dissolved oxygen levels in the water bodies. As a result, local environmental conditions will improve. Construction and operation of treatment plants in urban centres will reduce nutrient loading. This will help to reverse or retard eutrophication occurrence in the marine and freshwater environments (UNEP, 1991). Reduction or elimination of sewage pollution will therefore result into improved environmental conditions in all projects states in the region. Coral reefs and other marine habitats in the region will flourish as a result of improved water quality (World Bank, 1995).

2.2.5 Social benefits like gained through effective sewerage management

Public health considerations from a degraded marine environment manifest themselves through the contamination of seafood, direct contact, and the use of seawater in desalination and food processing plants. In addressing sewage pollution, in the long-term, improvement of public health and sanitation are expected. For example, provision of proper wastewater treatment facilities will reduce or eliminate any significant potential infiltration of sewage into the soil and groundwater. Furthermore, the provision of adequate wastewater treatment could produce an immediate improvement in water quality. Improved water

quality will promote public health of the coastal communities and reduce the recurrence of water borne diseases in the region (UNEP, 1982) and (WHO, 1996). Recurrence of cholera, typhoid in Kenya, Mozambique and Tanzania will decrease as a result of improved sewage management (WHO, 1996).

2.2.6 Efforts made so far to combat rivers pollution in Dar es Salaam city

The Sustainable Dar es Salaam Project (SDP) was launched in 1992. The overall objective was to strengthen the City Council's capacity in planning, managing of growth and development of the city in partnership with the public, private and popular sector. The Project would achieve sustainable development of the city region through:

(i) Strengthening the local capacity of the partners to plan, coordinate, and manage environmental and development activities; and

(ii) Preparing a long-term integrated urban development plan. The project aimed at adopting a four stage approach: preparation of a city environmental profile; holding a city consultation on environmental issues; establishing institutional framework (working groups) to prepare preliminary development strategies and detailed action plans; and preparation of a SDP for Dar es Salaam. During the consultation on urban environmental issues in 1992, nine environmental issues were identified including management of surface water and liquid waste. The

key program implementers further identified dangers and unsustainable way of using hazardous areas in the city such as bad practice urban agriculture (vegetable growing, livestock keeping) in hazard areas, particularly in Msimbazi valley.

Thus high contamination levels of Msimbazi river by heavy metals is very common. Small farmers in the valley irrigate crops with this contaminated water. Apart from carrying out farming in the Msimbazi valley, other people are constructing houses in the valley by ignoring the threat of seasonal flood.

In steep, erosion prone areas, housing and urban agriculture are carried out haphazardly. Such areas include: Kimara, Changanyikeni, Makongo and Mbagala. Practice of urban agriculture in hazardous areas is not necessarily bad if land conservation measures are incorporated, for example, terracing, tree planting, planting certain types of grass to stabilize slopes and curb erosion. Out of all the heavy metals in Msimbazi valley, lead was found most abundant, with concentrations ranging from 0.07 to 0.30 mg/l. This was followed by cadmium (0.008 to 0.020 mg/l) and zinc (< 0.002 to 0.015 mg/l). Copper and chromium were the least abundant (less than 0.002 and 0.003 mg/l, respectively. The results show that the pollution of Msimbazi water is abated in some way. In previous studies a few years back, the concentrations were much higher and copper was found to be present in concentrations ranging from 0.05 mg/l in

river Sinza to 0.36 mg/l Msimbazi river at Sukita, downstream (Kondoro *et al,* 1994).

2.2.6.1 .1Minimization of industrial and domestic pollution at Msimbazi river valley, Dar es Salaam

The Msimbazi river flows across a third of Dar es Salaam City and eventually discharges into the Indian Ocean. The river is an important water resource for residents of some of Dar es Salaam's poorest neighborhoods. Residents use the water in various ways - for drinking, bathing, support for agriculture and industry, and as an environmental buffer. Nevertheless, many industries continue to pour unwanted products from human and industrial activity into the river, which mostly threatening its functional benefits, and even its usefulness as an irrigation source.

The Msimbazi River Action Network (MRAN) brings together current Blacksmith partners (EMT, Envipro and LEAT) in an effort to organize clean-up and oversight activities focused on the Msimbazi river in Dar es Salaam. This network connects community and government representatives with the aim of minimizing industrial and domestic pollution sources on the river, and to

protect the over 100,000 people living on the river from heavy metal contamination as well as deadly diseases such as cholera.

With the support of the Conservation, Food and Health Foundation, Blacksmith Institute is encouraging full development and implementation of the locally-run Msimbazi River Action Network, a critical advocacy tool to promote direct remediation of the river and its catchment as well as policies to ensure the long-term health and sustainability of this vital resource for the residents of Dar es Salaam. The Network is in the process of identifying pollutants and polluting sources and facilitating the sharing of technical support, legal tools and other resources both from Blacksmith Institute and from local groups and government.

2.2.6.2 Measure employed to curbing sewage pollution to streams in the Mikocheni area.

Mikocheni, a neighborhood in Dar es Salaam, is home to four heavily polluted streams that run directly into the Indian Ocean. Untreated industrial and domestic waste is dumped into the waterways upstream, or into storm drains. The Trust is undertaking a project to monitor and stop this pollution of marine habitats and breaches. The project goals are to make wastewater treatment mandatory for all polluting industries, to stop residential houses from releasing

waste from septic tanks into streams, and to ensure that sewers, storm drains and pumping stations are properly maintained to prevent leaks into the stream.

This pollution poses a direct health risk to children who play in the streams as well as to cattle that graze on the banks of the streams and drink from the streams. Blacksmith Institute visited Tanzania in 2001 and, after conferring with local NGOs, helped to found Environmental Management Trust (formerly Clean Mikocheni Trust) with the mandate to monitor waterway and sewage pollution in the Mikocheni area of Dar es Salaam. Since the project's inception, EMT has conducted water analysis, met with local government officials, informed home owners about pollution hazards, and determined the sources of both domestic and industrial pollution.

