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Title: Assessment of the sustainability of solid waste collection and transport services by MSEs

The case of Bahir Dar city, Ethiopia

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Country: Ethiopia

Supervisor: Liliane Geerling

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Abbreviations

BDM	Bahir Dar Municipality
BDM SBCP	Bahir Dar Municipality Sanitation & Beautification Core Process
CBO	Community Based Organization
EPLAB	Environmental Protection and Land Administration Bureau
FFSCE	Forum For Sustainable Child Empowerment
FGD	Focus Group Discussion
ISWM	Integrated Sustainable Waste Management
LED	Local Economic Development
MSEs	Micro and Small Enterprises
MSMEs	Micro, Small and Medium Enterprises
MSW	Municipal Solid Waste
MSWM	Municipal Solid Waste Management
NGO	Non Governmental Organization
PPIAF	Public Private Infrastructure Advisory Faculty
UNEP	United Nations Environmental Program
UNDP	United Nations Development Program
US	United States
WCT	Waste Collection and Transport

Executive Summary

Different countries employ different approaches to manage waste in order to prevent its impacts on the environment. Especially for developing countries micro and small enterprises (MSEs) can be one of the methods which can play a vital role in achieving the active participation of the population as a solution for problems associated with solid waste (Scheinberg, 2001).

Until recent years in Ethiopia, solid waste management (SWM) services were majorly the responsibilities of the municipalities, which resulted in inadequate service provision. While in 2007, a new SWM proclamation No.513/2007 formulated at federal level, this law allows the private sectors including micro and small enterprises (MSEs) to participate in solid waste management service.

Bahir Dar is among the major cities located at north-western Ethiopia in which the city primarily starts solid waste collection service by MSEs and this study is focused on it. The focus of this study is to explore the sustainability of solid waste collection and transport services by MSEs in Bahir Dar and which government mechanisms are used to support/stimulate sustainable service delivery by MSEs.

To conduct this research, various literatures are reviewed; by selecting two sample MSEs using random sampling technique both primary and secondary data were collected. Questionnaires, interview, FGD and field observation were conducted and analysed using SPSS software, Excel sheets and narration.

The findings revealed that the main drivers for the organization of MSES in Bahir Dar city are the absence of any competitor in the private limited company (PLC) waste service, its service quality decrement and high service fee of the PLC on users. Besides the purpose of organizing these MSEs have multifaceted objectives. The immediate objective is for economic purpose, which is creating job opportunities for the poor people on the street. The second purpose is to keep the cleanliness of the city through creating more competitors.

The researcher assessed the factors that influence the sustainability of waste collection and transport services of MSEs using indicators. Based on the findings the MSEs are partly socially sustainable. This is because the MSEs have created job opportunities particularly for the vulnerable groups in the society and they are currently providing the service for all citizens without discrimination. In addition, the existing cooperation of users towards the service is encouraging in which 55% of the respondents replied as the users' cooperation is medium and 13% of the waste workers replied that users' cooperation is high. While the workers safety and satisfaction is under constraint.

Technically, though the MSEs have started using locally produced technologies such as hand carts, according to the findings, 80% of the respondents disagree as they are not well fit with the existing road and topography conditions. Moreover, the lack of sufficient WCT equipments; especially the lack of waste transport vehicle highly impedes the waste collection activity of MSEs. Besides, because of low awareness of users and lack of attention from BDM waste is hardly segregated at source. Due to these main factors the service is not technically sustainable.

Environmentally, the service is constrained by several factors and not sustainable .These are, absence of environmental policy, no waste separation at source, and waste is not timely collected. Besides, the collected waste is not safely disposed in the area and has a higher negative impact on inhabitants.

Financially, the MSEs are not sustainable. The service payment rate from the BDM is very minimum which does not lead and encourage to be financially self sustainable. Besides, the unfair service fee determination, unavailability of other revenue generating mechanisms and credit access further adds to the problem.

Institutionally, the service is unsustainable. This is because the duration of contract agreement of MSEs is too short (a three month contract) for cost recovery. Besides, to its limitedness in time, it does not allow the MSEs to work in flexible manner.

Politically/legally the existing laws permits for privatization to engaged in solid waste services. Besides the MSEs are legally accepted and registered under the existing law. But policies and proclamations are mostly at the country level and they lack contexuality and enforcement mechanisms during implementation. As a result they have minimal functions and make the service partly politically/legally sustainable.

Generally, though the service is partly socially and politically sustainable most of the other equally important factors or elements of sustainability are not being achieved. The service is highly influenced or affected by a number of factors. Mainly, a serious shortage of waste transport vehicles which has a great impact on the frequency of waste collection, poorly designed hand carts, absence of waste separation at source, unsafe waste disposal methods, insufficient funding systems, inadequate monitoring and supervision and low enforcement of rules to implement activities as per the local context. Because of these the current waste service delivery by MSEs is unsustainable. In order to make the service more sustainable in the nearby future essential recommendations are proposed. Such as;

For technical sustainability: Improving or modifying the hand carts; provision of a waste transport vehicle to MSEs should be given priority, in the long run the existing general purpose vehicles should also be replaced by waste service vehicles and promoting users' awareness.

For environmental sustainability: The existing federal environmental law should be broken down in to a regional law; promoting waste separation at source; there should be specified small temporary transfer sites in the city; enclosing (fencing) and upgrading the final dumping site; regular monitoring and supervision. In addition, the current practice of using waste for composting by the Green vision MSE should be supported and expanded to other MSEs.

For social sustainability: Creating an attractive working environment is required through answering the main cause for dissatisfaction of workers. Hence, primarily the existing salary should be improved. The health vulnerability of waste workers should be minimised through provision of medical support and regular use of protective cloths by the workers. Besides promoting users' awareness about how the waste is collected, separated and stored in a proper condition.

For financial sustainability: Improving the service payment rate of MSEs, providing incentives, designing revenue generating mechanisms and access to credit systems are required. The existing unfair service fee among users should be revised through detail information about the waste generation rate of users. Besides, there is a need to strengthen the linkage of MSEs with the existing NGOs in the city.

For institutional sustainability: Elongate the duration of the contract agreement with MSEs for potential cost recovery; besides, the contract agreement should be modified to allow the MSEs work in flexible manner. There should be continuous assessment of satisfaction about the service delivery and supervision function as well. Reward systems or mechanisms for the workers should also be employed so as to motivate them.

For political/legal sustainability

The existing federal environmental laws and SWM proclamations should be broken down in to regional laws with enforcement mechanisms so as to implement according to the local context.

Keywords

Sustainability, ISWM, Solid waste collection & transport, MSEs solid waste collection & transport service

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CHAPTER ONE: INTRODUCTION

1.1 Background

Population in urban areas is increasing at alarming rate, parallel most cities' waste quantity is increasing rapidly; an enormous volume of waste is generated every day. Recent studies show that 1.3 billion tons of solid waste per year has been generated from global cities with an annual cost of $205.4 billion (Hoornweg, D. & Tata, P., 2012) . The materials or substances in waste are even increasing in complexity and variety. This large amount of solid waste generation has become one of the serious challenges for environment and public health; particularly it is more serious in developing continents/ countries, like Africa (UNEP, 2004).

According to Ramachandra and Bachamanda (2007), solid waste management (SWM) is no longer a problem facing a particular country, but has become a global problem. This problem requires or demands full and continuing coordination and collaboration between the different stakeholders of scientists, economists, technicians, politicians, private organizations and citizens as well (Ramachandra , T.V & Bachamanda, S., 2007).
Different countries employ different approaches to manage waste in order to prevent its impacts on the environment. Involving the community at large is the basic option to employ effective SWM. Especially for developing countries micro and small enterprises (MSEs) can be one of the methods which can play a vital role in achieving the active participation of the population as a solution for problems associated with solid waste (Scheinberg, 2001).

According to Tadesse (2004), solid waste management (SWM) in Ethiopia was under the jurisdiction of municipal division of health; except Addis Ababa all municipalities or certified urban centers are administered by Proc. No. 206 of 1981 to provide, maintain and supervise environmental health services along with their activities. Until recent years, SWM services were majorly the responsibilities of these municipalities, which results in inadequate service provision reflected by lack of proper collection, poor sanitary facilities, improper planning and coordination (Tadesse, 2004). Due to the support of public private infrastructure advisory faculty (PPIAF) in Ethiopia; a new SWM proclamation No.513/2007 formulated, this law allows the private sectors to participate in solid waste collection, transportation, reuse and disposal of waste (PPIAF, 2011). Currently in Ethiopia, the local economic development (LED) program has been implemented by the Ministry of Finance and Economic Development in collaboration with the United Nations Development Program (UNDP) since 2009 (UNDP, 2012). The program has supported to establish and strengthen micro, small and medium enterprises (MSMEs) in different income generating sectors including solid waste management activities.

Bahir Dar is among the major cities located at north-western Ethiopia in which the city primarily starts solid waste collection service by MSEs and this study is focused on it. The city has almost 220,344 inhabitants including rural areas. The quantity of solid waste in Bahir Dar continues to increase and becomes unmanageable to the local government. According to Bahir Dar City (2010) solid waste characterization and quantification report, the MSW composition generation rate in daily total tonnage is that from residential (54 tons/day), commercial (24.2), institutional (17) and from street sweeping (3.56) a total of 98.8 tons per day. This shows that the households from residential areas are the major generators of municipal solid waste (MSW). From the total waste generated, 74.6 % is degradable or easily decomposable while 25.4% is inorganic materials such as metals, plastics, glass and paper waste.

1.2 Problem Statement

Currently in Ethiopia, solid waste management is growing beyond the capacity of the municipal governors. The increasing volume of waste pushes a high demand on the waste retrieval service. These challenges are reflected in most cities of the country (Tadesse, 2004). Due to a lack of budget for cost recovery systems difficulties are created to respond to the required demand in waste management (PPIAF, 2011). Hence, the country (Ethiopia) has started to organize and participate in micro and small enterprises (MSEs) in solid waste management activities.

Bahir Dar is a fast growing regional city in Ethiopia that also embarked on solid waste collection service through MSEs. They work in a public private partnership that aims solutions for solid waste collection and disposal in the study area, Bahir Dar. Started three years ago, MSEs have delivered a waste collection service to the residential and commercial sites to minimize the problem (Bahir Dar SWM report, 2010). Therefore, it is important to investigate the sustainability of the service delivery through MSEs so as to solve the obstacles facing with regard to the waste management system of the city and to promote the best experiences.

1.3 Research Objectives

1.3.1 General research objective

The general objective of this research is to explore the sustainability of waste collection and transport services by MSEs in Bahir Dar and which government mechanisms are used to support/stimulate sustainable service delivery of MSEs.

1.3.2 Specific research objectives

- To explore how the current waste management system of MSEs is organized in Bahir Dar.
- To identify the factors that influences the sustainability of MSEs solid waste collection service delivery in Bahir Dar.
- To identify government support mechanisms for the strengthening of the service delivery by MSEs.
- To propose recommendations based on the identified real gaps for the improvement of waste collection and transport system by MSEs in Bahir Dar.

1.4 Research Questions

1.4.1 Main research question

How sustainable is the service delivery for the collection and transport of solid waste by MSEs in Bahir Dar and how can this level of sustainability be explained?

1.4.2 Specific research questions

- How is the current solid waste collection and transport system by MSEs organized in Bahir Dar?
- Which factors influence the sustainability of waste collection and transport service delivery by MSEs in Bahir Dar?

- By which mechanisms does the government support and stimulate the waste collection services delivered by MSEs in Bahir Dar?
- How can solid waste collection and transport service delivery by MSEs be improved in the future?

1.5 Significance of the study

Solid waste management is a great challenge for the local government in the study area and it is hard for them to tackle the problem in a sustainable manner. The experiences of some countries show that involving MSEs at large improves the waste collection task in cities. This research aims to reveal relevant information for the local government in Bahir Dar in order to sustain the waste management service delivery by MSEs in the context of the local situation.

1.6 Scope and Limitations

The main focus of this study is exploring and explaining the sustainability of municipal solid waste collection service delivery by MSEs in Bahir Dar city. It is based on the three dimensions of integrated sustainable solid waste management: stakeholders, system elements and sustainability aspects. From the different stakeholder groups; the local government (as a facilitator), households and commercial establishments in Bahir Dar city (as service users) and the MSEs (as service providers) involved in a public-private partnership. Due to time constraints, this research majorly focuses on solid waste collection and transport service by MSEs in the study area.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter reviews literature which is related to sustainable solid waste management, starting with the basic concept of the ISWM frame work to private sector participation with a specific focus on the involvement of MSEs in solid waste collection services. It gives the foundation for designing the theoretical frame work to do this research as well as it helps for the researcher to enrich the thesis with literature based evidences.

2.2. Concepts of solid Waste, solid waste management and its challenges in medium and low-income countries

2.2.1 Solid Waste

The term waste is defined in different ways by many authors. Basically, according to Zaman and Lehman (2011) 'waste' refers to solid waste in which it includes any trash, garbage, refuse or abandoned materials which have 'no economic value' or functions for anyone (Zaman, A. & Lehman, S., 2011). This implicates that what is waste to one individual may not be waste to another individual and similarly, what may be waste to one nation may not be waste to another nation (Zaman, A. & Lehman, S., 2011).
According to Klundert & Anschutz (2001) waste contains useful and non- useful materials. It's useful materials provide a potential source of income to poor people.

2.2.2 Solid waste management

MSW includes materials disposal waste by households, industries, restaurants and hotels from commercial entities, collected and disposed by the municipal solid waste collection services (Magutu, P. & Onsongo, C., 2011).
MSWM provides the collection, transport, processing, recycling and disposal and monitoring of waste materials. It is generally undertaken to reduce the effects of waste on human health, environment or aesthetics and carried out to recover resources from it (Magutu, P. & Onsongo, C., 2011). It is the most costly urban service, which absorbs 20 to 40 per cent of municipal revenues in developing countries (Coffey, M. & Coad , A., 2010).

2.2.3 Waste management challenges in medium and low-income countries

In most developing countries the generated MSW widely consist of decomposable and recyclable materials. If properly managed, it would provide high opportunities for the development of the socio-economy of the countries. However, the fact is hardly recognized and the MSW remains a socio-economic challenge (Khatib, 2011). This is basically because of the following major factors.
The population in developing countries has increased at a faster rate. This urbanization effect results in overcrowding (densely populated areas); creates difficulty to find other options so as to dispose their waste materials safely and this also seriously limits the capacity of municipal and national governments to deliver and increase SWM facilities /services (Coffey, M. & Coad, A., 2010).

A lack of functional and integrated policies and processes creates difficulties to bring real stakeholders involvement (Marshall, R. & Farahbakhsh, K., 2013; Achankeng, 2003). Direct copy and ill adapted strategy and technology does not solve the problem, Lagos which can be

one of the African cities considered as even the dirtiest city in the world, is the reflection of such approaches (Achankeng, 2003).
According to Coffey and Coad (2010), the main solid waste management problems in developing areas are associated with; administration problems, insufficient funding (which is unable to give the required SWM service), inequity service provision(neglecting the poor), more reliance on imported equipment, lack of proper sanitary land-fill, illegal dumping and a lack of people's awareness in IWMS.
On the other hand; the employed staff in this sector is poorly trained workers and affects the solid waste management (Henry, R.K.,Yongsheng, Z. & Jun, D., 2005).

2.3 Integrated Sustainable waste management (ISWM)

ISWM is the current paradigm of SWM approach to shift away from linear land filling approach to a more holistic approach (Marshall, R. & Farahbakhsh , K., 2013).

Due to the complex nature of waste, top-down solutions and a management strategy will no longer be efficient and effective. Hence, a more integrated set of sustainable solutions is needed to ensure long term sustainability of the waste management system (Baud, I. & Post, J., 2003). 'Sustainable' in the ISWM aspect is 'appropriate to the local conditions' from a technical, social, economic, environmental, institutional and political perspective and capable of maintaining itself over time without negatively affecting the available resources it needs. While' integrated' implies the integration of sustainability aspects, different options of collection and treatment at different habitat scales, various actors, waste system and other urban systems (UN-Habitat, 2010; Klundert, A. & Anschutz, J., 2000).

2.3.1 Principles of Integrated Sustainable Waste Management

According to Klundert & Anschutz (2001) ISWM has four basic principles. These are: equity, effectiveness, efficiency and sustainability.
Equity: all inhabitants are entitled to get a service of proper waste management system. This is due to environmental health concerns and also from ethical considerations. Pollution in one side of the city can harm or affect the entire city cleanliness due to the pollution travel through different media.
Effectiveness: the extent to which the service objectives have been met/fulfilled in practice. The waste management model adopted should be able to remove all the waste generated in a given area.
Efficiency: the waste management system should entail cost minimization that helps for benefit maximization as well as resource optimization by considering issues of equity, effectiveness and sustainability. Efficiency is achieved when benefits that accrue from clean streets are balanced by all beneficiaries through their financial, labour, material, equipment or managerial contributions.
Sustainability: the waste management system should have a link to the local conditions and should be technically, economically, environmentally, socially, institutionally and politically feasible. The system should also have self maintenance mechanism overtime while optimizing the resources on which it depends (Klundert, A. & Anschutz, J., 2001).

2.3.2 Dimensions of Integrated Sustainable Waste Management

Within the ISWM there are three main dimensions that work in an integrated manner. These are; stakeholders, waste system elements and sustainability aspects (Klundert, A. & Anschutz, J., 2001; UN-Habitat, 2010).

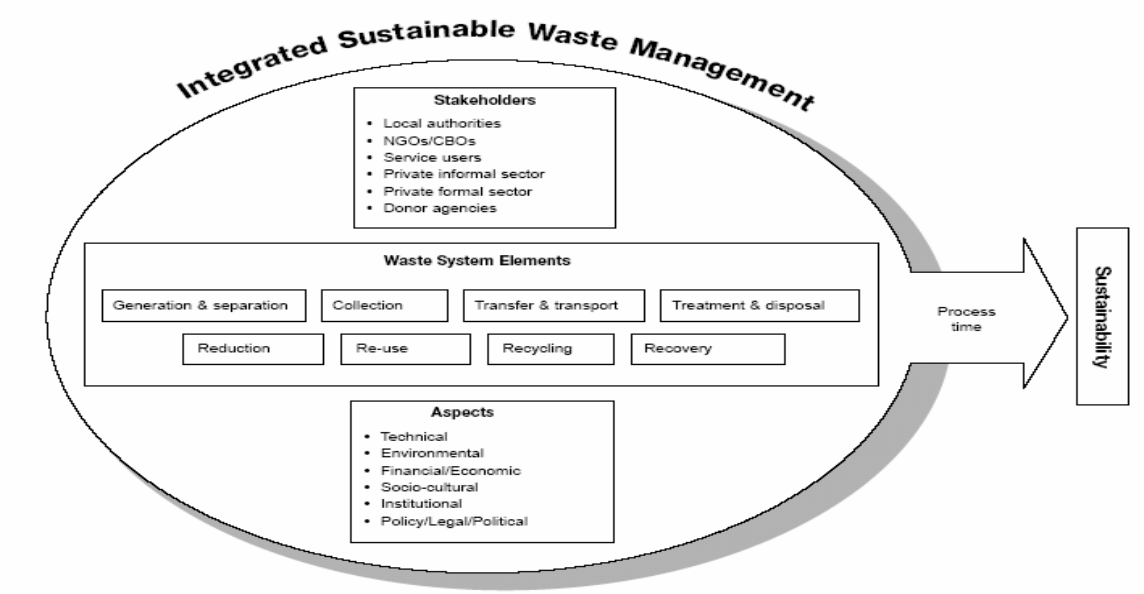

Figure 1: The ISWM Framework Model.
Source: (Klundert, A. & Anschutz, J., 2001; UN-Habitat, 2010)

2.3.2.1 Stakeholders

Klundert & Anschutz (2001) describe stakeholders as people and organizations that have different roles and interests in SWM but can cooperate in various activities of waste management for a common interest. These can include stakeholders such as; informal sector waste pickers, waste buyers, waste material dealers, wholesalers, recycling enterprises and end user industries. It also involves; National and Local government/City council, Non Governmental Organizations (NGOs)/Community Based Organizations (CBOs), Private informal sector, Private formal sector and Donor agencies and service users as well (Klundert, A. & Anschutz, J., 2001).This study focuses on the service delivery of formal organizations, which are basically small and micro enterprises as a stakeholder in SWM in collaboration with the support of the local government and inhabitants as well.

2.3.2.2 Elements of Solid Waste management Systems

Waste management systems are a combination of various phases in the management of the flow of materials within the city. It embraces the flow of materials from generation (source) up to the final treatment and disposal stage.
Here, waste collection, transfer, treatment and disposal are recognized as high profile elements in ISWM. The elements of waste minimization, re-use, recycling and compositing are also equally seen in the frame work (Klundert, A. & Anschutz, J., 2001). The focus of this study is on solid waste collection and transport as elements of the solid waste management system.