EMT has determined that a major contributing factor is a collapsed sewer infrastructure which needs to be refurbished and extended. In 2003, the Government of Tanzania began a $164.6 million project of renovation and expansion of the Dar es Salaam sewage system. Therefore, the group now works with the Dar es Salaam Water and Sewerage Authority (DAWASA) to develop a cleanup strategy for industrial and domestic wastewater pollution and to carry out physical inspection of the sewerage system to ensure that DAWASA carries out the needed renovations according to plan. EMT also works with the Ministry of Health and the National Environmental Management

Council (NEMC) to inspect industries suspected of pollution. So far, the renovation of one of Mikocheni's sewer lines has been completed, preventing wastewater overflows or other leakage from manholes to the streams. Some residents have also voluntarily renovated and lined their pit latrines so as to prevent leakage.

2.2.6.3 Management of waste effluent from Vingunguti abattoir, Dar es Salaam

An environmental engineering NGO called EnviPro is now working on a project in the neighborhood of Vingunguti, in Dar es Salaam, to manage waste effluent from Vingunguti abattoir, a local slaughterhouse. The slaughterhouse is dumping waste directly into the Msimbazi river, posing a significant health risk to residents of Dar es Salaam and surrounding areas, and EnviPro has designed a plan to install a wastewater treatment program for the plant. With Blacksmith's support, EnviPro is now working with the local industry and municipality to garner technical and other support for the project and for similar actions at other sites. While the focus remains on the slaughterhouse, EnviPro's overall goal is the rehabilitation of the Msimbazi river through identification and monitoring of polluting industries along the river's banks. Water from the polluted river is used by residents for domestic uses and even direct consumption (EMTReport,2003).

2.3 Policy Review

2.3.1 Legislation, regulations and policy in Africa

African countries have an abundance of regulations and policies covering various aspects of solid waste management in industrial, commercial, institutional and domestic sectors in the society. Diffuse waste management controls and authorities, gaps in legislative coverage, and the lack of "umbrella" legislation and management frameworks present serious impediments to consistent and appropriate control of both hazardous and non-hazardous wastes. In countries like Sudan, Kenya, Zambia, Ethiopia, Uganda, Mauritius, Seychelles, South Africa and many countries in Southern Sahara have progressed in this area with the formulation and implementation of national environmental action plans, technical guidelines and national solid waste management strategies.

In Kenya, Tanzania, Seychelles, Mauritius, Mozambique, and Madagascar have established legal and regulatory frameworks which address the problem of sewage directly or indirectly. In this regard several laws and management regimes, for example in Tanzania so far are in place to govern the management of sewage.

These laws include:

(i) *Water utilization Act of 1974*

The Act establishes a Central Water Board and River Basin Boards to mange water utilization and pollution. Further it sets the discharge standards of receiving water and effluent standards according to each substance.

(ii) *The Urban Water Supply Act of 1981*

The Act give National Urban Water Authority power to make rules regarding surface or ground water pollution and specifies that it is an offence to pollute water supplies.

(iii) *The Public Health (Sewerage and Drainage) Ordinance*

These Acts give particular powers to local governments to protect public health and regulate pollution problems including sewage pollution.

(iv) *The Industrial Licensing Act of 1974*

The Act requires the licenses to provide strategies for prevention and control of pollution.

However, most of the above-mentioned laws fail to address the problem of sewage adequately because of poor enforcement, lack of waste management guidelines, and generally these laws are weak. Inadequate finance and local technical capacity needed to make proper design, operation and maintenance of sewerage and on-site waste water facilities are the main problems hindering efficient management of sewage.

It should be noted that, the rapid growing coastal population in the Eastern African region is a major cause of various environmental problems. The population increase is exerting an increasing pressure on the coastal natural resources, which finally exceed its capacity to respond and recover from development pressures.

Coastal urban cities are the pollution "hot spots" in the region. The analysis has established that, in all project countries sewage is considered the principal cause for the pollution of the coastal, marine, and freshwater environment. The study also observed that few cities have sewers, but none has adequate sewage treatment system or disposal facilities. In many cases the operation and maintenance of the urban public sewerage systems are not satisfactory. Very little amount of sewage generated from the point sources is collected and treated before discharged into water bodies. This study clearly establishes that environmental problems facing the region due to sewage problem is significantly affecting socio-economic developments in the region such as tourism industry, fishing sector, public health and sanitation services.

There is a wide range of stakeholders that could be involved in socio-economic developments; however, they are not well coordinated, as the governments have not established guidelines to facilitate co-ordination of stakeholders (World Bank, 1995).

2.3.2 Other legal interventions in Tanzania

In Tanzania there is the National Environment Management Act, 1983(Edition 2002) which was printed under the authority of section 18 of the Interpretation of Laws and General Clauses Act, 1972. Under section 4 of this law, among others, empowers the "Council" to execute five duties: Advise the Government on all technical matters related to the effective management of the environment; Coordinate technical activities of all bodies concerned with environmental matters; and stimulate public and private participation in programmes and activities for the national beneficial use of natural resources.

2.3.3 National environmental policy

In December, 1997 Tanzania introduced a coherent environmental policy which defines objectives and strategies for the purpose of the promotion of long term economic growth, creating incentives for sustainable utilization of natural resources, disincentives for environmental pollution and degradation, and effective management of the overall environment. This means that the environment must be subjected to greater accountability and control, with more effective instruments having clear objectives to be pursued. It means strengthening the functions of government and the corresponding institutions in environmental protection.