2.3.2.2.1 Waste collection and transport as system elements

The collection and transport of solid waste takes the highest demand on municipal budgets and have the greatest impact on urban living. Solid waste collection is taken to include the storage of waste at the household, shop or business premises, and transporting the waste until it reaches its final treatment plant or disposal site (Coffey, M. & Coad, A., 2010).

These authors suggested that storage materials should be sufficiently durable and properly covered or enclosed. If waste storage materials are not properly covered or enclosed, they may create favourable conditions for the breeding of flies. Temporary containers like cardboard boxes and plastic bags are often used. Plastic bags are suitable for many reasons; they contain moisture if they have not been torn and they are also easy to handle. One of their limitations is that they are easily torn and open by cats and dogs (Coffey,M. & Coad,A., 2010).

According to Hoornweg & Bhada-Tata (2012) there are five waste collection methods. These are door to door, communal bins, curbside, self- delivered and contracted or delegated service collection methods.

House-to-House: Waste collectors round each inhabitant's house to collect garbage. The beneficiaries mostly pay for this service.

Community Bins: Customers bring their garbage to community bins that are placed at specific sites in a neighbourhood or locality. It is picked up by the municipality, or it's designate, according to the schedule.

Curbside Pick-Up: Beneficiaries leave their garbage outside their homes according to a garbage pick-up schedule set with the local authorities or secondary house-to house collectors. But it is not typical.

Self -Delivered: Waste generators deliver their waste directly to transfer stations or disposal sites or hire third-party operators.

Contracted /Delegated Service: Businesses hire firms or municipality with municipal facilities who arrange the collection schedules and the charges with users. Municipalities may license private firms and may designate collection areas to enhance collection efficiencies.

Box 1: Waste collection in Accra (Capital city of Ghana)

In Accra (Capital city of Ghana), the house to house system is mostly practiced in upper and middle income, low density parts of the city where infrastructure is well accessible. While communal container collection is implemented in low income and high density areas, waste is often dumped in open spaces or somewhere due to the problem of regular taking out of the collected waste from containers and the far distance of containers placement (Oteng-Ababio,M., Arguello, J.& Gabbay,O., 2013).

Maximizing the economic value of waste resources through reuse, recycling, and recovery will be effective when there is waste separation at source and a proper way of waste collection and transport systems. A collection system should be designed and operated in an integrated manner.

According to Coffey & Coad (2010) the following issues should be considered during waste collection. These are:

***The frequency of waste collection*:** concerns about the number of times per week or more than a week that waste is collected and it is an important parameter or criterion for any waste collection system. If waste is allowed to accumulate for a longer period of time, it will create unpleasant air pollution. The ambient temperature of the area determines the frequency at which waste should be collected. At high temperatures the breeding cycle of disease causing organisms such as flies is much faster and leads to offensive odor, so the waste should be collected more frequently, at least twice a week in hot climate.

Cost: is the other factor that should be considered. It is too expensive to collect very small quantities of waste on more occasions. The deposited waste in containers for a longer time may result in corrosion of the containers due to the decomposition of organic materials in it.

On the other hand the labour costs and unemployment is another issue. In which, because of high economic status, industrialized countries have capital-intensive technologies while labour-intensive methods may be appropriate for low income countries.

***Reliability*:** it is also very desirable that the frequency should not vary, so that household or users as a whole know when their waste will be collected. Unexpected variability in frequency reduces confidence in the waste collection service.

Point of collection: the location at which the waste passes from the control of waste generator to the control of waste collection enterprise/agency. It is another determinant factor in which the generator has the responsibility for taking the waste to the point of collection, and so is concerned about the time and effort required and must be willing to do this work.

Willingness to pay: in some cities a waste collection service is provided by the municipal authorities without charging. Any plan to finance a SWM system from user charges must take local attitudes into account. According to Shubeler (1996) large waste generators should pay a higher price per volume of waste collected than smaller users. Similarly for producers such as industrial and commercial entities, volume based charges are more appropriate so as to link the waste revenues to the actual service delivered.

Vehicle type for waste collection and transport: using general purpose vehicles which are inefficient and not suited to waste collection is a great mistake which is mostly practiced in developing countries. It is also better to take in to consideration that old waste collection vehicles are large sources of emissions (Hoornweg, D. & Tata, P., 2012).

The choice of technology for waste collection and transport

The choice of technology for waste collection largely depends on the accessibility of the service area, particularly the width and character of the streets (straight or curved, paved or not, narrow or wide) and on the type of topography (flat or hilly). The most commonly used vehicle type is a 1 m3cargo tricycle which has been adapted for uneven terrain. Cargo tricycles and hand carts cannot transport large volumes of waste or materials over long distances. In Guatemala, 30% of the trucks which are used to transport garbage are closed vehicles which have a dumping system and adapted by the collectors. This technology responds to lessen the health risks to the workers (Moreno, J.A., Rios, F.R. & Lardinois, I., 1999).

Transfer stations, methods of loading and transporting waste

According to Coffey & Coad (2010) specifying and implementing adequate number of small transfer stations are more useful than a single large one. Improper transfer arrangements can cause inefficiencies and scattered waste.

The method of loading waste from the storage material into the collection vehicle must be given careful attention since it has impacts on the health of the workers and the cost of the service. Some methods of loading a waste expose laborers to risks from contacting with the waste, inhaling dust and from traffic accidents (Coffey & Coad, 2010).

According to UN-Habitat (2010) a final waste disposal site should properly selected and fenced so as to protect the entrance of straying animals and to reduce the impact of waste on the surrounding environment as a whole.

2.3.2.3 Strategic aspects and measurements of Sustainable Waste Management services

The ISWM concept has six main aspects/lenses through which the existing waste management systems can be evaluated and with which a new as well as expanded system can be planned.

The six sustainability aspects of ISWM are explained by Klundert & Anschutz (2001) authors as follows:

Financial-economic sustainability aspects: These refer to budgeting and cost accounting within the waste management system considering the local, regional, national and international economy. It takes in to account issues such as privatization, cost reduction and cost recovery (Klundert, A. & Anschutz, J., 2001). The financial management should ensure productivity of labour and capital that can lead to the lowest cost per ton to operate. The waste generators should pay user charges, the resource recovery sector by paying a profit tax and the government should also contribute by allocating a municipal budget to waste management activities. For developing countries labour intensive technologies are financially and economically more sound than capital-intensive systems (Klundert , A. & Anschutz, J., 1999).

Technical sustainability aspects: Focus on the nature or the type of equipment and facilities used or designed and their application purpose. They also include evaluation of the cleanliness of the city on a consistent basis. The practical/actual implementation and maintenance of all waste elements are also part of the technical aspects (Klundert, A. & Anschutz, J., 2001).

The following should be considered for the technical sustainability of the system:

- The technologies should adapt the physical environment, such as topography nature, road accessibility and other physical requirements.
- Focus on locally manufactured or indigenous technologies and local availability of spare parts.
- The system should gear towards efficiency (optimum utilization of equipment).
- The equipments used should be durable, good quality and have a long expected life spam.

***Environmental sustainability aspects*:** the issues to be considered are the effects of waste management on land, water and air. These, therefore demand the need for wise use of/ conservation of non-renewable resources, pollution control and public health concerns.

Environmental sustainability can be achieved by implementing activities, such as minimizing loss of raw materials through the integration of waste reduction, re-use and recycling; reducing the adverse impacts of waste on air, water and soil at the surrounding environment as well as at global level and encouraging treatment and resource recovery at the source rather than 'an end pipe control approach'.

***Socio-cultural sustainability aspects*:** These focus on the influence of the culture of households, businesses and institutions on waste generation and management. Besides they consider the communities participation on waste management and the relation between sex, age, ethnicity and the social conditions of waste workers. i.e.
The selected WMS should be provided to all citizens regardless of ethnic, cultural, religious or social background. It should reduce risks to public health. According to UN-Habitat (2010), sound waste management contributes a lot to the healthiness of the inhabitants as well as workers involved in waste collection. Waste workers should have enough protective equipment like foot wear, gloves and masks for safety. It should also gear towards improving the working conditions of operators and be able to promote income and employment generation for the society. On the other hand; for citizens that are not able to pay unaffordable prices, there should be another option, which is cheaper. For instance block collection can be used instead of door-to-door collection.

Institutional sustainability aspects: These entail the political and social structures in controlling, as well as implementing waste management, the distribution of roles and

responsibilities, the organizational structures, procedures and methods, consideration of the existing institutional capacities and actors especially the private sector involvement is very essential.

The systems and technologies should shift towards capacity building for workers and managers, involve all the necessary stakeholders, and develop organizational cultures that foster transparency and accountability.

Designing fast feedback mechanisms is very essential; such as receiving feedback through telephone lines for complaints, continuous assessment of satisfaction and payment rates, as well as creating collaboration between inspectors and citizens. Besides employ evaluation and reward systems also helps the workers to enhance their working capacity (UN-Habitat, 2010).

Political/legal sustainability aspects: These address the boundary conditions in which the waste management system exists. The proposed systems and technologies should be supported by a legal framework that promotes the involvement of NGOs, private actors, decentralization, enables equity enforcement of rules and regulations. It also Gives attention to the 'waste management hierarchy' (waste reduction, source separation, re-use and recycling), above mere collection and disposal.

2.3.2.4 The concept of waste management hierarchy

Waste management hierarchy is best described by the "3Rs"denoting reduce, reuse, recover and eventually followed by unavoidable its final disposal to the landfill (Gertsaki, J.& Lewis, H., 2003). The best way to protect the environment is not to generate waste in the first place (the begin of pipe control approach focusing on source reduction) which is the contemporary approach to pollution prevention (Briliante , O.& Frank, E., 2009).

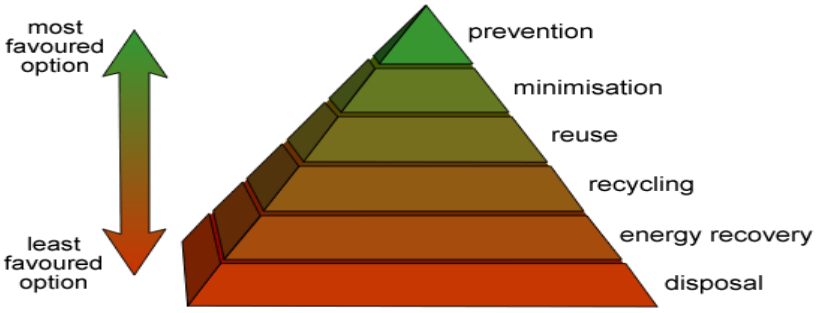

Figure2: Waste management hierarchies
Adopted from Gertsaki & Lewis (2003)

2.4 The concepts of private sector participation in service delivery

According to Coad (2005) the term privatization has broad meanings and it includes, privately owned registered and formal enterprises which deliver services as contractors, consultants or suppliers, commercialized utilities which have managerial autonomy, Informal sector enterprises, NGOs and CBOs. He argues that private sector participation (PSP) in SWM is often called a public-private partnership. However, in most cases the partnership is a three-way interaction. That is it must include the citizens/customers as well (Coad, 2005). Huysman (2004) also supports this argument. In the process of privatization for SWM, the private sector should play a great role as a service provider, while the local government should majorly perform facilitating as well as coordinating tasks. Here, service users also have a key role in waste separation at source, in recycling and monitoring and evaluation of service delivery (Huysman, M., etal, 2004).

Based on Cointreau-Levine (1994) there are four common methods/types of private sector participation in solid waste management. These are contracting, concession, franchise and open competition.

Contracting: The government gives a time bounded contract to a private organization so as to deliver solid waste collection service, street sweeping, collection of reuse and recyclables, transfer station and disposal site operation. The contract is made after a competitive procurement process. The private firm is paid for service delivery by the government under the terms of the contract.

Box 2: Advantages of contracting for waste management service

Among the different options for PSP, contracting for waste management service holds the highest promise to low income countries as a way of lowering costs.Various studies conducted in 317 cities from Wales and England and in 126 cities in Canada, show that a contracting way of solid waste collection service was 22% to 41 %-less costly respectively than the local government service (Cointreau-Levine, 1994).

Concession: The government gives a concession to a private company or organization to set up a facility that utilizes the government-owned resource-refuse. It enables the private limited firm to reuse and recycle waste materials, to recover resources through composting and electricity from refuse materials and finally to transfer or dispose refuse. It is a long-term contractual agreement, in which the private company builds the facility.

Franchise: In this type of participation the government grants a private firm an exclusive monopoly (a franchise) so as to provide solid waste collection service in a specific zone. The firm generates its own revenue from the customers and pays a license fee to the government. It is more expensive than contracting since there is billing and fee collection.

Open Competition: The government openly allows legal private firms for competition in order to deliver services like waste collection, recycling, and disposal services. Competition is a very important factor to get low-cost solid waste services from private contractors. The users pay the fee that the firm charges (Sheshinski, E. & López-Calva, L., 2003). It is a more expensive type of contract.

2.4.1 Importance of private sector involvement in solid waste management

Many authors suggest and recommend the importance of involving the private sector in different SWM service delivery for various reasons. Privatization has been the main component of structural reform programs in developed, as well as developing economies. The objective of such programs is to achieve higher economic efficiency, foster economic growth and reduce public sector borrowing requirements by eliminate unnecessary subsidies. The idea that private ownership has several advantages over public ownership in terms of being inherently implementing more efficient systems (Sheshinski, E. & López-Calva, L., 2003).

Box 3: Advantages of involving private sector in SWM

In Georgetown (Guyana) for instance, within five-years from a period of 1994 to 1998, by involving the private sector, increased the number of vehicles involved in daily collection operations from 4 to 18, more than double the frequency of service, and the city-wide coverage highly increased from 50% to 85%. So that this town was able to substantially improve its disposal operations by using a contracting system for disposal equipments (Cointreau-Levine, S. & Coad, A., 2000).

Besides privatization services by small and medium enterprises in India not only changed the traditional waste collection and disposal approach, but also created local innovations that fit the real situation and often increase the efficiency of the system (Gupta, 2006).

2.4.2 Limitations of PSP

Some of the rationales of involving PSP are mentioned in section 2.4.1. Despite its potential advantages, some authors also mention the limitations of privatization. An inadequate cost recovery system, inequality in service provision, dependency on higher officials, poor participation and higher user charges are some of its criticisms. It has also serious limitations in employment as well as labour conditions of public waste workers (Huysman, M.,etal, 2004).

Scheinberg (2001) also supports the above idea that private sectors are highly motivated to get more money (profit) than quality service provision. A proper way of service delivery depends on the good will of the contractor and the type of contract, and additionally if they understand the dynamics of local situations or conditions well.

2.4.3 Fundamentals for successful private sector participation

Private firms can be economically effective and efficient, only if the involvement of the private company is well supported by the local government and if there is competition at the tendering and during operations. Without competition, transparency, accountability and a good monitoring mechanism, a private sector service may be too expensive and inefficient (Cointreau-Levine, S. & Coad, A., 2000; Bartely, 1996; Warner, 2008). In this case more emphasis is given to economic aspects, which less likely consider the social aspects.

Besides for successful private sector participation there should be a balance between the private company and the public management, the contractual periods should enable economic depreciation of assets and repayment of loans, developing systems and facility sizes to make financially/ economically feasible (Cointreau-Levine, S. & Coad, A., 2000).

For municipalities to develop a productive private sector participation there is a need to understand and embrace lessons of participation, integration, capacity building, variability and diversity, gender marginalization and the role of existing service providers (Plummer, 2002).

Box 4: Considering citizens as key partners

Participation of users, starting from planning phase, should not be missed. This is because in Abuja-Nigeria, the people's unwillingness to pay for the services delivered by the private company is due to a lack of awareness. Citizens were seen as receivers of services rather than key partners which ultimately contributed to the failure of privatization in this city (Oteng-Ababio, M., Arguello, J. & Gabbay, O., 2013).

2.4.4 Social privatization and MSEs in solid waste service delivery

The concept of social privatization refers to transferring power and responsibility to different forms of civil societal organizations including MSEs, which does not in any way remove the need for governmental participation. It can be considered as a mechanism for self-governance and assuring the well-being of the society. (Moreno, J.A.,Rios, F.R.& Lardinois,I., 1999).

Different countries define MSEs in different ways. According to Haan, Coad and Lardinois (1998), MSEs are a class of enterprises which start their initiatives with a small amount of capital and fewer employees (micro enterprises capital ranges from $100 to $10,000 and workers 1 to 10, while small enterprises capital ranges from $ 5,000 to $50,000 and workers from 11 to 20). They basically relay on low cost technologies and can play a great role in the economies of developing countries.

MSEs are a form of privatization which is near and connected to the community. They are more cooperative and responsive to the local needs of the society (Scheinberg, 2001, Ahmed, S.A. & Ali, M., 2004). These enterprises are more likely to be interested in true PPP, where the government provides/leverages money for their activity such as to purchase assets. Promoting MSE privatization as one of the urban upgrading strategies will contribute to a sustainable waste management system. They are a part of the privatization process, but are less recognized, while they are crucial in development processes to 'get those people of the streets' (Scheinberg, A., Klundert, A. & Rudin,V., 2000).

The initiative or need for micro privatization may come from the government, as it appears in the case of Lima, Kampala and in Hyderaband, but at the grass root level individuals or groups can initiate the change. NGOs can also play a great role. For instance the Linis Ganda program in Manila has been successful in organizing informal solid waste collectors and is becoming a large private company (Harper, 2000).

In many cities the local governments can give the MSEs a concession, franchise or a contract for the services they are performing. This gives recognition as well as it creates a formal management and relationship between the municipality and the MSEs (Scheinberg, 2001).

According to Lardinois (1996), the simplest system encountered, for example in cities in Guatemala, Costa Rica and Bolivia is that the MSEs deliver the services to the users and the users pay the MSEs directly. The role of the local government is very limited and often no more than a certain type of authorization. These systems are often emerged without external support. The system in Peru is quite different. Most of the MSEs did not emerge spontaneously, but were motivated by NGOs at the request of the communities or the municipality. Here, the enterprises deliver the service; the users pay taxes to the municipality and the municipality contracts and pay the MSEs. The role of NGOs is very strong: they provide financial, technical and institutional advice and manage to obtain small loans from the banks (Lardinois, 1996).

His findings also shows that since there is a competitive market for waste collection and transportation services in Guatemala, the method of direct payment by the inhabitants is very

effective. But, in Peru, where the local government has granted the MSEs the right to charge the citizens directly for their service in some areas, this method results in non-payment or delayed payment and has had little success. This is because of three factors:

a There is no payment culture for these services because citizens consider it as free service provided by the government.
b The people do not give attention to the solid waste problem.
c The services are mainly provided to low income areas, while in Guatemala services are provided to high and middle income areas.

Box 5: MSEs roles and goals in Dar es Salaam, Latin America and Costa Rica

MSEs play a great role in making effective urban environmental services. For example in Dar es Salaam MSEs together with CBO has taken long term activities in recycling and waste recovery. These MSEs have a range of goals in which some are interested in long term securing their livelihood. Others want to live for a short time and to move in to higher employment status. In Latin America, due to a high degree of social interest like in urban waste cleaning, it is now called 'social privatization'. In a Costa Rican municipality, the MSEs service goals are basically providing satisfactory service to the clients and job creation in the community. The enterprises are supported by the local government policies and this initiated them to start recycling materials. Every year the tariffs of services are revised, according to the level of costs of the service (Scheinberg, A.,Klundert,A.& Rudin ,V., 2000).

2.4.4.1 Types of micro and small enterprises involved in solid waste service delivery

Despite the different categories of MSEs described by different authors, this research relies on Scheinberg's (2001) categorization of MSEs. She grouped MSEs into three main types of enterprises with a clear distinction namely: service-based, commodity-based and value-based.

- ***Service based MSES:*** enterprises that get their income from clients, beneficiaries or a combination of these by providing services like: waste collection, street sweeping and industrial cleaning.
- ***Commodity-based MSEs*:** enterprises that earn their income by selling profitable materials or products which they have salvaged produced or bought somewhere else.
- ***Value-based MSEs*:** enterprises that serve a social, environmental, religious or cultural purpose. The primary objective/goal of these entities is to bring and strengthening social or cultural change or environmental protection.

Among the three types of MSE categories the focus of this research will relay on the service-based enterprises, because in the study area these MSEs (service based) are currently engaged in solid waste collection and transport service delivery.

2.4.4.2 Features of service based MSEs

The main characteristics of service based MSEs are explained by author Scheinberg (2001) in the following manner:

Financial characteristics*:* prices for services are often determined with limited room for negotiation. Business activities may start formally or informally but in most cases they come to rely on contracts with formal sector (formal private or public sector).They have low profit margins due to various costs like delays in payments.
Political and social characteristics*:* Since their contract is linked with the municipal authorities or local government they are vulnerable to political, legal and administrative changes. They have little influence to mobilize political power and to participate in formal planning processes. The contracting laws of many countries do not permit municipal

officials/mayors to contract more than their term of office, so the contract period may be short due to political reasons.