2.3.4 The community state of the environment

The current state of the Tanzania environment is a matter of concern. A national analysis has so far identified six major problems for urgent attention. These include:

Land degradation which is reducing the productivity of soils in many parts of Tanzania. However, despite considerable national effort, over half of the communities in towns, municipals and cities and in the countryside do not have access to clean and safe water for washing, cooking, drinking and bathing. Pollution in towns, municipals and cities and the countryside is still affecting the health of many people, and has lowered the productivity of the environment; The loss of habitats for wildlife is threatening the national heritage and creates an uncertain future for the tourist industry;

The productivity of aquatic systems including lake, river, coastal and marine waters is threatened by pollution and poor management, and Tanzania forest and woodland heritage is being reduced year by year through clearance for agriculture, for wood fuel and for other demands. The policy overall objective is to provide policy guidelines, plans, monitoring, sectoral and cross-sectoral policy analysis in order to achieve compatibility among sectors and interest groups and exploit synergies among them. Generally, environmental degradation (solid waste disposal and soil erosion) has had and continues to have, adverse impact on the quality of human life and health of Tanzanians. The good example therefore, demonstrated by Ndugumbi, Tandale and Magomeni

wards community's in Kinondoni Municipal in Dar – es – Salaam city should be emulated. It is therefore logical to argue that, the community under the project area must ensure victorious end on this waged environmental gradation war.

2.3.5 The Kinondoni Municipal commission (waste management and refuse collection fees) By- Law, 2000

These By- laws are sited as the Kinondoni Municipal commission (waste Management and Refuse collection fees) by – law, 2000.

These By-laws applies throughout the area of jurisdiction of the Kinondoni Municipality.

2.3.6 Management of the solid and liquid waste

The Authority or its registered agents or contractors are exclusively responsible for the management of both solid and liquid wastes within the entire area of its jurisdiction.

2.3.7 Trade refuse

Every occupier of /or tenant of any trade is required to provide and maintain to the satisfaction of the Authority, a receptacle for trade refuse not less than 70 m^3 and fitted with a good and effective lid and shall daily cause to be placed within such receptacle the trade refuse from the trade premises in so far as the said receptacle shall be sufficient to contain the same. Where any trade is carried in

any residential building or any part thereof the whole of the waste arising there from shall be considered as trade refuse.

2.3.8 Domestic refuse

Every occupier and or tenant of any residential dwelling is required to provide and maintain to the satisfaction of the Authority, a receptacle for domestic refuse not less than 50 m^3 and fitted with a good and effective lid and shall daily cause to be placed within such receptacle the domestic refuse from the domestic dwelling in so far as the said receptacle shall be sufficient to contain the same.

2.3.9 Frontage maintenance

No person should place, or cause or permit to be placed upon the frontage of a house he/she owns or occupies any dirt, filth, rubbish, stones or any type of refuse. It is the duty of every occupier of a house to cleanness of the frontage of his/her house to the satisfaction of the authority.

2.3.10 Refuse collection fees

Every household or kaya and every occupier of trade premises shall pay at every end of the month refuse collection charges as provided for in the first schedule of these By- laws (Annex 16). Any person who fails or refuses to pay refuse collection charges on time shall be liable of 25% of the refuse collection

charge and in each case shall also be guilty of an offence under By- Law 24 thereof.

2.3.11 Application summary procedure

Community Based Organisations (CBOs) and any other bodies or person(s) engaged in garbage collection shall pay dumping fee as shall be set by the authority. Any contractor, Community Based Organisations, NGOs or any other person engaged in garbage collection who fails or refuse to pay garbage dumping charges on time shall be liable of a penalty of 20% of the dumping charges and in each case shall also be guilty of an offence under By- laws 24 hereof. The mode and of recovery of refuse collection charges shall apply *mutates mutandis* as provided under By-law 15 hereof.

2.3.12 Offense and punishment

Any person who refuse or fail to comply with provisions of these By- laws or gives false information in relation to any requirements of these By-laws shall be guilty of an offense, and shall be liable on conviction to a fine not exceeding fifty thousands shillings or a term not exceeding twelve months imprisonment or to both such fine and imprisonment.

2.3.13 Proposed measures

World Bank (1991) made a number of suitable proposals like allowing capable private companies and individuals to provide collection services through a process of interacting. This is now taking place in Dar es Salaam city council (DCC), where the refuse collection contractors are authorized to collect both refuse and fees as clearly provided in the DCC (Refuse collection) by-law, 1992. Of course, the aim here is to increase the capacity to collect and dispose off refuse. The application of this strategy has shown an increase in waste collection efficiency. The willingness of the people to pay refuses collection fees to contractors coupled with the close supervision by the city authorities have contributed to this achievement. Encouraging the community to participate in solid waste collection and management. For example in Dar es Salaam, a number of community based organization (CBOs) and non governmental organizations (NGOs have started participation in waste collection and creation of public awareness on proper solid waste management. Among the organizations are POCA in Sinza and Hanna Nassif Women Development Association. Refuse recycling; where materials like waste papers, plastics, scrap metals and waste glass and so on, need not to be transported to final disposal site, but rather, to proper recycling. The aim here is to increase life spans of refuse disposal sites. A demonstration organic waste treatment plant for biogas electricity (TAKAGAS) generation is underway.

CHAPTER THREE

3.0 RESEARCH METHODOLOGY

3.1 Introduction

Research methodology denotes a systematic process of solving a particular research problem. Thus research design, approach and strategies must be employed, to sort out the researched problem technically.

3.2 Research Design

The design of this study is exploratory. It was designed in such a way that its functions could reach and provide appropriate methods of collecting all relevant information with a minimal expenditure of efforts, time and money. But at the same time, with vibrant achievable goals. In this regard, therefore, coverage, sample and sampling techniques in case of primary and secondary data collection were laid down.

3.3 Research Approach and Strategy

This study mainly used survey approach whereby questionnaire; interviews; observation and documentary review methods were employed to collect an appropriate data. This study approach was strategically used to ensure accomplishment and promotion of specific and general objectives.

3.4 Sample and Sampling Techniques

3.4.1 Sample

A sample means a small number of respondents who are chosen to be true representatives of the population from a selected area for the research. According to Shipman (1992), therefore, a sample is a selection of some parts of the population on the basis of which judgment is made; small enough for convenient data collection; large enough to be truly representative; and enough to the population from which it had been selected.

3.4.2 Sampling techniques

On the other hand, sampling procedures are those techniques used to choose respondents and study area. Kothari (1992) defines sampling as the section of some part of an aggregate of totality on the basis of which a judgment or inference about the aggregate or totality is made. Luoga and Kajembe (1998) elaborate that a sample must be below 5% of the population. Thus, two approaches were employed based on purposive that is, selected house holds located along the river and random selection method from all three wards namely Ndugumbi (32 participants), Magomeni (38 participants) and Tandale (30 participants).

3.5 Data Collection Techniques

Access to reliable sources of information is not just only important for research. But it is crucial when it is necessary to provide an objective view of the development of society and of individual lives. "It is not just a question of scientific method, but also of fundamental principles of justice," writes (Norberg , 1998). Based on that philosophy the author employed three data collection methods, to include;

(i) Questionnaires,

(ii) Observations and

(iii) Documentary material.

3.6 Primary Data Collection

3.6.1 Questionnaire

The self-administered questionnaires were distributed to almost all beneficiary families living along Nalung'ombe River, within the project area. This technique was chosen simply because of its reliability, practicability and above all as Oppenhein (1996) and Kallinger (1973) pointed out that, do not exert much pressure on the respondents, thus makes the respondents to answer questions with more freedom and enable the researcher to collect more information easily. The questionnaires contained both "open-ended" and "close-ended" questions (Annex 6).

3.6.2 Observations

Systematically, observation encompassed selecting, watching and recording behavior and characteristics of objects or phenomena events. Observations therefore especially during actual project implementation was used to reach at the following observable behavior and characteristics.

(i) Interaction of beneficiaries/community and workplace/project place,

(ii) Interaction of assistant facilitators/MADEA management team towards community/participants,

(iii) Project general environment,

(iv) Worksite environment and so on.

3.7 Secondary Data Collection

In this research documentary as a secondary source of data was widely used in order to get enough and reliable literature and information. The researcher has started to visit various centers and libraries and get some reading material sources to review like pamphlets, magazines, journals, researches, and conference and workshop reports from NEMC , OUT, NLT and UDSM libraries. It was intended that, if this method was employed fully and properly, it would have enabled the researcher to be more familiar with at least all environmental issues, regards the project area.

3.8 Data Analysis

The primary and secondary data were analysed by using the Statistical Package for Social Sciences(SPSS) Version 8.5 of 1988. These data were presented in descriptive statistics including: mean, mode, median and frequencies.

3.9 Limitations of the Study

During the study undertakings, there were a number of problems which the author encountered. They are as follows:

3.9.1 Respondents

It was observed and experienced by the author that during the process of data collection some of the respondents were not ready to cooperate and avail the necessary information until told exactly the use of these data as they hesitated to be quoted in government spheres hence lose their securities. Also some of the respondents did not fill in questionnaires within agreed period and forces the researcher to rearrange the programs to make follow ups frequently, which increased extra transport costs and wastage of time.

CHAPTER FOUR

4.0 FINDINGS AND CONCLUSIONS

4.1 Demographic and Socio- economic Characteristics of Respondents

The majority of respondents were males (62%) while females were (38%). In the first place, it should be understood that, the background characteristics of the respondents include age, gender, knowledge and level of community responsibility (Table 3).

Table3: Respondents age distribution by gender

Age	Frequency		Total	Percentage
	Female	Male		
18 – 35 years	9	17	26	26
36 – 45 years	8	13	21	21
46 – 55 years	10	16	26	26
≥ 56 years	11	16	27	27
Total	38	62	100	100

Source: Survey data, 2004

From table 3 above, it shows that 84% of the respondents were married and those who were not married, were 10 male (10%) and 6 females (6%). All 100 respondents were Tanzanians by birth.

4.2 Respondents Awareness on Environmental Degradation

The results in table 4 shows that out of 100 respondents, 32% agreed to have knowledge and awareness while 68% have no knowledge and are not aware of environmental degradation.

Table 4: Respondents awareness on level of degradation

Any degradation	Frequency of Respondents			
	Male	**Female**	**Total**	**Percentage**
Yes	20	12	32	32
No	42	26	68	68
Total	62	38	100	100

Source: Survey data, 2004.

The data in table 5 indicates that, among 100 respondents, 28% agreed to have knowledge and awareness. On the other hand, 72% have no knowledge and are not aware of solid waste management.

Table 5: Respondents awareness on solid waste management

Awareness	Frequency of respondents			
	Male	**Female**	**Total**	**Male**
Yes	18	10	28	28
No	44	28	72	72
Total	62	38	100	100

Source: Survey data, 2004.

4.3 Solid Waste Disposal Service Delivery

Results in table 6 shows that, out of 100 respondents, 66% said, completely no environmental control was carried out in their area. And 30% of the respondents said only solid waste management is done partially, and 4% did not give any answer.

Table 6: Respondents awareness on the level of solid waste disposal service delivery

Awareness	Frequency of respondents			
	Male	Female	Total	Percentage
No	35	31	66	66
Not sure	26	4	30	30
No answer	1	3	4	4
Total	62	38	100	100

Source: Survey data, 2004.

4.4 Community Participation in Solid Waste Disposal

Results in table 7 reveal that among 100 respondents, only 36% accepted the first responsibility in solid waste management in their area. But 34% shifted the burden of responsibility to the local government authority with comments that, revenue collected from the community should take care of all social services plus environmental control and finance all relevant infrastructures and 36% said that waste management is the responsibility of the central government.

Table 7: Respondents awareness on responsibility for solid waste disposal

Responsibility	Frequency of respondents			
	Male	Female	Total	Percentage
Community her self	12	18	30	30
Local Government	14	20	34	34
Central Government	36	0	36	36
Total	62	38	100	100

Source: Survey data, 2004.

4.5 Community Social Service Demands

Results in table 8 shows that among 100 respondents 27% their priority was clean and safe water.

Table 8: Respondents perception on social services demands

Service	Frequency of respondents			
	Male	Female	Total	Percentage
Clean and safe water	23	4	27	27
Health services	9	22	31	31
Accessible roads	25	0	25	25
Primary school	5	12	17	17
Total	62	38	100	100

Source: Survey data, 2004.