Risk profile: They have a risk of poor cash flow due to a lack of on time payment or low payment rates from the side of municipalities as well as clients. The owners, workers and the business by itself have a low social status. It has negative image and due to this workers have very low interest to work for a longer time (Scheinberg, 2001).

2.4.4.3 Importance of Involving MSEs in solid waste management

MSEs have come into focus as a very essential economic sector in providing employment as well as income to a large population, particularly in low income countries (Haan, H., A. Coad and I. Lardinois, 1998). Since they emerge from their surrounding environment they are familiar with the local equipment, technology and approaches that can adapt or fit the local conditions (Scheinberg, 2001). Different authors further justify the potential advantages of participating MSEs in solid waste management service delivery as follows:

Service delivery at Low Cost

Different case studies show that MSEs can deliver the required waste collection service at lower cost. The lower costs are because of using the locally available and appropriate technologies which require less capital investment and operational costs (Scheinberg, 2001, Haan, H., A. Coad and I. Lardinois, 1998, Scheinberg, A.,Klundert, A.& Rudin,V., 2000)**.** They are an effective way of promoting affordable services to poor urban communities (Bartone, 1997).

Quality service provision

The small size of MSEs help them to be flexible, leads to stronger team spirit and enables to provide more quality services. Each worker knows that his/her payment depends on how well he/she performs the task. This makes them to be more motivated compared to workers in a municipal position. Moreover, the supervisor of MSEs is more urgent and closer which can enhance the standard of the work (Haan, H., A. Coad and I. Lardinois, 1998).

Links with community

MSEs operate often at neighbourhood level and favour community participation and control. The social pressure also enhances prompt payment and good service (Haan, H., A. Coad and I. Lardinois, 1998; Scheinberg, A.,Klundert, A.& Rudin,V., 2000). Besides, close links with the community can provide an opportunity for promoting source separation for recycling purpose which can benefit the workers by selling these recyclable materials.

Safety in numbers

MSEs have an advantage over one large contractor. This is because if there is a single contractor, the clients have little control of the price as well as the quality of the services (Haan, H., A. Coad and I. Lardinois, 1998).

Employment Generation

Since MSEs use more labour intensive technologies than the capital intensive ones, they can create employment opportunities (Haan, H., A.Coad & I. Lardinois, 1998; Scheinberg, A.,Klundert, A. & Rudin,V., 2000). In this respect promoting MSEs can play an important role in local poverty reduction strategies (Haan, H., A. Coad and I. Lardinois, 1998). For example in Tanzania MSEs create more job opportunities for women (Harper, 2000).

2.4.4.4 The sustainability of the MSEs

According to Moreno, Rios & Lardinois (1999), as any project sustainability assessment is conducted; the MSEs can be technically sustainable, because they adopt technologies which are viable in technical, economic, social-institutional and environmental terms for the needs of the society that can also complement with local technology when needed.

Economically, the MSEs can be sustainable because they have low costs and could support themselves with the payment received from the citizens covering the cost of the service.

Socially and institutionally, they can also be sustainable since they address the needs of the inhabitants they serve. However, the relationship with the local government is still very week and needs improvement.

Finally, the MSEs can be ecologically sustainable since they contribute more to the improvement of public health and environmental cleanliness, by increasing source separation and resource recovery which are important for economic activities (Moreno, J.A., Rios, F.R. & Lardinois, I., 1999).

2.4.4.5 Principles/Preconditions for strengthening the micro enterprises

According to Moreno, Rios & Lardinois (1999) the following principles are fundamental.

Strengthening of the three principal actors

Strengthening of the three principal actors of the state, the society and the MSEs is very crucial for a good functioning of MSEs. The success of these MSEs is basically determined by the tripartite integration of civil society, the enterprises which take over operations which were previously in public hands, and the public sector.

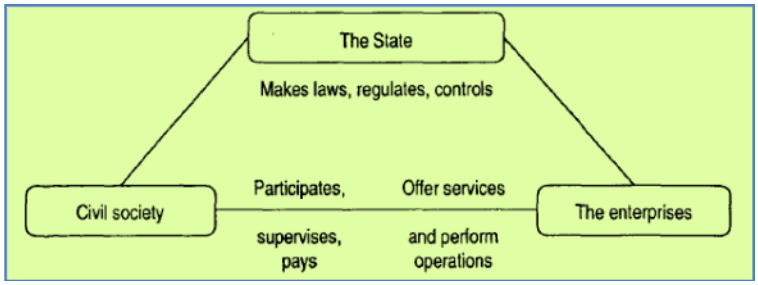

Figure 3: Civil society, the enterprises and the state/government in SWM
Source: (Moreno, J.A., Rios, F.R.& Lardinois, I., 1999)

Community participation and willingness to pay

Lardinois (1996) suggested that the communities satisfaction with the service delivered is crucial for the permanence of the enterprises to the citizens and is a very important precondition for their success.

The communities can participate in different ways:

•They put the garbage out in time for collection and store it properly as required by the MSEs.

•They timely pay for the service delivered by the MSEs.

•They monitor, supervise and control the work. For instance, they evaluate the quality of the work, the schedule, give comment on the service delivered, and suggestions about how the service can be improved in the future.

• Communities can participate in the management of the MSEs. For example, a few MSEs in, Costa Rica, El Salvador and Brazil are the property of a community organization (Lardinois, 1996).

Maintenance of public sector control, supervision and oversight

Whether the services are completely or partially privatized the responsibility for regulation, control and supervision must continue to be a municipal function, and this responsibility should be supported by active and continuous involvement of the community (Moreno, J.A., Rios, F.R. & Lardinois, I., 1999). The local governments have not only to maintain/improve services but also support to reduce their own costs (Harper, 2000).

Box 6: Miraflores Municipal and MSEs relationship

Harpers findings in Miraflores municipality show that the municipal management staff that was responsible for supervising the MSEs did not fully understood the work rules of these MSEs. The monopoly position of the local government makes the activities of MSEs very difficult. They are dependent on political decisions of the municipality and cannot plan on the basis of a fixed contract system and the government also pays them the minimum possible rates, which creates obstacles for growing and extending their services to the rest of citizens. Even though the senior managers of the city now realize the benefits of this new system, generally the municipal authorities still fail to treat the MSEs as autonomous businesses (Harper, 2000).

2.4.4.6. Supporting mechanisms of local government to MSEs

Based on Haan, Coad &Lardinois (1998), laws should be modified to allow enterprises to work on a legal basis and these authors further recommend the following main government supporting mechanisms to strengthen MSEs.

Providing Information and training

The main role of local government is to minimize the barriers for the enterprises to be involved in SWM as well. Municipalities may not have the necessary skills and resources to deliver business development related trainings. Hence, they should coordinate this task with the NGOs, business development, organizations etc. The municipality can provide technical guidance on the physical activities performance, occupational health and safety, relationships with citizens and about integrated waste management systems.

Economic incentives

The government can stimulate the enterprises involvement in waste management services by providing economic incentives. This is to increase the MSEs income/revenues of the provision of certain services. It helps the enterprises to overcome inefficiencies.
Reduction of taxes can be also considered as economic incentives.

Use of municipal facilities, equipments and land

When MSEs are taking over some materials or equipments from the municipal staff, it is better to consider the following possible mechanisms or factors may be necessary to take decisions:

- The equipments (for example trucks) or facilities can be sold to the enterprises or leased for some period of by annually or monthly payment. However, there should be clear leasing agreements.
- On the other hand, if the MSEs are geared towards using the old designed equipments of the municipality; for example if they use the previous handcarts which have a small carrying capacity they may not be efficient since they did not use and adopt superior to previous approaches.
- Land which is required for transfer of waste or storage equipments and offices shall be given by the local government at low rent.

Credit facilities

The major problem faced by these enterprises is a lack of access to credit. Micro enterprises should cover their costs and be profitable to survive. So, the government should provide a loan guarantee to the credit institutions which makes the credit available.

Supervision

When enterprises are involved in delivering SWM services at least four groups of supervisors should be organized from municipality staff, independent inspectors, MSE supervisors and beneficiaries.

The municipality staff supervisor helps to ensure the MSEs workers perform the work according to the agreed requirements. Moreover the existence of supervisors from citizens and commercial clients collectively can see many things more than an official supervisor. Users can notice whether their garbage is collected to late or not collected at all and helpful for immediate correction.

Public awareness campaigns

This support has a great role on the success of MSEs involvement. It should be directed towards understanding, developing and motivation of the citizens to be served. Posters, advertisements in newspaper, television, radio etc., can be used as awareness creation mechanisms. According to Sheckdar (2008) and Zhu, etal. (2008), the level of people awareness towards waste can influence the entire SWM activity.

2.4.4.7 Models for involving Micro and small enterprises

The literature reviewed reveals that different models can be used to involve MSEs in solid waste collection service. In Peru (Lima Metropolitan), the successful model in the city involves a closer relation between citizens and MSEs. Inhabitants receiving the service, supervise and contracts out to the MSEs and also pays them directly as the waste is collected. This direct relation with their customers enabled the MSEs to sustain. While the other model where MSEs provided the service to the community, in which the users supervising the work and paying the local government, who would contract and pay the MSEs was unsuccessful since payments of the various actors remained irregular, the MSEs face great difficulties due to shortage of income (Lardinois, 1996).

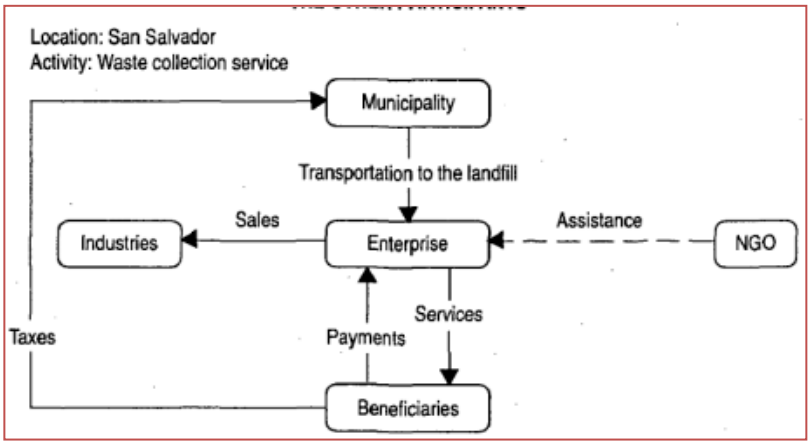

Figure 4: Relationships between the MSEs and other actors in El Salvador
Source: (Moreno, J.A., Rios, F.R.& Lardinois, I., 1999)

2.5 Conceptual frame work

The conceptual frame work of this research is developed by reviewing the fundamental concepts of the ISWM frame work via the privatization concept and the essentials and preconditions for involvement of MSEs in SWM.

The ISWM analytical model is the basis for this conceptual frame work. Because it embraces three major dimensions; stakeholders, waste system elements and sustainability aspects. The sustainability aspects help to assess whether the selected system of SWM is technically, financially, socio-culturally, environmentally institutionally and legally sustainable. All these can ultimately contribute to achieve equity, efficiency effectiveness and sustainability of the system as a whole.

This study majorly focuses on the solid waste system elements collection and transport, with MSEs as service providers for waste collection and transport services in Bahir Dar city and the local government of the city as facilitator. The success of MSEs is basically determined by the integration of the three principal actors; the state, civil society and the enterprises. In which maintenance of public sector control, supervision, administrative and financial incentives supported by active and continuous involvement of the community (users) are indispensible for MSEs functioning well. The existence of other supporters and joint actions with NGOs will enhance the activities of the growing MSEs. Generally, the conceptual frame work is summarised in figure 5 page 21.

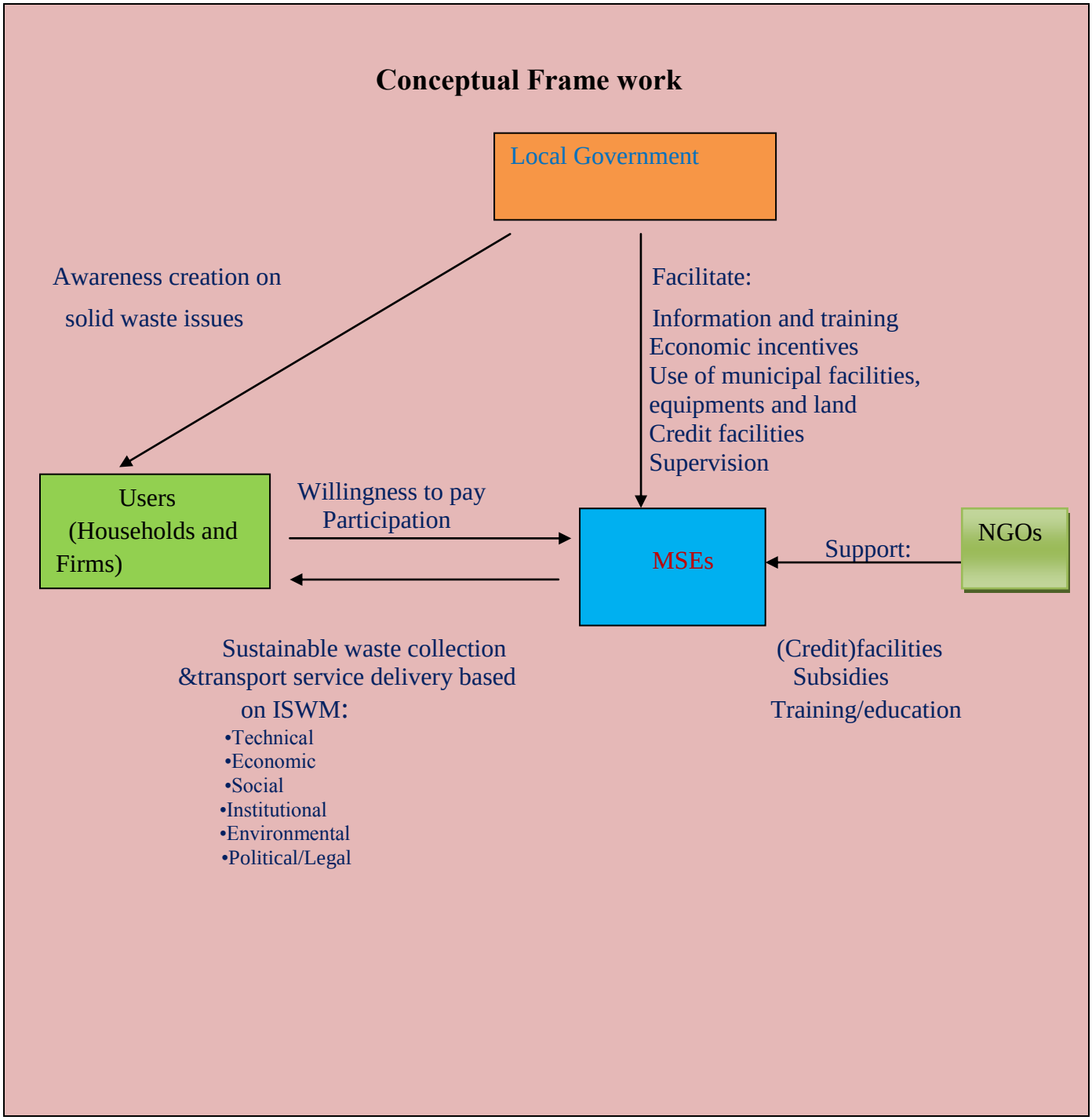

Figure 5: Conceptual frame work for sustainable MSEs solid waste collection &transport service delivery
Source: Developed by the Author based on ISWM frame work.

2.6 Literature review summary

SWM is not an easy task because it is complicated by interwoven challenges particularly in less developed countries**.** This is basically due to a lack of functional, integrated and appropriate policies and processes, so as to bring real stakeholder involvement, poor adapted strategy and technology, insufficient funding, inequity in service provision (neglecting the poor), a lack of proper sanitary land- fill, illegal dumping and a lack of people's awareness in IWMS. Moreover, the population in developing countries has increased at a faster rate and as a result it is impossible to solve these problems by the local governments alone.

The overall concept of the ISWM frame work shows that SWM is not a linear action; it needs systematic/integrated application in accordance to the local context and collaboration among the different actors and system elements. In this respect the government at each level should play a more facilitating role like in setting better rules and regulations, supervision and support. Besides, different studies recommend the usefulness of private sector involvement as a service provider, considering its limitations. Mobilizing the community at large is very helpful to achieve a long term solution. MSEs as a private and social entity can particularly play an important role in serving at low cost and creating employment to the poor in developing countries. Here, users' involvement and government support are fundamentals for successful service delivery of MSEs.

CHAPTER THREE: RESEARCH DESIGN AND METHODS

3.1 Introduction

This chapter shows the overall approach followed to conduct this research. It indicates the revised research questions, type of the research, techniques used, operationalization (which shows variables and indicators), sample size and selection, data collection and analysis methods.

3.2 Revised research questions

Main research question

How sustainable is the service delivery for the collection and transport of solid waste by MSEs in Bahir Dar and how can this level of sustainability be explained?

Specific research questions

- How is the current solid waste collection and transport system by MSEs organized in Bahir Dar?
- Which factors influence the sustainability of waste collection and transport service delivery by MSEs in the city?
- By which mechanisms does the government support and stimulate the waste collection services delivered by MSE's in Bahir Dar?
- How can solid waste collection and transport service delivery by MSEs be improved in the future?

3.3 Research type and approach

The type of this research is an exploratory single embedded case study. It can help to explore the sustainability of solid waste collection service by MSEs in Bahir Dar administration city through collecting data from the main stakeholders involved in ISWM and different working sites of MSEs in the city. Since the study was conducted by including the three different actors (local government, MSEs and users) it was helpful to get reliable data.
The researcher was used both qualitative and quantitative research methods. The qualitative approach used for getting a deeper understanding and information about the waste management service in the study area and the quantitative approach helped for triangulation.

3.4 Research Design

The following diagram shows the basic procedures used to conduct this research.

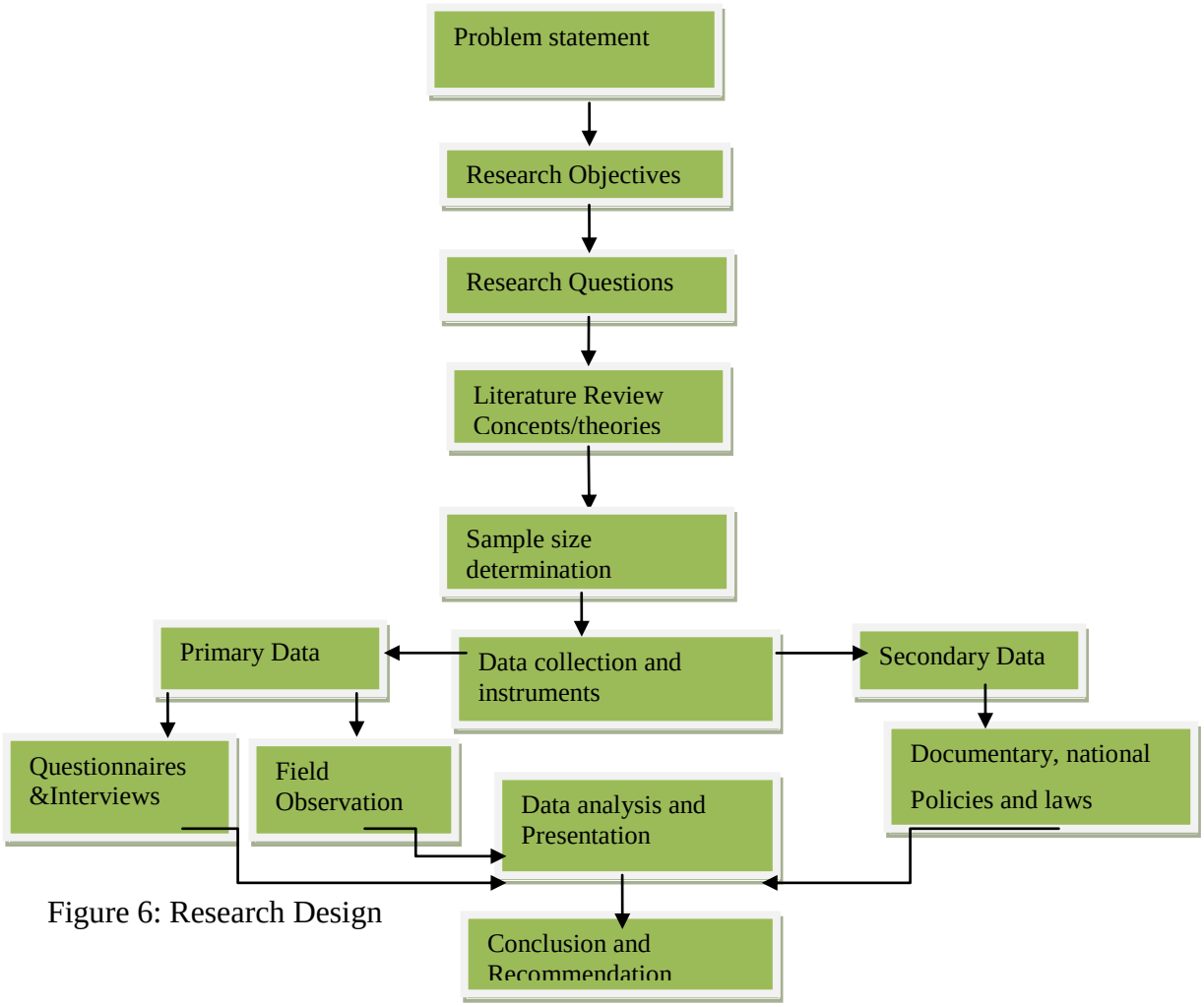

Figure 6: Research Design

3.5 Study population and Sampling Techniques

Bahir Dar city has 9 urban kebeles. In the city, 4 MSEs have started solid waste collection services. These MSEs delivers solid waste collection services through division of kebeles in equal proportion. From the 4 MSEs, 2 MSEs (Green vision MSE and Vision MSE) were randomly selected to collect data. In order to get better insight, 2 sample kebeles were also randomly selected from each of the 2 sample MSEs working area.

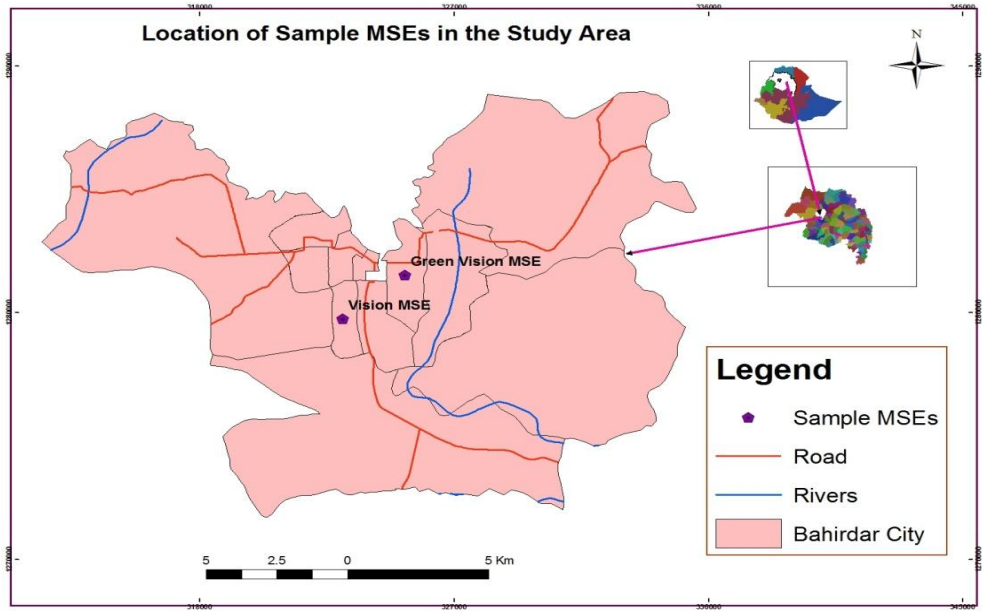

Figure 7: Location of sample MSEs in Bahir Dar

The main respondents were the MSEs managers and solid waste collection workers of MSEs, users and local government staffs including concerned experts.

The selection of solid waste MSEs workers is done through a convenience sampling technique. This method of sampling helps for the selection of samples from a given population where time is relatively short (Dornyei, 2007). From each of the 2 sample MSEs 50 waste collection workers, that are 100 workers in total, were selected to collect data.

The selection of users for focus discussion was through purposive sampling technique. From each of the 2 sample kebeles (MSEs working area) 10 users per kebele, in total 20 users were selected for group discussion. Besides purposive sampling was also used to select 3 respondents from government officials and 2 from MSEs managers. Totally, from 125 respondents data was collected using different instruments as indicted in the table below.

Summary of sampling population, techniques and data collection methods				
Categories of respondents	Sample size	Sampling technique	Data type	Instrument
MSE workers MSEs managers	100 2	Convenience Purposive	Primary Primary & secondary	Questionnaires, Interview & observation Interview
Users	20	Purposive	Primary	FGD & observation
Municipality staffs (Head, EPLAB, Local MSE Agency)	3	Purposive	Primary &secondary	Interview
Total	125			

Table 1: Summary of sampling population, techniques and data collection methods

3.6. Data types and collection methods

Both primary and secondary data were collected concurrently. The primary data were collected from users, government officials, MSEs managers and workers. From these data sources, the different data were collected through interview, focus group discussions, questionnaires (both open and close ended questionnaires were prepared before field survey) and direct observation. Interviews were conducted with, government officials (BDM, EPLAB, MSEs promotion office and MSE managers), where the researcher directly asked the respondents face to face by preparing interview guide questions. It was helpful to gather on how the current MSEs are organized in Bahir Dar, to explore government support mechanisms and to assess the sustainability of MSEs service delivery.

A focus group discussion was held among selected users of the city to enrich ideas on the current solid waste collection services of MSEs. Because it has an additional advantage over interviewing a single respondent and enables the researcher to explore the service delivery of MSEs according to users point of view; and it can supplement and cross examine the information gathered through individual interviews.

Questionnaires were used to collect data's from MSEs workers on the sustainability of MSEs service delivery in technical, financial, social, environmental institutional and policy/legal issues.

The other method employed was field observation. It was conducted to see how the actual services of solid waste collection and transport system by MSEs are implemented. It gives opportunities for the researcher to have a better understanding of the context within a situation or condition operates. This further helps to triangulate the responses from interview with the real practice. Digital camera was also utilized during the field observation to capture the situation of waste collection and transport processes.

Besides secondary data was gathered by reviewing different concepts, theories and related previous studies from books, journal articles, on SWM by MSEs and offices reports relevant national policies, laws and documents.

3.7 Data Analysis methods

The collected data was analyzed using different tools. Qualitative type data's were analyzed through a number of steps. The data was grouped under different themes and combining the themes in to larger categories. Having broader categories of themes helps the researcher to undertake creation of links between relevant categories of data. Besides, narration of qualitatively analysed data's is also employed.

The quantitative data is analyzed using SPSS software. This is done after appropriate coding the different data's and entering the data into SPSS software. Excel sheets were also used to analyze the collected data types. The findings from the analysis are presented by using tables and charts (pie charts and bar charts).

3.8 Validity and reliability

The reliability of data is mainly affected by the quality of measurements. Hence, to ensure the reliability of the data different methods such as reviewing the collected data through notes, tapes and videos were repeatedly done. Besides pre-tests of the prepared questionnaires are

done so as to modify or avoid any unforeseen mistakes in the questions. The respondents were also asked different questions for the same subject yet seeking similar information. The focus group discussion and field observations further helps to cross validate the information obtained through interview.

To achieve the validity of data, the study identifies the variables to be measured. The validity of the research was assured by a method of triangulation and through designing appropriate questions for interviews and questionnaires.

3.9 Variables and indicators

Prior to field work the researcher identified the variables to be measured for each research questions. Based on the reviewed literatures relevant indicators were also identified. The research questions with operationalized variables, indicators, data sources and analysis methods are summarised in the next pages.

Operationalization of variables and indicators			
RQ1: How is the current solid waste collection and transport system by MSEs organized in Bahir Dar?			
Variables	**Indicators**	**Data source**	**Data analysis**
Organization of MSEs			
Sub variables			
Motivation	Objectives	Interview with BDM & MSEs	Qualitative
Facilitators/actors	Availability of supporters	Interview with BDM & MSEs	
Members/workers	Workers characteristics (Gender composition, Age category, educational status,Income)	Interview with BDM & MSEs, Questionnaires	Qualitative/quantitative
Legality aspect	Policies & Laws w/h govern MSEs(Formally registration)	Interview with BDM & MSEs	Qualitative
Type of contractual arrangement	Existing working agreement	Interview with BDM & MSEs	Qualitative
SWCT system	Current SWCT system of MSEs	Interview with BDM & MSEs, Observation	Qualitative

RQ2: Which factors influence the sustainability of waste collection & transport service delivery by MSEs in Bahir Dar?			
Technical sustainability			
sub variables	**Indicators**	**Data source**	**Data analysis**
Technically adapted equipments	waste collection equipments type (locally Vs imported)	Interview with BDM & MSEs Questionnaires ,Observation	Qualitative/quantitative
	opportunities for maintenance of equipments	Interview with BDM & MSEs managers	Qualitative
	Adaptability of equipments to the physical environment	Interview with MSEs, Observation, Questionnaires	Qualitative /quantitative
Sufficiency of WCT equipments	Availability of sufficient WCT equipments	Interview with MSEs, Observation , Questionnaires	Qualitative /quantitative
Separate waste collection& transport	Use of different storage bins / separate collection	Interview with BDM, MSEs & FGD Users Questionnaires, Observation	Qualitative/quantitative
	Compartment containers in the vehicle	Interview with BDM &MSEs, Observation	Qualitative
Environmental sustainability			
sub variables			
Integration of 3 Rs	Environmental policies that enforces & promote 3 R's	Interview with BDM & MSEs, Questionnaires	Qualitative/quantitative
	MSEs practices towards the 3 R's (Ex. Collecting recycling materials, composting)	Interview with MSEs, Questionnaires Observation	Qualitative/quantitative

Frequency of waste collection	Time length of waste collection (days, weeks)	Interview with BDM MSES, Questionnaires, Observation	Qualitative/quantitative
Proper handling of waste by users	waste separation at source	Interview MSES, Questionnaires, Observation	Qualitative/quantitative
	Use of durable & closed storage material	Interview with MSES, Questionnaires, Observation, FGD users	Qualitative/quantitative
Safe disposal of waste	Use of closed /open type waste transport vehicles,	Interview with BDM & MSEs, Observation	Qualitative
	Availability of waste transfer sites,	Interview with BDM & MSEs, Observation	Qualitative
	Properly protected final disposal site (Ex. Fenced)	Interview with BDM & MSEs, Observation	Qualitative
Monitoring mechanism	Supervision function	Interview with BDM & MSEs, Questionnaires	Qualitative
Social sustainability	Equity service provision	Interview with BDM & MSE & FGD users	Qualitative
	Users cooperation	Interview with BDM & MSE FGD users, Questionnaires	Qualitative/quantitative
	Job creation in the society	Interview with BDM & MSEs, Questionnaires	Qualitative/quantitative
	Waste workers satisfaction	Questionnaires	Qualitative/quantitative
	Waste workers safety: (medical support, availability of protective cloths & regularly using of the cloths)	Interview with MSEs, Questionnaires Observation	Qualitative/quantitative

Financial sustainability			
Sub variables	Revenue generating mechanisms	Interview with BDM, MSEs Observation	Qualitative
Cost recovery	Level of cost recovery	Interview with BDM & MSEs	Qualitative
Willingness to pay	Beneficiaries willingness to pay	Interview with MSEs FGD Users	Qualitative
Financial access/support	Incentives	Interview with BDM & MSEs	Qualitative
	Credit access	Interview with BDM & MSEs	Qualitative
Service charge determination	Setting fairly fees	Interview with BDM, MSEs, Questionnaires	Qualitative
Institutional sustainability			
Workable contractual agreement	Sufficient contract periods & conducive regulatory system	Interview with BDM & MSEs	Qualitative
Capacity building mechanisms	Provision of trainings, Availability of reward systems for workers	Interview with BDM, MSEs Questionnaires	Qualitative/quantitative
Monitoring & controlling systems	Availability of monitoring & supervision	Interview with BDM, MSEs Questionnaires	Qualitative/quantitative
Political/legal sustainability	Availability of SWM policies at the local level	Interview with BDM, MSEs	Qualitative
	Availability of enforcement mechanisms to implementation	Interview with BDM, MSEs Questionnaires	Qualitative/quantitative
	Existence of laws that allow to participate privates(MSEs), NGOs	Interview with BDM & MSEs	Qualitative
	Legally registration of the MSEs	Interview with BDM & MSEs	Qualitative

RQ3: By which mechanisms does the government supports and stimulates waste service delivery by MSEs in Bahir Dar?			
Supporting mechanisms			
Financial supports	Incentives	Interview with BDM & MSEs	Qualitative
	Payment of service charge on time	Interview with BDM & MSEs	Qualitative/quantitative
	Access to credit	Questionnaires Interview with BDM & MSEs	Qualitative
Capacity building	Training &public awareness	Questionnaires Interview with BDM &MSEs	Qualitative/quantitative
Equipments & material support	Supported equipments	Interview with BDM & MSEs	Qualitative
Monitoring system	Supervision function	Questionnaires , Interview with BDM & MSEs	Qualitative/quantitative

CHAPTER FOUR: RESEARCH FINDINGS AND ANALYSIS

4.1 Introduction

This chapter focuses on the findings obtained from fieldwork and addresses the research questions. It starts with the local context which gives a general overview of solid waste management in Ethiopia and particularly in the study area, Bahir Dar city. Then, it explores the findings of the current organization of MSEs and the factors that influence the sustainability of waste collection and transport service delivery by MSES, paying particular attention to the technical, environmental, social, financial institutional and legal aspects using indicators. Besides the government supporting mechanisms so as to strengthen MSEs activities are presented and discussed in this section.

To provide answers to the research questions, interviews were conducted with BDM, Bahir Dar MSEs promotion office, Amhara regional environmental protection bureau and MSEs managers. Different data were collected from waste workers through questionnaires, analyzed using SPSS software and Excel sheet; and the findings are presented in graphs and tables. Besides focus group discussions and site observations were conducted to enrich and cross validate the data.

4.2 Overview of SWM in Ethiopia

4.2.1 Regulatory Framework

The constitution of the Federal Democratic Republic of Ethiopia sets the basis for enactment of specific legislative instruments governing environmental matters at a national level. Some articles in the constitution such as articles 44.1, 92.1 and 92.2 are deal with environmental related rights, obligations and objectives in the country. These articles have shown the following fundamental legal grounds.
Article 44:1 emphasizes that "all persons have the right to live in a clean and healthy environment". Article 92.1states that "Government shall endeavor to ensure that all citizens live in a clean and healthy environment" and article 92.2 states that "Government and citizens shall have the responsibility to protect the environment."

The environmental policy encompasses issues of solid waste management (Bahir Dar city SWM, 2010). There is no separately formulated solid waste management policy in Ethiopia, but there is a proclamation (Proc. No. 513/2007) formulated at federal level concerning SWM. According to this proclamation, the main purpose of the legislation is to enhance at all stages capacities, so as to prevent negative impacts while creating socially and economically useful assets out of solid waste. Besides it also sets two general obligations of urban administrations. The first obligation is that the cities administrations shall create a conducive or enabling environment to encourage investment in providing solid waste management services. The second obligation states that any person shall obtain permission from the responsible urban administration before engaging in SWM activities.
Though article 92.2 states that the protection of the environment is the responsibility of both the government and citizens, until recent years SWM in particular entirely relies on the municipalities/government, has faced many challenges and resulted in low quality service delivery (Tadesse, 2004).

4.2.2 Private sector participation in SWM in Ethiopia

PPIAF has encouraged the government of Ethiopia so as to involve the private sector in municipal solid waste management. In 2002, PPIAF provided adequate budget for a detailed diagnosis of the solid waste sector in the country, focusing on generation, collection, storage, transport, and disposal of waste. The findings were presented by preparing workshops on PSP in the sector, and further insights into other countries best practices appropriate for Ethiopia were gained through visiting Egypt and South Africa. Based on the results of this study, in February 2007 the government passed the SWM Proclamation No. 513/2007. This law permits for private operators to engage in waste management activities (PPIAF, 2011).

By 2002 MSWM was in a poor state. SWM had not been a national concern and investments were very low. There was no formal arrangement for charging waste generators and weak financial and cost recovery systems were among the main sources of poor waste management performance (PPIAF, 2011).

4.2.3 MSEs development strategy in Ethiopia

The Federal Government of Ethiopia has recognized and gave attention to MSEs for they are essential vehicles to solve the challenges of unemployment, economic development and equity in the country. Hence, the government has designed a national MSE promotion and development strategy in 1997. Consequently, MSEs development agency was established at Federal level in 1998 (Mulu, 2009). The strategy paper highlights the following main aspects. The primary aim of the MSE development strategy is to create an enabling institution, legal and other supportive environment for the growth of MSEs.

In order to achieve the above objective, basic principles that should be adhered to are indicated. The fundamental principles highly emphasize the advancement or improvement of the life of most vulnerable groups of the society (the women), the provision of support services on fee basis, and training support needs.

Since the sector is too vast and complex with the limited financial and human resources available for the support programmes, there is a need to focus on particular target beneficiaries. In principle, selecting targets and setting criteria is depending on the local context and the responsibility of each region. MSEs, which are based on labour intensive technologies, and local raw materials, which have higher sectoral linkage, those engaged in import substitution (a potential for export) and tourism activities are fundamentals to select the beneficiary MSEs.

The strategy addresses all the essential elements of support programs considered necessary at federal, regional and local levels, with the private sector, business organizations, and NGOs as important implementing agencies in line with the governmental structures. The support programs include measures like creating an enabling legal framework in general and specifically facilitating access to finance, provision of incentives, trainings encouraging partnerships, access to appropriate technology, market, information and advice, infrastructure and institutional strengthening of the private sector organizations.

4.3 Bahir Dar city and its SWM overview

4.3.1 Description of Bahir Dar city

Bahir Dar is the capital city of Amhara national regional state (one of the 9 regional states in Ethiopia). It is located in the north western region of Ethiopia which is 560 km from Addis Ababa, at 11" 38'N, 37" 10'E on the southern side of Lake Tana at an altitude of 1800 meters (above sea level). It has experiencing the prevalence of high (hot) temperature in which the maximum temperature increases as high as 32 ^{o}c. Its location near Lake Tana and Abay River give more attractiveness to the city.

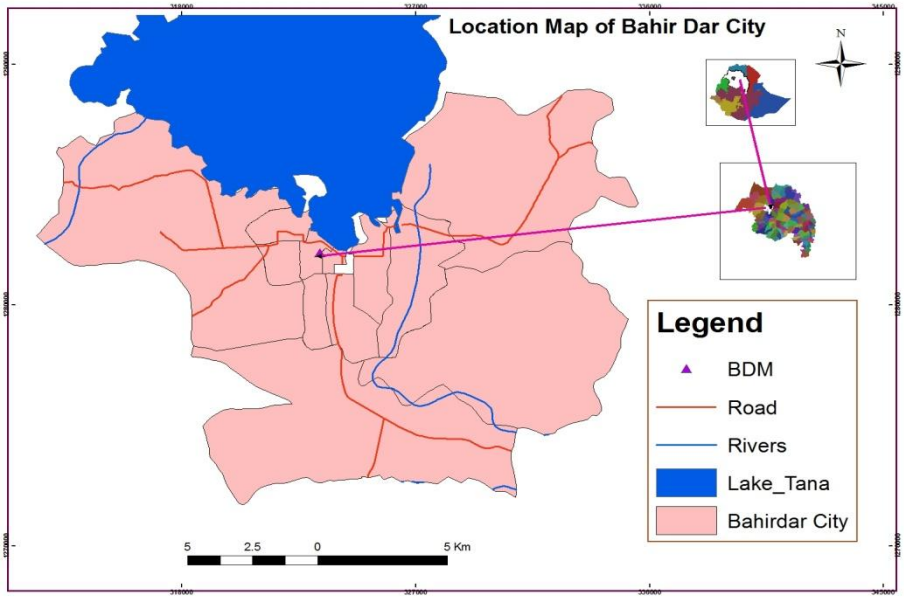

Figure 8 : Location map of Bahir Dar city in the country & region

According to 2007 population census, 220,344 inhabitants are living in Bahir Dar administration. The urban population accounts 180,094 and the rural people constituted 40,250. The annual population growth rate of the city is increasing at faster rate which is about 6.6%; from this the birth rate contributes 2.6% and 2.8% is migration rate. The average household size estimated to be 4.4 (Bahir Dar city SWM, 2010).

Significant numbers of the urban dwellers (in Bahir Dar) and about 26% of the rural inhabitants are engaged in agricultural activities. From the total land use system of the Bahir Dar administration, human settlement (including rural, urban and informal settlements) covers about 30% of the area; others 23.7 %, 31 %, 8 .3 %, 6.77% and 0.25% is respectively covered by agriculture, Water body, rock, marshy and forest land (Bahir Dar city SWM, 2010).

Small and medium scale industries are also found in Bahir Dar. The major industries are textile, tannery, leathers, oil, plastic and abattoir. According to Bahir Dar City (2010) solid waste characterization and quantification study, the Bahir Dar textile industry and the tannery are highly significant as compared to the others.