4.6 Community Willingness to Pay for Solid Waste Disposal Services

Results in table 9 shows that out of 100 respondents only 30% are willing to pay while 70% are not willing to pay for solid waste disposal services.

9: Respondents willingness to pay for solid waste disposal services

Response	Frequency of respondents			
	Male	Female	Total	Percentage
Yes	18	12	30	30
No	44	26	70	70
Total	62	38	100	100

Source: Survey data, 2004.

4.7 Observations

During this study it was observed that the Nalung'ombe river floodness and continues flow of water from leaking pipes (Plate A) has formed a large swamp and ponds along side the river. As a result it creates a bleeding place for mosquitoes and bacteria which transmit malaria parasites and other water bone diseases (Annex 12–12(a)).

Figure 2: Plate "A" – Presents typical picture of leaking pipes at the project site

4.8 Conclusions

The problem of solid waste disposal in different forms still and continues to persist in Tanzania and allover the world. However various efforts have been employed to fight it. Laws have been enacted and policies formulated to combat the problem. In order to reach at most proper and permanent solutions, all stakeholders involved must act seriously. The local governments on the other hand, must support community mobilization through CBOs and NGOs to create awareness.

Also must ensure the enforcement of law, by- laws and implementation of policies which aim at effective and efficient solid waste management. The private sector, CBOs and NGOs on the other part, must have clear and effective strategies for channeling, coordinating and networking the limited resources allocated for the war against environmental degradation. It must be noted that, keeping the environment clean, protected, conserved and sustainable, becomes and remains a noble duty requiring the involvement of every one within her or his community to ensure there no garbage and litter clog gutters around their areas.

4.9 Recommendations

This project has lifted up the sense of responsibility among the MADEA'S community and through this raised sense of self development culture and momentum built so far, all prevailing environment hazards which are mainly caused by Nalung'ombe River will be completely halt. Nevertheless long term plan and strategies in due course should focus at least on eight immediate tasks to include:

(i) Enhancing solid waste management capacity building from household's level to individuals/each resident levels.

(ii) Enhancing a continuous garbage collection and general cleaning campaign from the community levels to individuals/each resident participatory levels.

(iii) Enhancing consultation and facilitation on institution of by-laws governed by local government authorities against any violence of solid waste management principles.

(iv) Earmarking and providing of common solid waste dump area for simple and cost effective management in all three wards under the project.

(v) Construction of stone or Concrete River banks to enable a permanent river course.

(vi) Construction of drainage systems which will enable easy collection and lead stagnant water directly to the main river particularly during rainy seasons.

CHAPTER FIVE

5.0 IMPLEMENTATION OF ASSIGNMENT

5.1.0 Executive Summary

Project title:

Project title was " Solid Waste Management and River Bank Stabilization" along Nalung'ombe River in Kinondoni Municipal in Dar- es- Salaam City in Tanzania.

Contact person:

The Chief Actor was Mr. Kasanzu Kitwana as a Secretary General, land line telephone number +255-51-1703370, mobile phone was 0744-471150, E-mail address was Kasanzu@yahoo.comak and Fax number was +255-51-762208

Proposal Submitted by:

M/s Magomeni Development Association (MADEA),

P.O. Box 16464 Dar es Salaam, Tanzania.

Problem statement:

On the basis of SWOT analysis and reviewed literatures, the Nalung'ombe river is highly polluted. Three factors are identified as causes of the pollution. These include draining of pit latrines into the river, dumping of solid wastes into the river and the increasing soil erosion along the river banks. The existence of high density squatter along the river has been reported to exacerbate the situation. Consequently according to NEMC(2003), the Nalung'ombe river is saturated with nutrients, toxic metals, farm effluents and garage wastes. This has

adversely affected the aquatic ecology of the river and water flow regimes. On the other hand the river water has been rendered unsuitable for human and domestic consumption. For example there has been recurring cases of outbreak of diseases such as cholera, typhoid and dysentery in the area (IDWE Report, 2004). It was the aim of this study therefore, to work collaboratively with MADEA management in order to create awareness about environmental problems to the immediate community. Specifically the study focused on strategies to control and sustainably manage the solid waste
disposal and river bank destabilization problems along Nalung'ombe River.

Mission statement:

The mission for this study was to promote positive environmentally responsible values among community members with the view of alleviating solid waste disposal and river bank distabilisation problems along Nalung'ombe River.

Target group:

The target group was all community members living along Nalung'ombe River which cuts across Magomeni, Tandale and Ndugumbi words in Kinondoni Municipal in
Dar es Saalam City.

Project activities:

The project activities included;

(i) One day community members workshop about environmental protection against solid waste disposal and soil erosion;

(ii) General cleaning and collection of pileup garbage heaps in the project area;

(iii) Collection and transfer of heaps of sand sediments from inside and along the Nalung'ombe river;

(iv) Tree planting along Nalung'ombe river banks in Magomeni, Tandale and Ndugumbi wards stretch; and

(v) Sewerage system unblocking and cleaning in the project area.

Project outcomes:

The project outcomes after a full implementation may be summarized as follows:

(i) By virtue of one day workshop which involved about one hundred community members living along Nalung'ombe River, environmental conservation and control awareness raised.

(ii) Sanitary solid waste dumping and water flood control reduced rampant communicable diseases particularly cholera in that area.

(iii) By virtue of tree planting, environmental problems like wind dust and soil erosion along Nalung'ombe river banks was minimized.

(iv) Unblocking sewerage system, concomitant with garbage collections, hazardous disease incidences like typhoid, dysentery and diarrhea from that area were reduced and so on.

Donors funding:

The CUSO/NOVIB of Holland, Tanzania branch donated Tshs. 4,286,800= This was about 79.16% of the total project cost.

Community contribution:

The community managed to contribute Tshs. 1,128,000/, which was about 20.84% of the total project cost.

5.1.1 The Project Proposal

5.1.2 Project title

Name of the project is "Solid Waste Management and River Bank Stabilization" along Nalung'ombe River in Kinondoni Municipal, Dar-es- salaam city.

5.1.3 Duration of the project

It was a pilot project which its implementation started from January 2004 to January 2005 a period of thirteen months from the time of sensitization to the time of completion of all project activities.

5.1.4 Project area

The project area was along Nalung'ombe river which cuts across Magomeni Tandale and Ndugumbi wards in Kinondoni Municipal in Dar-es-salaam city.

5.1.5 Project objectives

(a) General objective

The main project objective was to mobilize households community members living along Nalung'ombe river to participate on sustainable conservation of river system and solid waste management.

(b) Specific objectives include the followings:

(i) To develop community capacity to articulate demand and implement activities such as general cleaning and garbage collection around the project area and enable them to sustain these activities at community level.

(ii) To ascertain with local knowledge and understand the actual degree of problems and needs assessment, regarding soil erosion control and solid waste management.

(iii) To ascertain a level of community self-responsibility, commitments and participation in self-development activities such as tree planting along the river bank.

(iv) To educate the community on solid waste management through one day workshop.

(v) To sensitize and mobilize the community on the project sustainability.

5.1.6 Project components

The project components combined:

(i) A one day workshop about environmental protection against solid waste disposal and soil erosion.

(ii) General cleaning and collection of piled up garbage heaps in the project area.

(iii) Collection and transfer of heaps of sand sediments from inside and along the Nalung'ombe river.

(iv) Tree planting along Nalung'ombe river banks in Magomeni, Tandale and Ndugumbi wards stretch.

(v) Sewerage system unblocking and cleaning in the project area.

5.1.7 Project institutional setup

The project institutional setup entailed five bodies including the Ministry of Home Affairs which is the sole registrar of all community based organizations in Tanzania. Followed by the wards development committees from Ndugumbi, Tandale and Magomeni. The wards committees were responsible for community mobilization, sensitization and raising public awareness on the project. The Magomeni Development Association Executive Committee had role of management, monitoring, evaluation and eventually was to ensure sustainability. Local government authorities development committees in the relevant areas of the study played a role of material resources organization and

monetary contributions. Finally, the CBO registered members who are beneficiaries and rest of the community ensured full participation and commitments.

5.1.8 Project expected outputs

The following were the envisaged outputs after a full implementation of the project.

The community of about one hundred families living along Nalung'ombe River got and enjoyed a one day workshop on how to manage and conserve environment. By virtual of that workshop therefore, skills and knowledge on environmental conservation stick and imparted into participants minds. As a result the same knowledge passed to the whole community, hence the raise of environmental conservation and control awareness in the project area. After implementation of that project, sanitary waste solid dumping and hazardous diseases like cholera, and malaria would be easily controlled. At the same time after unblocking sewerage system, concomitant with general cleaning and garbage collections, disease incidences like typhoid and diarrhea would be reduced.

Also moves like tree planting would minimize environmental problems like wind dust and soil erosion around the river in question and so on.

5.2 Project Work Plan

The project work plan for the whole project from selection of donor and sensitization to the monitoring and evaluation has been shown on (Annex 13).

5.3 Project Monitoring and Evaluation

MADEA Executive Committee, Management and Free Consultant from Community Economic Development (CED) programme of the Southern New Hampshire University (SNHU) and Open University of Tanzania (OUT) ensured that, all requested funds from the donor and members contributions was utilized physically into the planned actions. The researcher/consultant, therefore, was visiting the project area and MADEA at least once a week for proper advice and further consultations.

In addition, the project management kept track of activities and measured progress against the expected main results through:

(i) Visiting the community(s) involved from time to time to evaluate the progress;

(ii) Impact assessment forms were issued to all relevant local government authorities to assess if any behavior or attitude change on environment conservation and garbage management has occurred.

(iii) MADEA ensured good cooperation, relationship and communication through local government authorities for the purpose of information exchanges.

Furthermore, monitoring and evaluation of this project was designed to ensure effective and efficient implementation of the plan and the sustainability of the intended impact. The monitoring and evaluation system was instituted as a review mechanism to monitor the progress and assess outcomes compared to the original situation in those communities and local governments, objectives and expectations.

Monitoring in this case, referred to the tracking of the progress of implementation of the project whole plan. Evaluation on the other hand, was a critical and objective appraisal of the overall strategic planned activities process at MADEA in the form of specific milestones of the project activities achievement.

In monitoring therefore, MADEA had to prepare and issue monitoring and reporting guidelines to all officials who were involved in the implementation and the audit exercise. Specifically a data collection instrument was needed.

Also had to define monitoring and evaluation roles and responsibilities to be played by the relevant local government authorities and all MADEA Executive Committee Members; and determine the type, format and schedule of flow of information from all relevant local government leaders, relevant Executive Committee Members to MADEA project management.

Disseminated relevant information received and collected from relevant authorities (as mentioned above) and thereafter compiled reports to the management and relevant donors. But ensured that, MADEA through management committees continued to mobilize other sources of financing according to the planned future activities, for further extension of the same service to other affected communities, through Wards Executives, and so forth.

Two types of evaluation of the strategic planning process at "MADEA" were used. The first was done once in every three months using internal evaluators (MADEA Staffs) and another one after six months using an external evaluation team from the Local Governments Authorities offices working together with MADEA internal evaluation team which was not responsible for the implementation of that project. Three months prior to the coming of the external evaluators an internal evaluation was already done and discussed during the mid- semi-annual meeting. The internal and external evaluations had similar Terms of Reference (ToR) and most preferably they focused on:

(i) Assessing the reasons for success or failure of specific aspects of the project strategic plans of action or implementation and impact;

(ii) Assessing as to whether the strategic plan and implementation has been achieved their objectives;

(iii) Finding out as to whether the effects of the project plans were contributing to a better fulfillment of the mission and vision of MADEA management;

(iv) Assessing the adequacy or inadequacy of resources donated and contributed by MADEA members to implement that project;

(v) Determining as to whether or not available resource (resources utilized) as were utilized efficiently to achieve the planned objectives; and

(vi) Determining as to whether the process of the project planning and implementation were facing any difficulties in actions or any expected and unexpected problems. Then, they were to prepare a clear and comprehensive Terms of References to guide both evaluations. The ToR of the two evaluations mostly preferably covered, but not limited to:

(vii) Subject of the evaluation;

(viii) Methodology adopted includes; data collection procedures, sampling procedures, indicators to be used and basis for comparisons, and so forth;

(ix) Analysis of the field findings;

(x) Evaluation of the achievements and,

(xi) Feedback of evaluation findings. Both, the internal and external evaluators had the mandate to decide on the additional issues to be included or evaluated so long as agreed with MADEA management (Annex 14).