4.3.2 Policy & legal aspects related to SWM in Bair Dar

There is no SWM or environmental protection law/ proclamation which can deal particularly for the region. It is the federal law that has been tried to use. This creates difficulty on the implementation and monitoring waste management activities on a legal basis as local context varies. To minimize the problem the regional state health bureau prepared a basic solid waste management directive in 2009 which focuses on source reduction, garbage classification, collection, storage, transport recycling and reuse. Accordingly, they are very weak.

According to the information obtained from Bahir Dar city MSEs Office, all the MSEs are legally registered under proclamation number 686/2002 by the trade and industry promotion office. Additionally SWM Proclamation No. 513/2007 permits for private operators including MSEs to engage in waste management service.

4.3.3 SWM and Institutional Arrangement in Bahir Dar

According to Bahir Dar city SWM (2010) survey, the institutional arrangement of SWM in the city has no good integration or coordination between actors. Each sector is working independently. The following diagram shows the current SWM institutional in Bahir Dar.

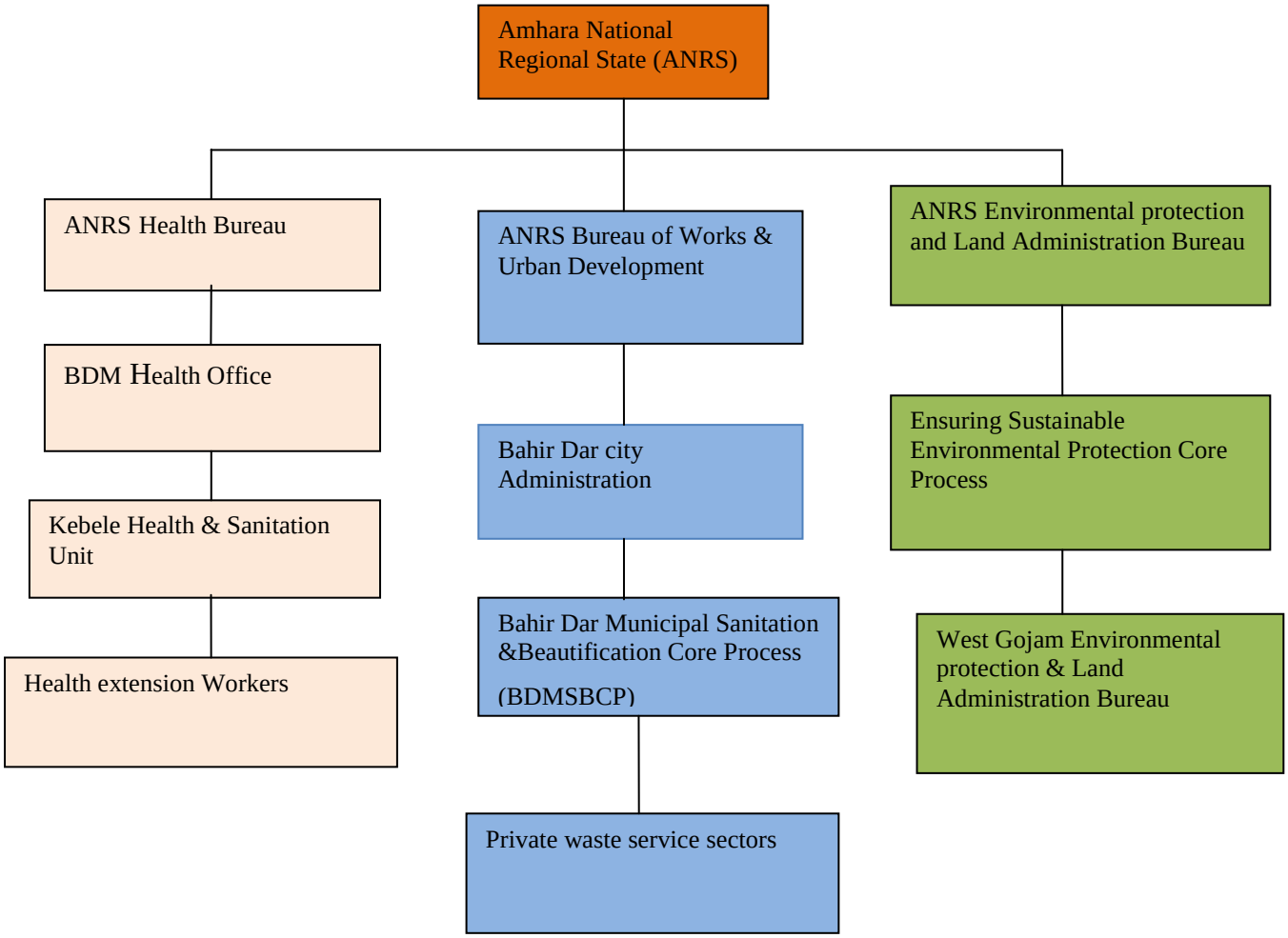

Figure 9 : Institutional Arrangement of SWM in Bahir Dar City
Source: Bahir Dar SWM survey, 2010

The Role of Major sectors in the institutional arrangement of SWM				
	Bahir Dar City Administration	ANRS Environmental protection and Land Administration Bureau	ANRS Health Bureau	Private waste service providers
1	Administration (financing, disposal Management)	Establish & publish technical standards	Preparing technical standards for pollution control & Public Health Protection	Waste collection
2	Legislation	Supervision and Monitoring	Supervision	Street Cleaning
3	Programming	Pollution Control	Pollution Control	Waste transportation
4	Construction	Execution	Execution	Reuse
5	Set up technical standards	Solid waste in/out	Hazardous waste in/out	Disposal and Treatment
6	Training, supervision &Information			

Table 2: Major sectors roles in the institutional arrangement of SWM in Bahir Dar
Source: Bahir Dar SWM, 2010

The other stakeholders who are participating in the city are SWM, Bahir Dar University in conducting research and study works; NGOs participate in awareness raising and developing waste management plan; and households and commercials participates in primary collection and paying the service fee.

Before solid waste service privatized (until 2009), the municipality delivered its services through provision of few communal containers (70 waste storage containers) distributed at specified sites of the city. These metal containers had a capacity of 8m3 and were not emptied regularly. Transportation of the collected waste in containers to the disposal site was also the responsibility of the municipality.

At present, there are no communal containers used for storage of waste communally. Instead one private company and four MSEs are now providing door to door collection service from households, institutions and commercial buildings. While, street sweeping activities are still performed by the municipality itself.

Based on the Bahir Dar city 2010 solid waste survey, about 70 % of the generated MSW (69 tons per day) is collected and transported daily to the disposal site, only 2% of waste is used for composting. This implies that most of the solid waste is transported to the open field dumping site, which is situated at four kilometer far from the city.

4.3.4 The Organization of MSEs for SWM in Bahir Dar city

4.3.4.1 Motivation to organise MSEs

The researcher asked the head of the municipality sanitation and beautification core process,"Why are you motivated to organise MSEs and provide waste services through them?" According to the interviewed response of Mr.Dawit, before there was only one private limited company, which is called Dream Light, that provided solid waste collection service in Bahir Dar. This local private company has given the responsibility to collect and transport the city's waste by receiving the service fee directly from users. And the company played a great role in the cleanliness of the city up to some period of their agreement with the municipality. Since there has not been any competitor, the service quality of the private limited company has decreased through time. On the other hand, they became highly interested to gain more profit and tried to raise their monthly service fee from 8.00 birr to 12.00 birr (from $ 0.50 to $ 0.70 US dollar) for households and a similarly higher increment on commercial users. As a result, the service users highly complained for this sudden change of the service fee to the municipality.
Due to these facts the municipality planned to find other alternatives and highly initiated to organise the MSEs with the integration of other stake holders (sectors).

Besides, according to the interview held with Mr.Fentahun Workeneh (Bahir Dar city MSEs office representative) the purpose of organizing these MSEs has multifaceted objectives. The immediate objective is for economic purposes, that is creating a job opportunity for poor people on the street. The next purpose is to keep the cleanliness of the city by creating more competitors. Since the city is one of the major tourists destination sites this has also a benefit in changing the image of the city through minimizing those people who lived on the street. There were even some individuals that can have the capacity to work but their life was depended on imploring, so the organization of MSEs creates a job opportunity for such people.

4.3.4.2 Main actors /Facilitators

As per interview conducted with Mr. Dawit (BDMSBCP) basically, the organization of MSEs is initiated by the government (municipality). The main actors or supporters in the process of organizing the MSEs are the Bahir Dar city municipality, the Amhara region environmental protection bureau and Bahir Dar city MSEs promotion office. Besides these governmental officials, two NGOs support, UNDP and FFSCE (Forum for Sustainable Child Empowerment) play a great role in the start-up of waste services by MSEs. These NGOs provided various working equipments such as hand push carts, bicycles for MSEs managers which are used for daily supervision, hand gloves, boots, uniforms, providing trainings and construction of offices.

4.3.4.3 Processes of organization and characteristics of the workers

According to the interview responses from Mr.Fentahun Workeneh (Bahir Dar city MSEs office representative) the organization of MSEs is done through a number of steps. The selection of members is mainly done at kebele level.
First, the kebele administration announces for the jobless, poor and orphan youths to apply and organise in MSEs. After registration is completed, careful screening and filtering is done at kebele level to check whether the applicants are truly from those vulnerable groups (members that have no means of livelihood). This is because very poor people and individuals without housing were the main target members. Finally after confirmation they are legally registered by a trade and industry bureau.

Age category of respondent's waste workers

According to Broussar and Tsegay (2012) the youth population in Ethiopia is between the ages of 15-29 years. The sample study findings reveal that 78 % of the total sample respondents are found between 15 and 29 years. While 20% and 2 % respondents are 30-40 years and ages who have greater than 40 years respectively.

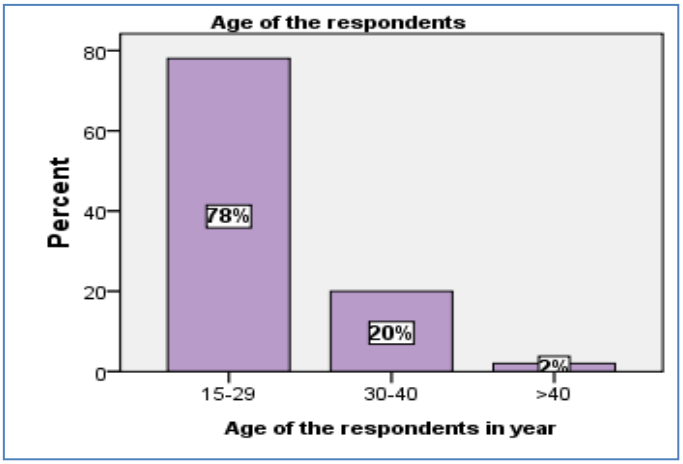

Chart 1: Age distribution of sample waste workers
Source: author field survey, 2013

Sex composition

The sample study findings (in table 3 below) show that from each of 50 respondent's female workers accounts 42 and 44 respectively in Green vision and Vision MSE. While the remaining 8 and 6 respondents are males respectively in Green vision and Vision MSE. From the total 100 respondents, female waste workers account 86 and 14 workers are males.

Sex of the respondents waste workers				
Count				
		MSEs		Total
		Green Vision MSE	Vision MSE	
Sex of the respondent	Male	8	6	14
	Female	42	44	86
Total		50	50	100

Table 3: Sex composition of respondent's workers
Source: author field survey from sample waste workers

Educational status

The educational level of sample respondents the two MSEs waste workers shows that 48 % of the respondents are at primary level and 41% are illiterates. The remaining 5% and 6% of the respondents are secondary school completed and college/university graduated respectively.

The researcher also asked the head of municipality sanitation and beautification core process why some graduate youths are included? According to his response, primarily the MSEs were organised with less educated people and during the process this particularly results in a poor financial recording and management system. To minimise such challenges it has been tried to mix with university graduate youths and they are mostly engaged in the management and supervision activities.

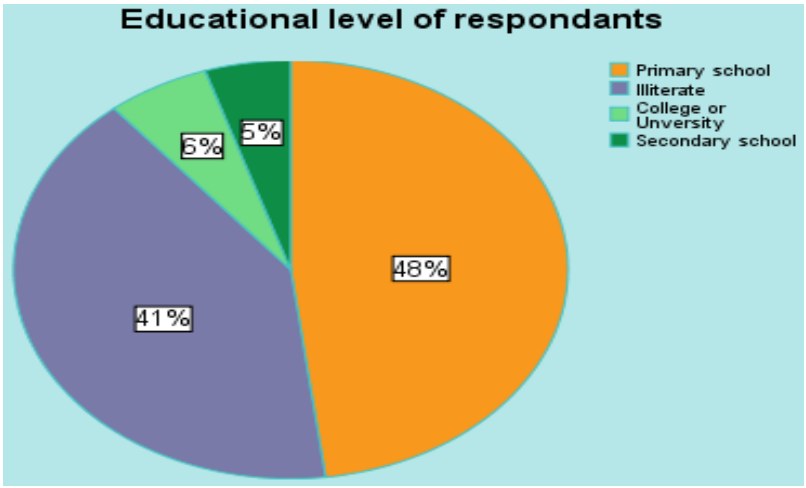

Chart 2: Educational status of respondent's waste workers
Source: author field survey, 2013

Monthly income of respondents

The sample study findings from each 50 respondents in both MSEs show that, 46 and 48 respondents have a monthly salary of between $ 26.51-29.45 US dollar respectively in Green vision and Vision MSEs; and 4 and 2 respondents have a monthly salary of between $ 58.86 - 88.25 US dollar respectively in Green vision and Vision MSEs.

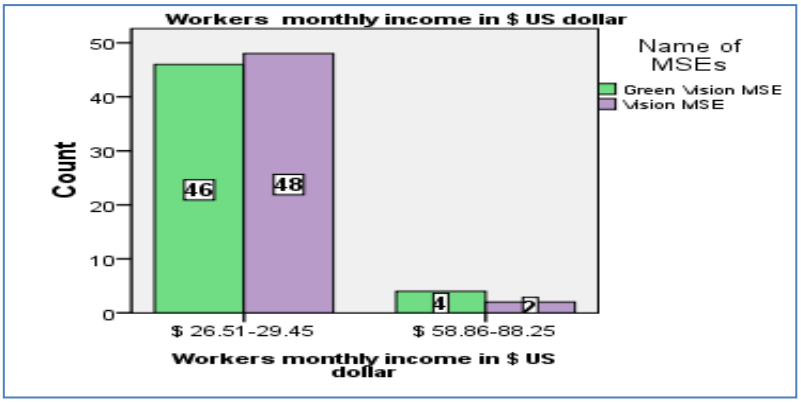

Chart 3: Respondent workers monthly income in $ US dollar
Source: author field survey, 2013

4.3.4.4 Current solid waste collection system and contractual arrangement of MSEs

From the interview conducted with Mr. Getachew (regional environmental protection core process) and Mr Dawit (from Bahir Dar municipality) it became clear that before the waste service has been privatised, a container system was the main waste collection method in the city. Since the containers were not emptied regularly, inhabitants obliged to dispose and throw their waste just around the container areas. As a result, there was unpleasant smelling up to certain distance from the containers.

To alleviate the shortcomings of the previous system, currently the solid waste collection service has been delivered through a door to door collection system in which waste collectors of MSEs knock on each door and take away the stored waste from each user. There is no communal container system in the city and all the community bins have been removed. Adopting the current door-to-door collection system, which started through Dream Light private limited company, the current MSEs have also implemented and promoted this system by taking a legal agreement with BDM.

During the starting of a MSEs waste collection service, the agreement was like a franchise system in which the MSEs deliver the service and directly collect their service charge from users. According to the managers of Green vision MSEs this method was too difficult. This is because at the time there was no enforcement mechanism designed to enforce the service users in order to pay the service fee.

Currently, the type of contractual agreement is arranged in a contract system, where the municipality collects the service fee and monthly pays to MSEs according to the contract. The service fee is collected with other utilities payments such as the water and electricity bill by the municipality. So now, the responsibility of MSEs is just provision of waste collection service to all citizens, regardless of checking whether users pay for the service or not.

According to Mr.Dawit, each household pays a monthly fee of $ 0.5 US dollar. While the commercial users pay more fee, $ 1.76-$ 41.18 US dollar monthly depending on the amount of waste they generate. This is because the commercial users generate a larger amount of waste material than households. Primarily the service fee was determined based on water consumption. However, the application of this system resulted in high complaints from users; particularly users such as local beer producers consume high amounts of water resources, hence setting the service fee related to water consumption, but that was unfair for households. Nowadays the service fee is revised and the MSEs have started working at$ 0.50 US dollar; parallely the private company service fee is also reduced from$ 0.70 US dollar to $ 0.50 US dollar. As per Mr.Dawit explanation, initially the service fee was determined by little awareness of users. After a while the municipality has tried to create awareness using meetings regarding the payment of users.

Besides to the information obtained from BDM SBCP and the two MSEs mangers the solid waste collection and transport service of the MSEs is not limited to high income groups but serve all citizens. Even though there are people in the city which cannot pay for the service due to economic reasons, the MSEs deliver the service including these individuals.

4.4 Factors that influence the sustainability of WCT service delivery by MSEs

4.4.1 Technical sustainability factors

The researcher developed criteria to assess the technical sustainability of MSEs WCT service. These are the type of equipments used (locally or imported) ,opportunities for maintenance and availability of spare parts for the equipments, accessibility of the area for WCT equipments and fitness to the local situation, availability of sufficient WCT equipments, use of separate storage bins and availability of compartment containers in the vehicle .

Waste collection equipments type

According to data collected from respondents and the researcher's field observation most of the waste collection and transport equipments used by the MSEs workers are locally produced and more labour intensive. All the respondents (100 waste workers) confirm that they mostly use locally made equipments like hand push carts, shovel, wheelbarrow etc. in their daily waste collection activity.

Widely used equipments for waste collection &transport service				
Count				
		Name of MSEs		
		Green Vision MSE	Vision MSE	Total
Equipments Used by waste workers	Locally made	50	50	100
	Imported	0	0	0
Total		50	50	100

Table 4 : Widely used equipments for waste collection and transport service by MSEs workers

Photograph 1: Locally manufactured waste collection equipments

Source: author field observation, 2013

Opportunities for maintenance of equipments

As mentioned in the above (table 4) most of the equipments used by respondents are made locally by small manufacturing enterprises/industries organized in the city. According to the interviewed managers of the two MSES, spare parts are easily accessible and maintenance is not a problem since they can be repaired by the local manufacturers.

Accessibility of the area and design of hand carts to the local situation

Adaptability of equipments to the physical and social environment is an important element for technical sustainability of the service. The accessibility of the area for waste collection trucks is very essential. The study findings reveal that 66% of the respondents replied that the waste collection truck have access to reach up to their working site. While 34% of respondents mentioned the waste collection truck have faced great difficulty and are unable to reach their waste collection site.

Workers response on the accessibility of the area for waste transport vehicle			
		Frequency	Percent
Valid	yes	66	66
	No	34	34
	Total	100	100

Table 5: Workers response on the accessibility of the area for waste transport vehicle

The design of waste collection equipments should fit with the existing road and topography conditions. In this case the researcher asked: "Do the existing waste collection equipments, such as hand carts, fit with the existing road and topography conditions?" According to the study 80 % and 11 % of the respondents replied respectively as disagree and strongly disagree and only 9 % of the respondents agree. Here, the researcher also observed that on rough road (surfaces) and sloppy sites it was difficult to move hand push carts by a single person and it is required to push even by more than four workers. So this may have an impact on the efficiency of each worker.

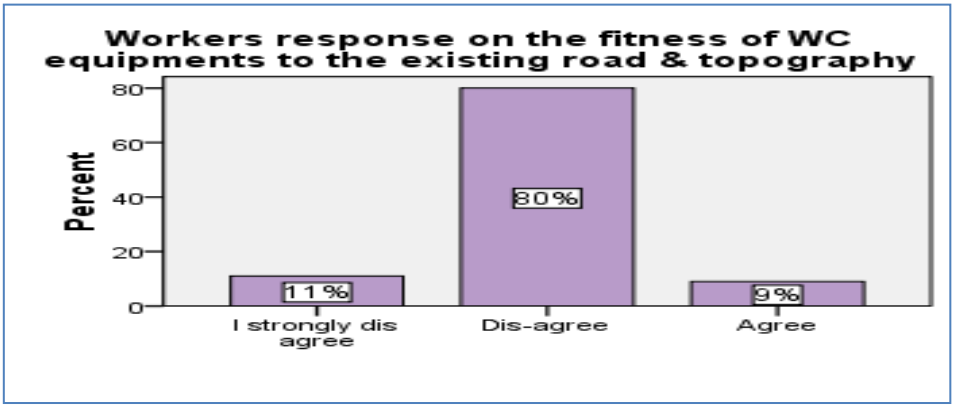

Chart 4: Workers response on waste collection equipments (hand carts) fitness to the existing road & topography

Availability of sufficient WCT equipments

In both MSEs service areas one of the greatest challenges for their activity is the lack of a waste transport vehicle. Even though both sample MSEs can use one vehicle, obtained with support from the municipality, it is not owned and ordered by the MSEs. As (per interview held with the two mangers of MSEs), the vehicles are general purpose trucks, which not only operate to transport the waste but also have other activities in the municipality, such as in road construction. Due to such reasons they cannot use the trucks as required. The data collected through questionnaires from waste workers shows that respectively 77 % and 23% of the respondents replied strongly disagree and disagree with the sufficiency of WCT equipments.