5.4 Management of the Project

The key people and the project management team included of the following:

(i) The Chairperson who is also a professional mechanic technician and with a lot of community management experience;

(ii) The secretary general who was responsible for every day activities;

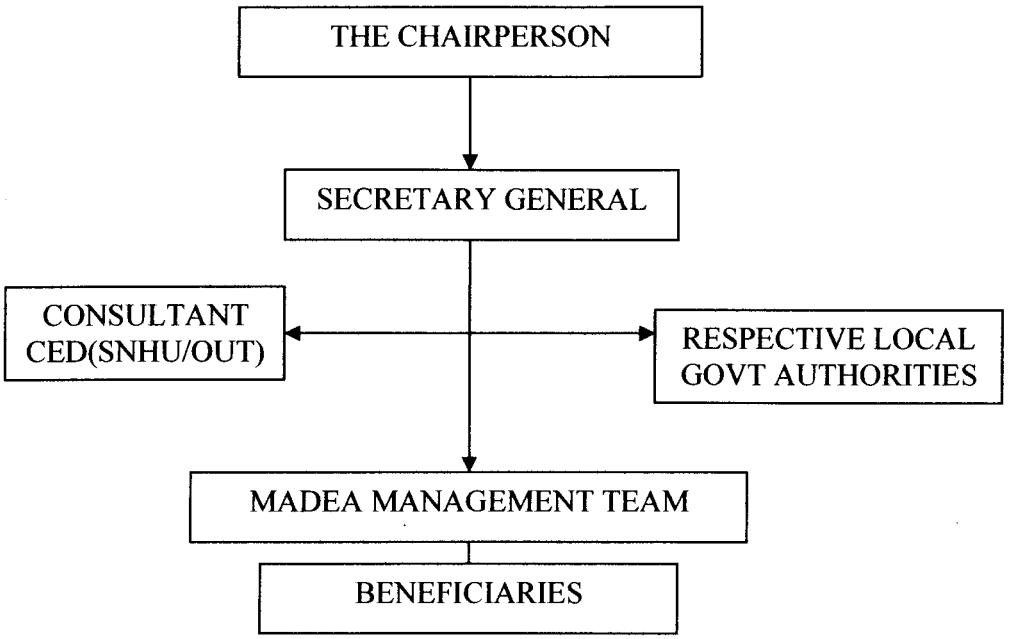
(iii) Accountant and procurement officers who were responsible for daily funds payments and material inputs;

(iv) Training and project managers who were responsible for participants monitoring and day to day supervision;

(v) Animators and facilitators who were responsible for participants mobilization and;

(vi) Two assistant facilitators their bio data has been given under (Annex 7).

THE PROJECT MANAGEMENT STRUCTURE:



5.5 Sustainability

The management adopted the following strategies in order to ensure sustainability of the project:

(i) Enhanced and continuous capacity building through community training on environmental conservation and solid waste management from household to individuals' level.

(ii) Enhanced severe punishment such as monetary fines against anybody violating environmental laws and regulations.

(iii) From time to time the community will be asked by MADEA through local government authorities to replace either dead or uprooted trees for the purpose of permanent soil erosion control.

(iv) From time to time MADEA management will be supplying them (community) with bulletins, magazines, stickers and any other relevant information about environmental conservation in order to keep and up date awareness.

(v) In the case of garbage heaps, MADEA'S management will liaison and ask all relevant local government authorities to establish appropriate procedures on how each house hold should run and maintain a common dust bin for simple solid waste management.

5.6 Project Budget

One of the project activities included a one day training project programme to the community in the area for rising of their awareness, mobilization of resources and other project implementation components. The budget covered the following items:-

(a) Training costs (I)

No	Description	Tshs.
(i)	Lunch of 100 participants @ 2500	250,000/=
(ii)	Soft drinks of 100 participants @ 250	25,000/=
(iii)	One day rental of hall	280,000/=
(iv)	Material computer printing 36 pages @ 800	28,800/=
(v)	Photocopies 100x36 @ 25	90,000/=

(vi)	Notebooks 100 @ 550	55,000/=
(vii)	Bic pen 100 @ 80	8,000/=
(viii)	Two facilitators @ 20,000	40,000/=
(ix)	One participants register @ 10,000	10,000/=
(x)	General administration costs	40,000/=
	Sub Total	**846,800/=**

(b) Sand sediments and solid waste collection and disposal costs (II)

No	Description	Tshs.
(i)	Collection of garbage heaps 110 trucks @ 25,000	2,750,000/=
(ii)	Removal and transfer of sand sediments along the river, 20 trucks 25,000	500,000/=
(iii)	The purchase of tree seedlings 150 @ 500	75,000/=
(iv)	The purchase of sewerage systems unblocking tools	115,000/=
	Sub Total	**3,440,000/=**

Grand total amount **(I+II)** requested from the Donor, was Tshs. **4,286,800/=**

(c) Community Contribution

On training costs (I)

No	Description	Tshs.
(i)	Photographs steel pictures	78,000/=
(ii)	Video Camera	90,000/=
(iii)	One pick up (vehicle hire)	65,000/=
(iv)	Contingencies fund	20,000/=
	Sub Total	**328,000/=**

(d) On solid waste disposal and tree planting costs (II)