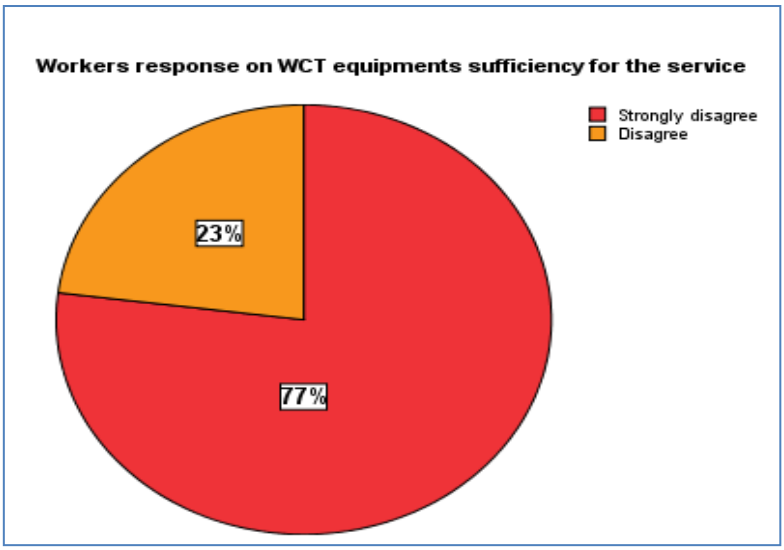

Chart 5: Workers response on the sufficiency of WCT equipments

The researcher observed this serious problem during field investigation. The workers kept the truck and stayed a minimum of 3 hours after finishing their work (collecting the waste at a point) since they have also the responsibility to load the collected waste.

"We try to work fast and finish the collection of waste as early as possible, but the truck can't be available on time. There are days even without eating our lunch, while looking for a truck. Moreover, we could not use our limited free time, since the truck violates the schedule and has come after a long hour of delay." (MSE Waste worker, 2013)

Photograph 2: Photograph taken when "Vision MSE" workers while looking for the truck for a longer time.
Source: author field observation

The data analyzed from the two MSEs waste workers, in table 6 below reveals that the causes of irregular service provision for users. As the analysis shows 45 respondents from Green vision MSE and 47 respondents from Vision MSE, totally 92 respondents from 100 sample respondents justify shortage of waste transport vehicle as the main constraint to provide frequent waste service. While few respondents, 5 and 3 respondents respectively from Green vision and Vision MSE mentioned that vehicles damage as a problem.

Main reasons for irregular WCT service * Name of MSEs Cross tabulation				
Count				
		Name of MSEs		Total
		Green Vision MSE	Vision MSE	
Main reasons for irregular WCT service	Shortage of waste transport vehicles	45	47	92
	Vehicles damage	5	3	8
Total		50	50	100

Table 6: Main reasons for irregular WCT services by MSEs

Use of different storage bins and conducting separate collection

The economic value of waste can increase if waste is segregated at source and stored in separate storage materials. But based on workers day to day observation, the study findings revel that 78% of the respondents replied that users has stored their waste without separation and 22% of the respondents confirm that users waste has been poorly handled/dispersed.

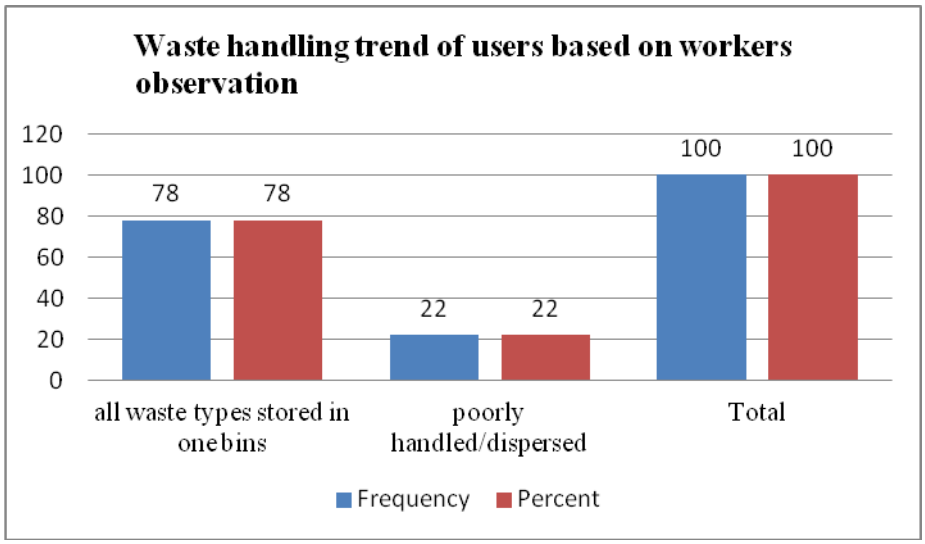

Chart 6: Waste handling trend of users based on workers observation

As indicated in the table below large number of waste workers which accounts 24 respondents in Green vision MSE and 26 respondents from Vision MSE each out of 50 respondents replied that the main draw backs for separate waste collection is both lack of attention from BDM and low awareness of users. While 22 respondents from Green vision MSE and15 from Vision MSE each out of 50 respondents replied that the main drawback for separate collection is low awareness of users. The remaining 4 and 9 respondents from Green vision MSE and Vision MSE respectively responded that lack of attention from the BDM as the main reason for the failure of separate waste collection.

Main reasons for the failure of separate waste collection				
Count				
		Name of MSEs		Total
		Green Vision MSE	Vision MSE	
Main reasons for the failure of separate waste collection	Lack of attention from BDM	4	9	13
	Low awareness of users	22	15	37
	Lack of attention from BDM & low awareness of users	24	26	50
Total		50	50	100

Table 7: Main reasons for the failure of separate waste collection

Availability of compartment containers in the vehicle & its convenience for loading

The existence of compartment containers in the vehicle is helpful for separate collection and transport. Based on field observation the trucks that are currently used to transport waste do not have separate containers. They are general purpose trucks which transport and dump all types of waste materials together. In addition, they are not convenient for workers during loading.

Photograph 3: Vision MSE workers while loading waste on General purpose truck (no compartment containers, unsafe loading)
Source: Author field observation, 2013

4.4.2 Environmental sustainability factors

Availability of environmental policies and enforcement mechanisms

The existence of environmental policies that guide activities of waste in line with the 3Rs is very crucial for the environment as well as to use waste materials for economic purpose. According to interview conducted with Mr. Getachew (regional environmental protection core process) there is no environmental policy particularly for the region (in the study area) but there is an environmental policy and the SWM proclamation at country level that advocates and emphasises for these 3Rs. However, according to the data analysed from respondents indicate that respectively 33% and 67% of the respondents replied the existence of these policies have very low and low supportive functions with regard to waste management.

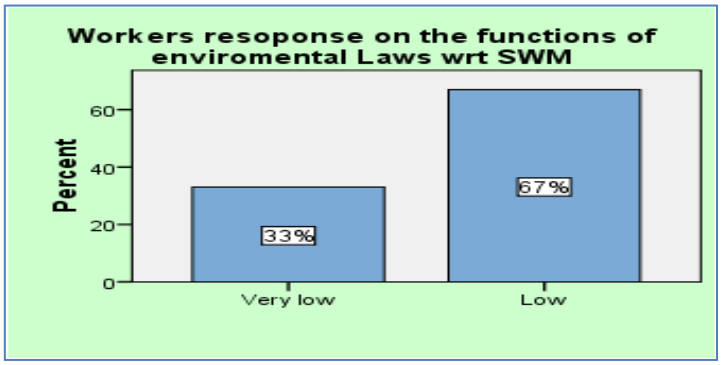

Chart 7: Workers response on the supportive functions of existing environmental laws

Availability of Monitoring and supervision function

According to Haan, Coad &Lardinois (1998), when enterprises are involved in delivering SWM services, at least four groups of supervisors should be organized from municipality staff, independent inspectors, MSE supervisor and beneficiaries. The research findings reveal

that 58% of the respondents have not even been supervised by the municipality, others 29% and 13% of the respondents replied that there has been very rarely and sometimes supervisory function by the municipality respectively.

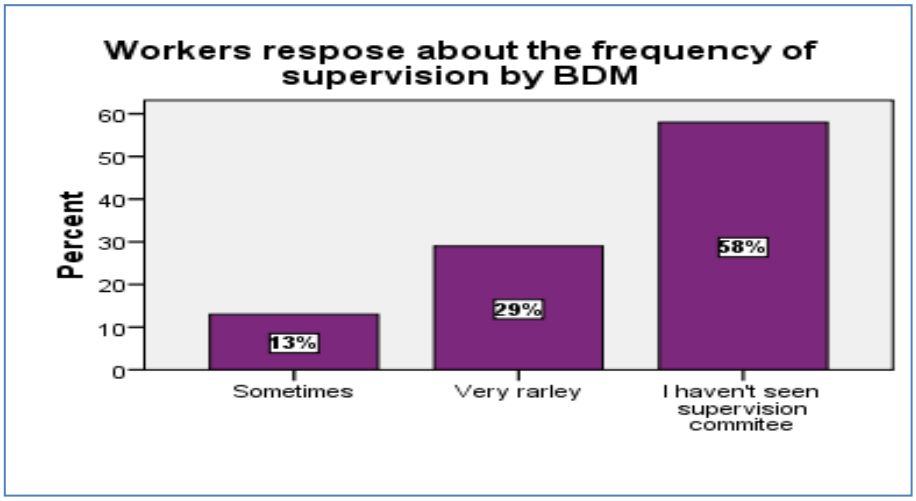

Chart 8: Workers response on the supervision function of BDM

MSEs Practices towards the 3 R's

According to Moreno, Rios & Lardinois (1999), to make MSEs service environmentally sustainable, the MSEs have to implement and gear their activities towards environmentally sound practices. In this case, an important composting practice has been started by one of the sample MSEs (Green vision MSE). Since this MSE has small farm (supported from BDM) workers have been using the compost for their fruit farm. However, according to the managers of Green vision MSE since the MSE have not their own trucks, it has been difficult to transport waste for this purpose (composting) and this limits the amount of compost to be produced. The second sample MSE (Vision MSE) is still practicing a collecting and dumping approach.

Photograph 4: Waste as a raw material for compost
Source: author field observation, 2013

Another important observation was that MSEs workers have started to collect some recyclable materials like plastics and metallic substances. The data analysed from both MSEs respondents reveals that 42% of the respondents has been collecting those materials individually while doing their regular waste collection service.

The response of waste workers about the collection of recyclable materials					
		Frequency	Percent	Valid Percent	
Valid	Yes	42	42	42	
	No	58	58	58	
	Total	100	100	100	

Table 8: The response of waste workers about the collection of recyclable materials

However, according to the workers, since there is no separation of waste at source by the users, they have faced great difficulties to get the usable materials after the waste has been mixed.

Photograph 5: Recyclable materials collection by Green vision MSE workers

Source: author field observation, 2013

Use of durable &closed storage materials by users

According to the data analysed from waste collector's observation, the widely used waste storage materials of households are sacks (89%) and card boxes (11%), which are water porous materials during the rainy season. No respondents replied plastics and metallic storages. Unfortunately this research was conducted during rainy season and the respondents of waste collectors said that "since the storage materials used by users are open, exposed to rain and easily permeable to water, it highly increases the weight of waste. Besides the addition of moisture (rain water) in the waste creates a bad smell which seriously affects our health. It has exposed us for coughing and asthmatic diseases."

Users waste storage material based on workers observation					
		Frequency	Percent	Valid Percent	
Valid	Sacks	89	89	89	
	Others such as card boxes	11	11	11	
	Total	100	100	100	

Table 9: Users waste storage materials based on workers observation

Photograph 6: Commonly used waste storage materials of users
Source: author field observation, 2013

Waste separation at source

According to interview conducted with the BDM and MSEs managers, FGD held with users and the data analysed from day to day observation of MSEs workers reveal that there is no waste separation at source in which 100 % of the respondents replied that waste has been hardly separated at source (see section4.4.1 chart 5).

Frequency of waste collection

As (Coffey & Coad, 2010) waste should be collected more frequently, at least twice a week to avoid unpleasant air pollution. The frequency of waste collection from sample respondents reveals that 46% of the respondents have been collecting users waste in two weeks interval. While respectively 37%, 3% and 14% of the respondents has conducted waste collection service once a week, twice a week and daily.

Workers response on the frequency of waste collection schedule				
Count				
		Name of MSEs		Total
		Green Vision MSE	Vision MSE	
Workers response on the frequency of waste collection schedule	Daily	8	6	14
	Twice a week	3	0	3
	Once a week	37	0	37
	Every two weeks & above	2	44	46
Total		50	50	100

Table 10: Workers response on the frequency of waste collection schedule

According to FGD held with users the frequency of waste collection was their main issue as it is not satisfactory. Users complain the service because of their waste has not been collected on time.

Explanation from MSEs manager about the constraint of frequent waste collection:

> *"This is not due to the weaknesses of the workers but the service is highly affected by the lack of transport vehicles at the required time. Since the vehicle has multiple activities in BDM, it mostly delays and violates the schedule. So, really we accept the comment coming from users side."(Interview with manger of MSE; July, 2013).*

Further one of the waste collectors explains as follows:

> *"There are big hotels where we have collected their waste daily. The problem is very serious during Saturday and Sunday since the offices are closed and the driver of the truck is also not available on these days. At this time we have faced a great challenge where to put the collected waste from hotels. When we tried to store somewhere until Monday, few illegal scavengers have scattered the waste on the asphalt and taken away the new storage sacks during night. This creates additional burden on us since the dispersed waste has to be collected again". (MSE waste collector, July, 2013).*

Availability of waste transfer site

The study findings show that there is no temporary transfer site prior to final disposal and instead the MSEs workers simply collect in any free space until the waste is transported to its final disposal site. The problem is when the vehicles are not available; the waste stays there for a week resulting in unpleasant smelling around the area. According to the interview held with the two MSE managers this causes a consequent or even conflict between waste workers and inhabitants of the area. As (per field observation) workers have collected the waste from users and stored almost on the foot path, which is really creating difficulties for the people to pass along the road. This is because no specific site or temporary stations are delineated in the city to collect the waste until its final disposal.

Photograph 7: waste collected on the foot path
Source: author field observation, 2013

Waste transport vehicles type

As (per field observation) all the waste transport vehicles used by MSEs are open types without any cover, this will lead to dropping of waste during transportation. Moreover, since

the vehicles are of a general purpose type, they are not convenient for loading and very risky for the health of MSEs workers.

Availability of proper final disposal site

According to UN-Habitat (2010) a final waste disposal site should be properly selected and fenced so as to protect the entrance of stray animals and to reduce the impact of waste on the surrounding environment as a whole.

In the study area, the final dumping site is not well protected, it has no fence. During field observations animals like cattle simply entered to the disposal site and according to inhabitants their cattle and sheep are affected by plastics while grazing. Due to this impact, farmers around the area highly complain over the site.

Photograph 8: Dumping site of the study area without any protective measure (fence)
Source: author field observation, 2013

4.4.3 Social sustainability factors

Equity service provision

One of the principles of ISWM is that inhabitants are entitled to get a service of waste management. In this case, according to the interviewed respondents from BDM and managers of MSEs all the MSEs workers have delivered the service without discrimination of citizens.

The service is not limited to the rich; it is equally delivered for even those that are unable to pay the required fee due to a very low economic status. As they mentioned, the mechanism that the poor has been served is through a legal procedure. When an individual is unable to pay for the service due to economic reasons, he has to have legal evidence from his kebele administration so that he does not have to pay for the service.

Users cooperation

Users' cooperation is an important factor for sustainability of the service. As (per interview conducted with Mr.Dawit, BDM sanitation & beautification core process), users motivation for the service have been improved/increasing from time to time. They try to adapt holding (storing) their waste in their surrounding until the waste workers have visited and collected the waste. According to him, this is a radical change in the city and additionally they are becoming familiar in paying their service charge with other utilities.

Further investigations from waste workers responses (chart 9 below) about users' cooperation reveal that from each 50 respondents in both MSEs, 11 respondents from Green vision MSE and 2 respondents from Vision MSE replied that users cooperation is high; 25 respondents from Green vision MSE and 30 respondents from Vision MSE replied that users cooperation is medium; 14 and 17 respondents respectively from Green vision and Vision MSE replied users cooperation is low. Only 1 respondent from vision MSE responded that users cooperation is very low. Totally from both MSEs (100 respondents), 13 and 55 respondents replied that users cooperation is high and medium. The remaining 31 and only 1 respondent replied that users cooperation is low and very low.

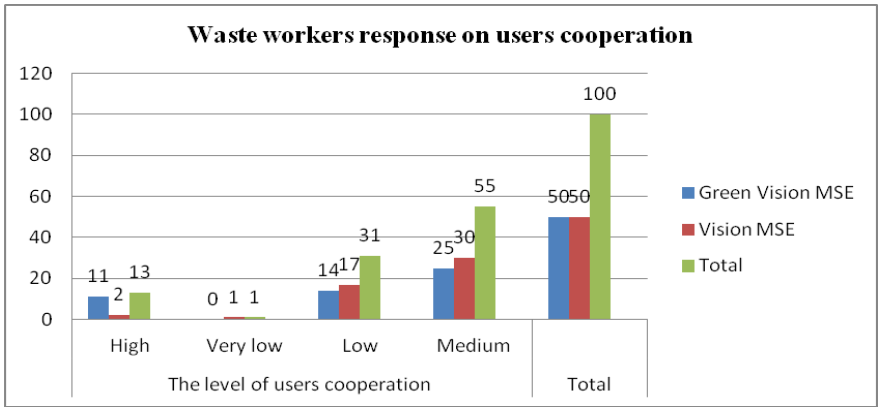

Chart 9: Waste workers response on Users cooperation

Waste workers satisfaction and their safety

The findings from both MSEs respondents show that from the total 100 respondent's waste workers, 93 respondents are not satisfied due to very low payment, and very few respondents which account 3 and 4 respondents are not satisfied respectively due to the complexity of the job and poor safety of workers condition. For comparison purpose the two MSEs respondents reasons for dissatisfaction are presented in the table below.

Reasons for dissatisfaction of workers				
Count				
		MSEs		Total
		Green Vision MSE	Vision MSE	
Reasons for dissatisfaction of workers	Safety/healthy of workers is poor	1	3	4
	Very low payment	48	45	93
	The job is very challenging	1	2	3
Total		50	50	100

Table 11: Reasons for dissatisfaction of workers

The Green vision MSE managers said "The existing payment of workers is very minimum as compared to the challenge that we have faced. If the payment is improved, the workers are interested and committed to the work,"

"We have delivered the service in a condition that a kind of worm from the waste drops on our body; we are doing this because we have convinced ourselves for the work. And believing and hoping that the payment will be improved, but not yet; while the living cost has been increased."(Waste worker, July, 2013)

Waste workers safety is another decisive factor. Workers should have enough protective equipment like foot wear, gloves and masks for safety. Based on workers responses in the sample area, 92% have protective clothing while the remaining 8% have no protective clothing.

Workers response on availability of protective clothing			
		Frequency	Valid Percent
	Yes	92	92
	No	8	8
	Total	100	100

Table 12: Workers response on availability of protective clothing

Though a large number of the respondents have responded that they have safety clothes, the researcher (during field study) observed that a considerable number of waste workers were actively engaged without wearing even hand-gloves.

Photograph 9: Waste workers without hand Gloves during waste collection

(From these 3 waste workers only the lady one wear hand gloves, the remaining 2 workers did not use gloves).

Source: author field observation, July, 2013

Further investigations on the safety of workers indicate that 36% of the respondents have faced either contact with hazardous materials or injury.

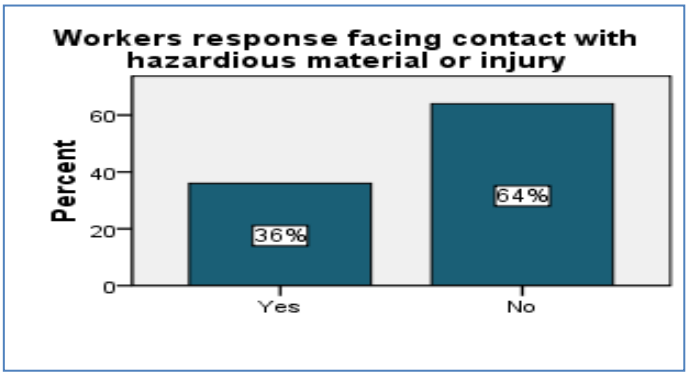

Chart 10: Workers response on facing contact with hazardous material or injury during waste collection

Quotes from MSEs workers:

"Since there is no waste separation at source, hidden materials like broken bottles and needles highly injured our hands even through penetrating the glove during collection. Besides, especially the hand gloves are worn out frequently since it has high load on it, at this time there is no fast response on supplying the glove and sometimes we decided to buy gloves from our own pocket." (Waste worker, July 2013)

"The problem is further aggravated by the absence of any medical support for the workers.