No	Description	Tshs.
(i)	Collection of piled up garbage heaps 15 days x 20 youths @ Youth 2,000 (a day)	600,000/=
(ii)	Unblocking sewerage system 5 days x 20 youths 2000 (a day)	200,000/=
(iii)	Tree seedlings planting was done by the community herself	000/=
(iv)	Free consultation from the CED Programme	000/=
	Sub Total	**800,000/=**

Grand total amount **(I+II)** to be contributed by the Community Tshs.**1, 128, 000/=**

(e) Project budget analysis

No	Description	Tshs.
(i)	The whole project costs amounted to	5,414,800/=
(ii)	Out of the above amount, donor contributed	4,286,800/=
(iii)	Community contributed	1,128,000/=

(f) The project budget leverage

No	Description	100%
(i)	From the above budget analysis it was directly revealed that, the donor requested funding(CUSO/NOVIB) was about	79.16%
(ii)	While the remaining, which was about contributed by the community	20.84%

5.7 Project Logical Frame Work

I	II	III	IV
Narrative Summary.	Measurable Indicators	Mean of Verification	Important Assumptions
Goal: Environmental Conservation and solid waste disposal.	Soil erosion and solid waste management.	MADEA project budget.	No political, social, economical or climatological ly crises or back lashes.
Purpose: To fight against soil erosion and solid waste mismanageme nt.	Raise public environmental awareness and mobilization.	Contract Document between Donors(NOVIB/CUSO) Arusha and MADEA top Management	MADEA members and community full participation.
Out puts: Environmental management skills, Knowledge and know how of the beneficiaries or inhabitants will improve.	Public will be imparted with skills and environmental knowledge and become aware always. Reduced disease incidence. Trees planted on river	Minutes of meetings Cashbook records.	1.1 MADEA will effectively manage the project and ensure monitoring evaluation. 1.2 Climate conditions

Diseases like bilharzias, diarrhea, typhoid and malaria will be reduced. Wind dusty and soil erosion will be minimized and so on.	banks. Clean sewerages and surroundings. People will settle indefinitely or permanently (that is no more exodus during rainy seasons).		will remain friendly (no floods). 1.3 Also the water level of the Nalung'ombe river after removing or reducing sand sediments will reside.
Activities: The project activities will include: Developing a management skill program for the inhabitants. Raising public awareness and mobilization. General cleaning and collection of garbages and tree planting. Removing and	Inputs/Resources: Program and training manuals, funding for a one-day forum, and contract of facilitators in public animation.	Training Logbook. Records of Agreements with MADEA Management and Trainers/Facilitators	1.1 Capacity building /training or raising community awareness and mobilization plus impartation of skills effected. 1.2 Participation of all stakeholders in solid waste and tree planting along Nalung'ombe

transferring heaps of sand sediments from inside the river. Sewerage system cleaning.			river in Kinondoni Municipal.

5.8 Actual Implementation

The project implementation had two wings, to include encountered problems and get through, and methodology as follows:

5.8.1 Encountered problems

The project implementation started as it was planned, as the bestowed donors (CUSO/NOVIB) approved and disbursed funds in time (Annex 4). At that time, the community contributions stood at Tshs 436,000= which brought a deficit of Tshs 692,000= of the total project costs. After discussions between all relevant local government authorities and MADEA Executive Committee, it was agreed that some costs could be recovered through material contributions, like free tree seedlings from Kinondoni municipal seed bed and free removal and transfer of sand sediments by the solid waste municipal depot. Fortunately both support were honoured and eventually pulled down the deficit by Tshs 575,000=. And coincidently, the forum participants through adhoc campaign run by the author

managed to raised another Tshs 197,000= which was over and above, the envisaged deficit by Tshs 80,000=. There after other project activities carried out smoothly, under supervision of MADEA team of management. However, technical inputs regarding further implementation and management of the project was still provided by the author.

5.8.2 Methodology

Methodologically, the first phase of intervention of the project as stated earlier involved a one day community workshop about environmental conservation and control in order to create awareness. This was done on the same day concurrently with community sensitization, again in order to impart them with all causes of soil erosion and solid waste disposal problems and how to combat them by way of participatory approach. This workshop was facilitated by the author himself in collaboration with two assistants. Facilitation of the workshop was done through paper presentation, discussions and plenary sessions conducted by the assistants. The author commends these participatory approaches and tools of analysis employed as were quite more appropriate to enable the workshop participants especially those who were ignorant or with low knowledge to capture the subject.

5.9. One Day Participant's Workshop Contents

5.9.1 A detailed plan of the workshop (Annex 19)

5.9.2 Introduction

The meaning of environmental degradation

The meaning of population growth and urbanization

5.9.3 Factors influencing the urbanization growth

- Transportation
- Rapid population increase
- Administrative functions
- Geographical inertia
- Mining and Industrialization

5.9.4 Socio-economic problems associated with urbanization growth

- Unemployment
- Environmental degradation
- Provision of social services
- Congestion or unchecked urban growth

5.9.5 General types of environment

- The natural environment.
- Geographical environment.
- The physical environment.
- The non-human environment.

- Cultural environment.

5.9.6 Environmental conservation and management

Preservation of the environment from: Destruction; loss of natural resources by careful use and management. Renewable and non-renewable resources; measures and control that are directed to exploitation and improvement of the resources within a given environment.

5.9.7 Common types of environmental problems and their consequences

- Destruction of forests.
- Water pollution.
- Soil pollution.
- Environmental hazards

5.9.8 Common types of solid wastes

- Urban or Municipal domestic solid wastes.
- Hazardous solid wastes.
- Industrial solid wastes.

5.9.9 Methods of controlling solid waste disposal in urban areas

- At household levels.
- At community levels.

5.9.10 Panel discussions

Group one and two (causes of environmental problems in their area and solutions).

Group three and four (causes of solid wastes in their areas and solutions).

Group five and six (overall methods in controlling solid waste disposal at both household and community levels in their area).

5.9.11 All participants declaration

5.9.12 Workshop evaluation fills in forms exercise as last activity

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