During door to door collection for instance, one of our friends was bitten by someone's dog and she has been treated at her own expense with a great problem.

Some of us have families, if we have faced a health problem and stay at home without work, the whole family will be endangered. Hence, our health care should be considered." (Waste worker,July 2013)

Photograph 10: personal interview with waste worker

Creating Job opportunity in the society

According to Klundert& Anschutz (2001) the waste management system should be able to promote employment and income generation in the society. The findings in the study area reveal that the current SWM system has created job opportunities particularly for the vulnerable groups in the society (youths, women). For example from the sample respondents 83% are women. This shows that there have been more employment opportunities for women.

Further investigations indicate that the existing waste management service has also started to absorb university graduated youths, 6% of the respondents are graduated from university.

4.4.4. Financial sustainability factors

Factors such as beneficiaries, willingness to pay, level of cost recovery and revenue generating mechanisms, availability of incentives and access to credit determine the financial sustainability of the MSEs service. The next sub section discuses the result of these factors in the research area.

Beneficiaries' willingness to pay

According to Mr.Dawit (BDM SBCP) primarily the service charge was determined through little awareness of users .Nowadays the service fee is revised and the MSEs have delivering the service and users are voluntary to pay for the service and has been collected with water bill via BDM (see section 4.3.5).

According to FGD held with users of Vision MSE, participants said that "We are already paying for the service but the problem is the collectors have come once in two weeks and sometimes they have come in three weeks interval."

Cost recovery and revenue generating mechanisms

According to Moreno, Rios & Lardinois (1999), financially the MSEs can be sustainable since they could support themselves with the payment received from citizens and covering the cost of the service. However in the study area the MSEs financial contract with the BDM is very minimum and highly limited for salary of workers.

The service payment of the MSEs is calculated and paid from the municipality based on workers salary with very little administration budget. According to the manager of Vision MSE there are 71 workers in their MSE; out of these 5 management bodies have a monthly salary of 1500.00 Ethiopia birr ($ 88.25 US dollar) and the remaining 66 workers have a monthly salary of 500.00 Ethiopia birr ($ 29.40 US dollar).

Then, the total contract budget released from the BDM to MSEs service payment will be 5*1500.00+ 66*500.00 = 40,500.00 Ethiopia birr or $ 2382.35 in US dollar (which is for the monthly salary of the workers); and only 5000.00 Ethiopia birr or $292.15 in US dollar for administrative costs like for maintenance of hand carts, to buy hand gloves, telephone expense, etc. This shows that almost their total budget is not more than salary.

The same financial contract system (service payment) has also been applied to Green vision MSE. The absence of any revenue mechanism other than this fixed service payment from the BDM is another challenge for MSEs development.

Availability of incentives and access to credit

According to interview conducted with the two sample MSES Managers there is no financial incentive except covering the cost of fuel and salary of the vehicle driver (the driver is employed in the municipality). Besides, due to long bureaucracy of the financial institutions they did not still get financial credit.

Setting fairly Fees

Based on the data obtained from BDM, there are different collection fee rates for households and commercials. Each household pays a monthly fee of 8.00 Ethiopia birr or $ 0.50 US dollar, while the commercial users pay more fee, 30.00-700.00 Ethiopia birr or $1.76-$ 41.18 in US dollar monthly depending on the amount of waste they generate. According to the

interview held with BDM officials the higher payment of the commercial users is because they generate a larger amount of waste material than residential users.

On the other hand (as per the interview conducted with the managers of MSEs) many people who live in rented housing still do not pay for the service. Some individuals have even more than 15 dormitories, and are considered as a single household or user. Besides there is no extra payment system when users generate more waste on special days like ceremonies. All this can reduce the actual payment for the service.

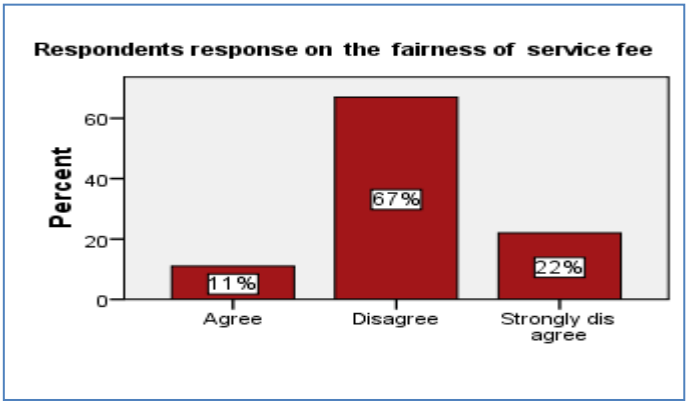

Chart 11: Respondents respond on the existing service fee

4.4.5. Institutional sustainability factors

Sufficient contract periods & conducive regulatory system

The availability of a sufficient and conducive regulatory system according to the local context is helpful for the sustainability of an institution. According to Cointreau-Levine & Coad (2000) the contractual periods should enable economic depreciation of assets and repayment of loans, developing systems and facility sizes to make financially feasible.

The investigation in the study area shows that the duration of the contract agreement between BDM and MSEs is for three months and renewed every three months, which is too short. Besides, according to the managers of Green vision and Vision MSEs the agreement does not allow to work in flexible manner. i.e

> *"During special ceremonies like wedding, holidays or meetings, hotels and similar institutions generate more than the usual amount of waste. In these cases, there is a high load in the work of MSEs and obliged to do this task without any extra benefit". (Interview with MSEs managers, July, 2013).*

Provision of trainings for MSEs managers and workers

Capacity building is crucial since it increases workers knowledge and skill for better waste management system.

According to Mr Dawit (BDM SBCP) and MSEs managers, MSEs workers took training at least once in collaboration with Bahir Dar technical and vocational collage about safety, how to manage the different collection tools, entrepreneur, customer and financial management. In addition, the two MSEs have shared experiences from Addis Ababa and Awassa cities. Based on workers response (in the graph below) 59% of the respondents have

taken training two times and others 29 %, 10% and 2% respondents had taken training once, three times and more than three times respectively.

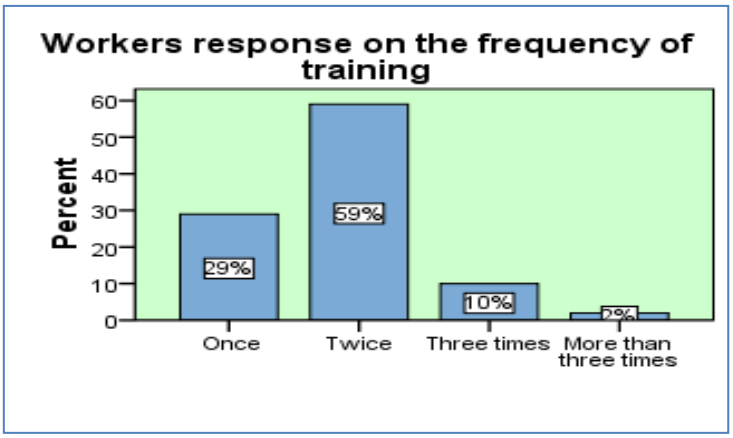

Chart 12: Waste workers response on the frequency of training

Availability of reward systems

Employ evaluation and reward systems also help the workers to enhance their working capacity. In this case, according to the interviews conducted with both MSEs managers and all the 100 respondents confirm that there is no reward mechanism until now for the existing workers.

Availability of supervision and monitoring system

Monitoring the actual implementation of the service is very crucial to establish and design mechanisms for effective PPP and feedback from those who implement waste collection service and users as well.

The investigation in the study area indicates that 58 % of the respondents confirmed that no supervision has been conducted by BDM. Others, 29% and 13% respectively, replied that there has been very rarely and sometimes a supervisory function by the municipality (See section 4.4.2; Graph 7).

Besides (according to interview held with Mr Dawit (BDM SBCP) and MSEs managers) there has not been conducted any customer satisfaction survey about the service by MSEs. This may widen the information gap between service facilitator (BDM), service providers (MSEs) and beneficiaries.

4.4.6 Political/legal sustainability factors

A policy/legal ground that are available at local context, its enforcement mechanisms to implement SWM measures and the existence of rules to participate the private sector (MSEs) NGOs etc. determine the legal sustainability of any waste service. In these aspects, the study findings in the research area reveal the following situation.

Availability of policies at local context & enforcement to implement SWM activities

According to interview conducted with Mr. Getachew (regional environmental protection core process) there is no environmental policy particularly for the region. As he further explained, there is only an environmental policy and the SWM proclamation at country level; and this has created difficulties to enforce and implement SWM activities as per the local context. The study findings from respondents also reveal that respectively 33% and 67% of the respondents replied that these policies have very low and low supportive functions (see section 4.4.2, chart 6).

Existence of rules that allow participating privates (MSEs) and NGOs

According to the reviewed policy/legal documents such as the country's environmental policy and the recent SWM proclamation no.513/2007 allows for privatization in solid waste services. There is also a national MSE promotion and development strategy which emphasizes the important contribution of MSEs and the essential mechanisms to strengthening them. The information obtained from BDM shows that one private firm and four MSEs are engaged in the city's waste management service with the additional support of the available NGOs (FFSCE and UNDP). Besides, these MSEs are formally/legally registered under the existing legal rules.

4.5. Government support and stimulation mechanisms for MSE's

According to Haan, Coad & Lardinois (1998), the government should have supporting mechanisms that can enable enterprises to work in a conducive environment.

So that the following sub section discusses the findings of government supporting mechanisms in the study area.

4.5.1 Providing trainings

As mentioned in section 4.4.5 (chart 13) the two MSEs have shared experiences from other cities. Regardless of the variation in frequency of training, all respondents (100 respondents) have taken training in related with their work such as in managing the different waste collection tools, entrepreneur, customer and financial management.

4.5.2 Financial supporting Mechanisms

Availability of Incentives

According to the data obtained from BDM and MSEs, there are no direct financial incentives given to MSEs (except the service payment); the municipality has covered the cost of fuel for waste transport and the salary of the drivers. Here, the drivers are employed in the municipality.

Regular service payment to MSEs

In this case, all the respondents replied that their monthly payment has been paid without delay. Whether the service fee is collected from users on time or not the municipality has paid the service payment for MSEs regularly.

Access to credit

The support of the government in facilitating access to credit is very limited. According to the managers of Green Vision MSE and Vision MSE due to long procedural rules the financial institution still did not allow the credit.

4.5.4 Provision of municipal equipments & land

According to the interview conducted with Mr. Dawit (BDM SBCP), MSEs in the city did not have vehicles for waste transport. Recently, to encourage and improve the service of MSEs the municipality has provided one vehicle for each of the MSEs. But as the MSEs managers frequently mentioned, the problem is the availability of these trucks at the working hours of MSEs. Since the trucks are still not owned and ordered by the MSEs.

BDM provided a land for the construction of a Green vision MSE office and with financial support of UNDP this MSE constructed their own office.

Photograph 11: Green vision MSE office constructed in collaboration with UNDP & BDM support
Source: author field observation &interview with the manager of the MSE

Another observation conducted by the researcher in this MSE (Green vision) was the support of composting site and fruit farm from the municipality.

But, on the other extreme one of the sample MSE (Vision MSE) has not even a temporary office. According to the manager of Vision MSE due to long bureaucracy still they do not have the working office.

> *"There is no specific site for waste collection equipments such as hand carts. The equipments are placed somewhere on the kebele administration compound. Here in the kebele many customers come for different issues and they complain since the equipments have some bad smelling after working." (Interview with Vision MSE manager, July, 2013).*

4.5.4 Supervision function and monitoring

Based on Moreno, Rios &Lardinois (1999) whether the services are totally or partially privatized the responsibility for control and supervision must continue to be a municipal function. However; in the study area the data analysed show that 58% of the respondents are not supervised by the municipality, while 29% and 13% of the respondents replied respectively that there has been very rarely and sometimes supervisory function by the municipality (see section 4.4.2; Graph 7).

4.5.5 Awareness raising programs

According to Zhu, et al. (2008), all the systems in SWM from HH waste storage to waste separation, recycling, amount of waste, willingness to pay for services, etc. depend on public awareness. In this case, according to interview conducted with Mr. Dawit (BDM SBCP), the main awareness creation method of BDM about SWM is through public meetings. Here, posters, advertisements in newspaper, television, radio, etc. are less recognised.

On the other hand, the way of awareness creation had shortcomings. Especially at the starting of fee collection system from users, it has raised complaints from user's side. This is because

the municipality initially did not create awareness about the amount of fee to be collected and the method of fee collection. Besides, according to respondent waste workers one of the major drawbacks for separate collection is both lack of user's awareness and lack of attention from the municipality (see section 4.4.2, table 7).

4.6 Respondents suggestions for future improvement of the service

The researcher asked the respondents "What do you suggest so as to improve the service in the future? According to their response from each 50 respondents in both MSEs reveal that 20 and 13 respondents respectively from green vision and vision MSEs replied that increasing the service payment; 24 and 33 respondents respectively from green vision and Vision MSEs replied improving the WCT equipments and the remaining 6 and 4 respondents respectively from green vision and Vision MSEs replied that promoting users awareness in the future.

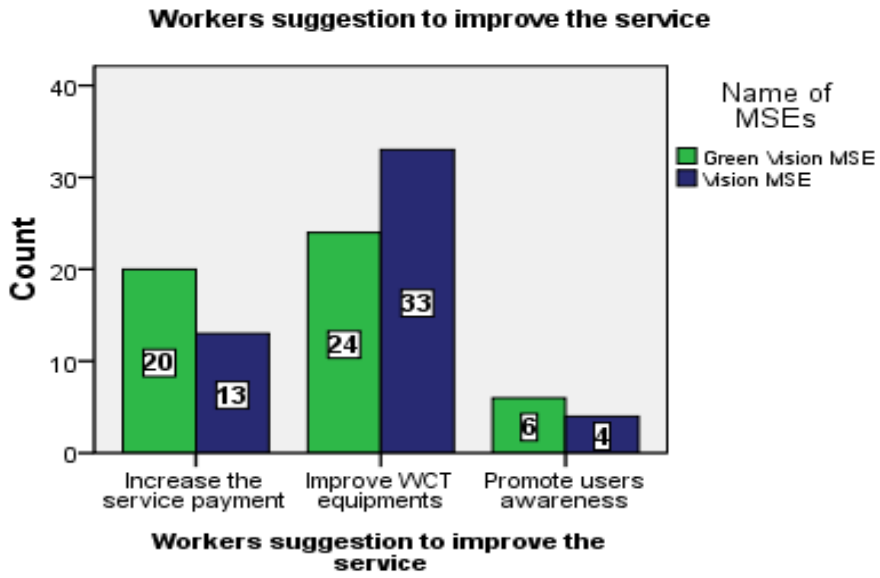

Chart 13: Workers suggestions for future improvement of the service

CHAPTER FIVE: CONCLUSIONS AND RECOMMENDATIONS

5.1 Answers to research questions

How is the current solid waste collection and transport system of MSEs organized in Bahir Dar?

According to the study findings the main drivers for the municipality to find other alternatives and highly initiated to organise the MSEs are; the absence of any competitors for the PLC waste service in the city and their service quality decrement through time, as well as high interest on profit and users complaints about the higher service charge of the PLC. Besides, the purpose of organizing these MSEs has multifaceted objectives. The immediate objective is for economic purposes, that is creating employment opportunities for poor people on the street. The second purpose is to keep the cleanliness of the city by creating more competitors.

The organization of MSEs is basically initiated by the government. The main actors or supporters in the process of organizing the MSEs are the Bahir Dar city municipality, Amhara region environmental protection bureau and Bahir Dar city MSEs promotion office. In addition to these governmental offices, the two NGOs support UNDP and FFSCE play a great role in the current waste services of MSEs.

The sample study findings show that a large number (78%) of the MSEs workers are organized under the category of youths, age between 15 and 29 years, amongst which a higher percentage (86%) of the waste workers is women. Besides most of the workers have educational back ground of primary school (48%) and illiterates (41%). Here, universities graduated youths (6% of the respondents) are also now the workers of the enterprise. Therefore; it may mislead to conclude that waste workers in MSEs are totally lead by illiterates (low social status) since higher level graduate workers are joining the work. Large numbers of waste workers in both MSEs have very low monthly income.

The MSEs are legally registered. They have also legal contractual arrangement with BDM and work in a contract payment system in which service charge from users is collected by the municipality and the municipality pay a regularly service payment for the MSEs based on the agreement. The current solid waste collection system of MSEs is entirely focused on door to door collection service and it has been provided for all citizens.

Generally, the organization of MSEs is purposefully and legally initiated by the local government so as to create employment opportunities for the youths and poor people (dominantly women's are the workers). In line with this, keeping the cleanliness of the city through them is the second main objective of organizing the MSEs. Currently they (MSEs) are providing a door to door waste collection service with low monthly payment rates for the workers and at a lower cost for the users.

Which factors influence the sustainability of waste collection and transport service delivery by MSEs in Bahir Dar?

The factors that influence the level of sustainability of WCT service delivery by MSEs are identified and discussed through assessing the main and sub variables of sustainability aspects based on the ISWM model. The variables are assessed and presented using relevant indicators in accordance with the findings in the research area as follows.

Technically, though the MSEs have started using locally produced technologies such as hand carts, according to the findings, 80% of the respondents disagree as they are not well fit with

the existing road and topography conditions. Waste transport vehicles are general purpose types which are not convenient for loading and not suited for separate collection since they lack compartment containers. Moreover, the lack of sufficient WCT equipments; especially the lack of waste transport vehicles, highly impedes the waste collection activity of MSEs. Besides because of low awareness of users and lack of attention from BDM waste is hardly segregated at source, the trend shows that almost every waste is stored in one storage material. Due to these main factors the service is not technically sustainable.

Environmentally, the service is constrained by several factors. The absence of an environmental policy particularly for the region influences the implementation of the service. The absence of waste separation at source has impact on the collection of recyclable materials. The waste storage materials are not water proof and closed, in addition they are exposed to rain and sun which has resulted in bad odour and affects workers health. The frequency of the waste collection schedule is not short, rather largely scheduled in once a week and more of once in every two weeks which can create favourable conditions for the breeding of microorganism's and pollution. The waste transport is highly limited by the lack of an owned waste transport truck. Besides, the collected waste is not safely disposed in the area. There is no temporary transfer site prior to final disposal and instead the workers simply store in any free space, which results in health related problems and conflicts with inhabitants. All the waste transport vehicles used by MSEs are open types which have no any cover. This will lead dropping of waste during transportation.

Further, the final dumping site is not well protected; has no fence. Due to this, animals like cattle simply enter to the disposal site and according to inhabitants their cattle's and sheep has been affected by plastics while grazing. This shows the dumping site by itself has an adverse effect on the surrounding environment. The inadequate monitoring and supervisory function worsen the situation so that it is environmentally not sustainable.

Socially, the service is partly sustainable. The MSES have created job opportunity particularly for the vulnerable groups in the society (the women, jobless youths) and even for educated people. They are currently trying to provide the service for all citizens without discrimination (achieved equity principle). In addition, the existing cooperation of users towards the service is encouraging in which 55% of the respondents replied as the users cooperation is medium and 13% of the waste workers replied that users cooperation is high. But workers satisfaction is low due to minimum payment rates their safety is not well kept. Though most of the workers responded as they have protective cloths, they do not use it regularly. Besides they lack medical support. Due to these cases, the service is partly socially sustainable.

Financially, the MSEs are in trouble. The service payment from the BDM to MSEs is almost for the workers monthly subsistence which does not lead and encourage them being financially self- sustainable and to do further activities. Besides, the unfair user's service payment system, unavailability of other revenue generating mechanisms and long bureaucracy of the financial institutions to provide credit further adds to the problem. Due to these main challenges the MSEs are financially not sustainable.

Institutionally, the service is also not sustainable. This is because the duration of the contract agreement of MSEs is too short (a three month contract) for cost recovery. Besides, to its limitedness in time, it does not allow the MSEs to work in a flexible manner. There is no reward system applied to the workers. On the other hand, the monitoring and supervision function is also weak. No customer (users) satisfaction survey has been conducted about the service of the MSEs.

Politically/legally the existing laws permits for privatization to engaged in solid waste services. Besides the MSEs are legally accepted and registered under the existing law. But policies and proclamations are mostly at the country level and they lack contexuality and enforcement mechanisms during implementation. As a result they have minimal functions and make the service partly politically/legally sustainable.

Generally, though the service is partly socially and politically sustainable most of others equally important factors or elements of sustainability are not achieved. The sustainability of the service is highly influenced or affected by a number of factors. Mainly, a serious shortage of waste transport vehicles which has a great impact on the frequency of waste collection, poorly designed hand carts, absence of waste separation at source, unsafe waste disposal methods, insufficient funding systems, inadequate monitoring and supervision and low enforcement of rules to implement activities as per the local context. Because of these challenges the current waste service delivery of MSEs is unsustainable.

The matrix table below (table 13) shows that the summary of the study findings in comparison with the sustainability assessment indicators.

Table 13: Sustainability outcomes Matrix

Sustainability out comes Matrix			
Sustainability Factors	**Assessment Indicators**	**Outcomes**	
		Green vision MSE	**Vision MSE**
Technical	Use of locally made equipments	+	+
	Opportunities for maintenance	+	+
	Adaptability of hand carts to the physical environment (road, topography)	-	-
	Accessibility of the area for waste collection truck	-	-
	Availability of sufficient WCT equipments	- -	- -
	Compartment containers in the vehicle	- -	- -
	Use of separate storage bins	- -	- -
Environmental	Environmental policies that promote 3 R's & enforcement mechanism	-	-
	MSEs practices towards the 3 R': Composting Collecting recyclable materials	+ +	- +
	Frequency of waste collection by MSEs	-	-
	Waste separation at source	- -	- -
	Use of durable &closed storage material	-	-

	Availability of waste transfer sites	-	-
	Properly protected (fenced) final disposal site	-	-
	Monitoring &supervision function	-	-
Social	Equity service provision	+ +	+ +
	Users cooperation	+	+
	Job creation in the society	+ +	+ +
	Waste workers satisfaction	-	-
	Waste workers safety: Availability of protective cloth,	+	+
	Regular use of protective cloths,	-	-
	Availability of medical support for workers	–	–
Financial	Revenue generating mechanisms	- -	- -
	Level of cost recovery	- -	- -
	Beneficiaries willingness to pay	+	+
	Availability of Incentives & credit access	- -	- -
	Setting fairly fees	-	-
Institutional	Availability of sufficient contract period	-	-
	provision of trainings	+ +	+ +
	Availability of reward systems for workers	-	-
	Availability of monitoring and supervision system	-	-
Political/Legal	Legally registration of the MSEs under the existing rule	+	+
	Availability of enforcement mechanisms to implement SWM activities	-	-
	Availability of policies at the local context	-	-
	Existence of laws that allow to participate privates (MSEs), NGOs	+	+

***Source**: Designed by the researcher by comparing the research findings with the indicators*

Key

+ + = Highly positive **+** = Positive **- -** = Highly negative **-** = Negative

The matrix table (table 13) reveals the following outcomes:

In terms of technical sustainability, since the MSEs use locally made waste collection equipments and which gives them an opportunity for the maintenance of the equipments

nearby, the matrix shows positive in these aspects. However, others most of the results are negative and highly negative. Especially the in availability of sufficient equipments (lack of vehicle) influences the activities or the services of MSEs and it shows highly negative in the matrix. Besides the waste collection equipments (hand carts) have a problem of fitness to the existing road and topography of the area, there is no separate storage, there are no compartment containers in the vehicles, all these show negative outcome and finally contributes to technically unsustainable.

Environmentally, except the MSEs activities or practices towards the 3 R's(since they have started collecting recyclable materials and composting by one of the MSE) all other outcomes are negative and since there is no waste separation at source the matrix shows highly negative results that make the service environmentally unsustainable.

The social aspect scores the most positive in the matrix. The MSEs are equally delivering the service for all citizens, there are users cooperation for the service, high job creation in the society (for vulnerable groups on the street, graduated youths), most workers also have protective cloths all these have positive and highly positive value for the social sustainability of MSEs waste service. Here, there are some limitations such as irregular use of protective cloths, absence of medical checkup and dissatisfaction of workers because of low payment which have negative value.

Financially, except user's willingness to pay which is positive, most of the other results are highly negative and which has the highest negative value in the matrix.

Institutionally, provision of trainings for the waste workers is well done and has positive value, while most of other indicators are not achieved and show negative value.

Politically/legally, since the law permits for privatization and the MSEs are legally accepted and registered under the existing rule, they have positive value, while the policies are still at the country level and they have low enforcement/power at the local area due to these they have negative value in the matrix table.

To summarize, the matrix table indicates that based on their higher negative value the sustainability of the service by MSEs is highly affected or influenced by financial, technical, environmental, institutional, political /legal and social factors.

By which mechanisms does the government support and stimulate the waste collection services delivered by MSE's in Bahir Dar city?

In providing trainings to MSEs workers, the government has played a better role in which all sample respondents have taken training at least once and more than once. Recently, the government has also tried to strengthen them through educated youths.

Financially, the government has paid the service payment of MSEs regularly. This was encouraging; however, it is very minimum payment rates which cannot lead the MSEs financially sustainable. The financial problem of MSEs is further aggravated by the lack of support in providing incentives and access to credit.

In terms of equipments and land support, even though the municipality has provided one vehicle for each of the MSEs, the way of providing the vehicles is highly problematic. The MSEs cannot own and order the vehicle as required for the waste collection service and this seriously affects the service. In addition, though one of the MSE (Green vision MSE) has his own office and composting site, the Vision MSE has faced difficulties due to a lack of these facilities.

The data analysed from respondents reveal that the municipality has a very low supervision function. In addition it has also a limitation in awareness creation methods. It was like "the cart before the horse." That is the municipality initially did not create understanding for users about the amount of fee to be collected and the method of fee collection as well.

Generally, the mechanisms employed by the municipality to strengthen MSEs are too limited in most of the aspects. Particularly in financial support, waste collection equipments and facilities support, monitoring and supervision system and awareness creation methods are very weak which does not lead the MSEs to be a sustainable service provider.

5.2 Reflections on Literature reviewed

The literature reviewed in chapter two, enabled the researcher to develop a basic conceptual framework and formulation of questionnaires used during primary and secondary data collection. The reviewed literature enabled to expand author's knowledge on the important aspects of sustainable solid waste management, and the role and sustainability of MSEs in waste service delivery.

Harper (2000) findings show that the initiative or need for MSEs may come from the government or at the grass root level individuals or groups can initiate the change. NGOs can also play a great role. In the research area, it is the government that has played a leading role/ initiation to organise MSEs. Here, the two NGOs (UNDP and FFSCE) support has played a significant role for the current services of MSEs.

Authors Haan, Coad and Lardinois (1998) state that MSEs have an advantage over one large contractor. This is because if there is a single contractor, the clients have little control of the price as well as the quality of the services. This is true in the study area in that one of the initiations to organise MSEs is to create competitors for the PLC waste service, since the PLC in BDM has increased their service fee on users and their service quality has reduced through time.

According to Lardinois (1996), the contractual system encountered in Guatemala, Costa Rica and Bolivia is that the MSEs deliver the services to the users and the users pay the MSEs directly. However BDM has quite a different approach in which the MSEs provide the service and the municipality collects the fee from users and regularly pays to the MSEs.

According to Ababio, Arguello & Gabbay (2013), in Accra the house to house system is mostly practiced in upper and middle income zones and communal container collection is implemented in low income groups. But the research findings in BDM reveal that the door to door waste service is not limited to the rich, it is equally provided for even those that are unable to pay the required fee due to a very low economic status. Besides there is no communal container system currently practiced in the study area.

According to Klundert & Anschutz (2001), in order to be technically sustainable, the technologies should adapt the physical environment such as topography nature, road accessibility and other physical requirements. But the study findings in BDM indicate that waste collection equipments/hand carts are too heavy and demand a number of workers to move the equipments, especially in rough and sloppy areas. While in case of using locally made technologies the findings are in agreement with Haan, Coad and Lardinois (1998), MSEs basically rely on locally available and low cost technologies such as hand carts.
In addition, authors Hoornweg & Tata (2012) justified that using general purpose vehicles for waste service is a great mistake since they are inefficient. In agreement with this suggestion,

the study findings revealed that the MSEs are still using the general purpose trucks and they are not conducive for the waste workers during loading; transport and to separate the waste.

According to Scheinberg, Klundert & Rudin (2000), the Dar es Salaam MSEs have taken long term activities environmentally in recycling and waste recovery. The study findings from sample MSEs shows the MSEs have started to collect recyclable materials during waste collection. But this activity of workers is constrained by the absence of waste separation at source. One of the MSE has tried to use waste as a raw material for composting. However, this practice is highly limited by the lack of a waste transport vehicle. While the other MSE is only practicing a collecting and dumping approach. As (per Coffey & Coad, 2010), waste should be collected more frequently, at least twice a week to avoid unpleasant air pollution. However the frequency of waste collection from sample respondents revealed that users waste has been collected still once every two weeks.

Coffey & Coad (2010) further suggested that specifying and implementing an adequate number of small transfer stations is more useful than a single large one. Improper transfer arrangements can cause inefficiencies and scattered waste. In the research area there are no large and small transfer sites. Rather waste is collected in any free space and leads to bad smelling in the area as well as a conflict between collectors and inhabitants. Moreno, Rios & Lardinois (1999) findings in Guatemala showed that 30% of the waste transport trucks are closed vehicles. This technology responds to lessen the health risks to the workers. While the sample studies in BDM MSEs revealed that all waste transport vehicles are open types and they are not even safe for the workers during loading. UN-Habitat (2010) recommends that the final waste disposal site should be properly selected and fenced to reduce the impact of waste on the surrounding environment. In the research area, the final dumping site has no any protective measure like fences and because of these livestock resources of the neighbourhood farmers are highly affected and also results in air and ground water pollution.

Socially, according to Klundert & Anschutz (2001), one of the principles of ISWM is that all inhabitants are entitled to get a service of waste management. In this case, the MSEs workers in the research area have delivered the service without discrimination of citizens. According to Harper (2000), MSEs in Tanzania create more job opportunities for women. More similarly 86 % of the respondents of waste workers from the sample MSEs in the research area are women. As per UN-Habitat (2010), sound waste management contributes a lot to the healthiness of the inhabitants as well as workers involved in waste collection. But the findings in the study area show that there is no medical check-up or support for waste collectors and they face contact with hazardous materials or injuries.

According to UN-Habitat (2010), designing a continuous assessment of satisfaction and creating collaboration between inspectors and citizens is important for institutional sustainability. Besides employ evaluation and reward systems also help workers to enhance their working capacity. Here the investigations in the study area show that there is no assessment conducted on users satisfaction about the MSEs service and reward systems hardly exist for the waste workers.

Financially, the findings in the research area are in agreement with that of Harper (2000) findings in which the municipality pays them the minimum possible rates which creates obstacles for growing and extending MSEs services. This practically happened in the study area, the MSEs are not financially sustainable due to very low payment from the BDM and lack of other of revenue mechanisms.

According to Moreno, Rios & Lardinois (1999), whether the services are completely or partially privatized the responsibility for control and supervision must continue to be a

municipal function. However, the findings in the research area indicate there has been a very weak supervisory function of the municipality. In addition, Haan, Coad & Lardinois (1998) suggested that when the municipality supports equipments (for instance trucks) to the enterprises there should be a clear leasing agreement or they can be totally sold to the MSEs. Though the BDM in the study area has provided vehicles for the MSEs, the MSEs still did not owned and use the vehicle in a legal agreement and this influences their work at large.

5.3 Recommendations

It is justified that in the conclusion part the MSEs service delivery is currently not sustainable for the various reasons mentioned above. But this does not mean that the service delivery of MSEs cannot be improved. In order to improve and make the enterprises service delivery more sustainable in the future the following recommendations are proposed.

For technical sustainability

The existing hand carts should be modified to fit with the existing road, topography conditions and so as to easily push by the waste workers.

Moreover, the provision of a waste transport vehicle to MSEs should be given priority in order to deliver frequent waste collection service. Here, the MSEs should have their own waste vehicle or the vehicles which are previously supported from the municipality should be legally transferred and used regularly for the MSEs.

Since the existing general purpose vehicles are not convenient for waste loading (for the efficiency of the work as well as workers health), they should be replaced by waste service vehicles in the long run.

For environmental sustainability

There should be an environmental law which guides and enforces activities in line with ecological sustainability. Since it is a prerequisite for the whole range of activities, the existing federal environmental law should be broken down in to a regional law so as to implement according to the local context.

The municipality in collaboration with the MSEs workers should encourage and promote waste separation at source. Here, waste collectors can also play a significant role since they have access to reach users during door to door collection.

In order to avoid storing of waste in anywhere before final disposal and to minimise conflict there should be specified small transfer sites in the city. The selection of sites should be determined in consultation with waste collectors and users as well.

The municipality should have a plan in the short run to minimise the current impact of the final dumping site at least through enclosing/fencing the site. In the long run, the municipality have to take joint actions with interested as well as potential stakeholders (NGOs) on finding long term measures and funding possibilities in order to upgrade the final dumping site.

The BDM should monitor and supervise regularly whether the waste is safely managed or collected by the MSEs. This helps the municipality to give concrete solutions based on the actual problems faced by the MSEs.

The current practice of using waste for composting by the Green vision MSE should be supported and expanded to other MSEs.

For social sustainability

Creating an attractive working environment is required through answering the main cause for dissatisfaction of workers. Hence, primarily the existing salary should be improved according to the situation.

The health vulnerability of waste workers should be minimised through provision of medical support. Besides regular use of protective cloths by the workers should be given attention and be a culture, for this follow up and advising the workers are essential.

Users' awareness creation about how the waste is collected, separated and stored in a proper condition should be promoted.

For financial sustainability

The municipality should strengthen the MSEs to be financially self-sustainable, through improving the service payment rate considering the challenge of the work, providing incentives and access to credit systems.

The municipality can also participate the MSEs in street cleaning (sweeping) for additional revenue of the MSEs from the service.

The existing unfair service fee among users should be revised through detail information about the waste generation rate of users.

There is the need to strengthen the linkage of MSEs with the existing NGOs in the city.

For institutional sustainability

The municipality should revise/elongate the duration of the contract agreement with MSEs for potential cost recovery. Besides, the contract agreement should be modified in close consultation to allow the MSEs work in flexible manner.

There should be continuous assessment of satisfaction about the service delivery of MSEs and a supervision function as well.

Reward systems or mechanisms for the workers should be employed so as to enhance the waste service delivery of the waste workers.

For political/ Legal sustainability

The existing federal environmental laws and SWM proclamations should be broken down in to regional laws with enforcement mechanisms so as to implement according to the local situation.

5.4. Areas for future Research

The researcher acknowledges and suggests that the study is not comprehensive to address all issues of SWM. Hence, further investigators should focus on the following issues.

- Comparative advantages of Micro enterprises as a waste service provider versus Private limited firm's waste service.
- Economic and environmental advantages of reuse of materials
- The extent and effect of unsafe waste management on waste workers health and their economy as a whole.
- Why women's are mostly involved as a waste worker than men's and its advantage for the service?

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Annex 1: Research Activity schedule

	Activities	Dates			
		Jan -June	July	August	September
1	Submission of first(outline) research proposal	Jan. 28			
2	Submission of second research proposal	may.6			
3	Submission of final research proposal	June.10			
4	**Field work**	From June 17 up to July 16			
4.1	Consult the city administrator and concerned experts (SWM experts)	June.19			
4.2	Selecting 2 MSEs and 2 kebeles	June.20			
4.3	Selecting users from 2 kebeles For FGD	June.21-June 22			
4.4	Providing training for one assistance	June 23			
4.5	Conducting interview with the government staffs	June 24- June 26			
4.6	Conducting interview with the 2 MSEs managers	June 26-June29			
4.7	Collecting Data from MSEs Workers through questionnaire	June 30-July 10			
4.8	Conducting FGD with users		July11-July 13		
4.9	Field observation	July13-July 15			
5	Data coding and analysis		July 19- Aug 25		
6	Submission of draft thesis			26-Aug	
7	Submission of final thesis				Sept. 6
8	Thesis defense				Sept. 9-13

Annex 2: Interview Guide for Bahir Dar municipal staffs

Title……Sex……..
Department.....

A. Current solid waste collection and transport service

1. Are their policies or laws with regard to SWM?
2. Are the existing policies or laws include or give emphasis to proper waste collection and the 3 Rs?
3. Are there practices such as reuse & recycling activities in the area?
4. What limitations do you observe in implementing the policies for SWM?
5. Can you give some information about how the current solid waste collection service by MSEs is organized?
5.1. When did it start?
5.2. Who are the workers? (youth men, woman, or both?)
5.3. Who initiated it? Government, Community, or NGOs?
5.4. Are all the MSEs legally registered?
5.5. What is the objective of organizing these MSEs?
6. Can you describe the current solid waste collection system of MSEs in the city?
7. Does the BDM have any contractual agreement with MSEs activities?
7.1. If yes, what is the type of contractual agreement? Franchise / contract / concession /open competition?
8. What advantages do you observe from this current system (MSEs service delivery) as compared to the previous government service?
9. What are the challenges or difficulties face in the MSEs waste collection service? What do suggest improving the service in the future?

B. Government support and stimulation mechanisms for MSE's

Financial supports

10. How much percentage of budget you allocate for the waste management from the total city's budget?
11. Does the government supports MSEs by providing financial incentives?
12. Does the government supports MSEs by reducing taxes?
13. Does the government supports MSEs by paying the service charge on time?
15. Does the government encourage MSEs by facilitating access to credit?
16. How the waste collection service charge of users is determined?
17. What is the system of fee collection?
18. Who is responsible to collect the user's fee?
19. Do users pay the service charge on time? If not what is the major reason for the delay?

Enabling Rules & regulations

20. Is there an institutional frame work in the city to perform SWM with MSEs?
21. Are the existing rules & regulations (contract agreement) conducive for the work of MSEs?
22. What limitation do you observe on the existing rules and regulations?

Equipments & material Support

23. Are there equipments and materials supported by the government for the MSEs?
23.1. If yes, what are the type of equipments & materials supported by the government?
24. Does the municipality have information about the number of waste containers in the city? How many waste containers are in the city? Is it sufficient?

Capacity building Mechanisms and awareness raising programs

25. Does the government provide training for MSEs managers and workers?
For how many MSEs managers and workers does the government provides training?
26. Are there awareness raising programs with related to SWM?
If yes, what are the public awareness raising methods that you use?
27. What are the mechanisms used by BDM to let users participate?

Supervision function and monitoring

28. What are the monitoring and control systems of BDM with regard to waste collection & transport service of MSEs?
29. Does the BDM have complaints and feedback mechanisms?
If yes, what are the complaints and feedback methods that the BDM uses?
30. Does the BDM conduct regular supervision for solid waste collection and transport services by MSEs?
31. Does all the generated waste in the city collected by MSEs?
32. Do you observe improvement in the cleanliness of the city after the MSEs have started the service?
33. Does the waste collection service of MSEs addresses all inhabitants?
33.1. If yes, how they address?
33.2. If not, how others inhabitants which do not have access to MSEs service has managed the waste? What are the basic reasons for not addressing all citizens?
34. Have you ever conducted a citizen/user satisfaction survey about the MSEs service delivery? If yes, what does the survey result show?

Annex 3: Interview Guide Questions for MSEs managers

III. Interview Guide Questions for MSEs managers

Respondent No…… ….MSEs Name…… Position……

Sex. a. male b .Female

Educational level: a. Illiterate b. Primary school c. Secondary school d. College or University

General information about how the MSEs are organized

1. Can you explain how you are organized the MSE ?
2. Who initiated it?
3. Who are the members? Youth, men or women?
4. What is the main objective of the members to organize in MSE?
5. Who are the main supporters during the process of organization of the MSE?
6. What is the current solid waste collection and transport system of your MSE?
7. What is the type of contractual arrangement with BDM?
8. Do the MSE faced any challenges externally from the BDM &/users?
How about internal (within the MSE itself) challenges?
9. What solutions do you suggest to improve the service of MSE in the future?

III Sustainability of the MSEs solid waste collection service delivery Assessment questions:

Technical Sustainability

10. Are the waste collection services of the MSE fit with the local inhabitants need?
11. Do the workers use locally available technologies for waste collection & transport?
If yes, what are the types of locally made equipments?
12. Do you observe any advantages of using locally made technologies?
If yes, what are their main advantages that you observed?
13. Are there any limitations of using local equipments?
If yes, can you mention some of their limitations?
14. Do MSEs use imported equipments for waste collection service?
14.1If yes, do you observe any difficulties of using these equipments?
15. Do the equipments have opportunities for maintenance?
16. Which types of equipments are the MSEs mostly use for solid waste collection? Locally made or imported?
17. Are the number of waste transport vehicles sufficient to provide the service?
18. Do the vehicles have compartment containers?

Social sustainability assessment from the side of MSEs

19. Does your MSE waste collection service address all inhabitants of the working area?
If your answer is yes, how you address? If not, what is the problem?
20.Are service users satisfied with the MSE service? If yes, what are the activities made for the satisfaction of users?
21. How do you confirm the satisfaction of customers?
22.What are the methods used to create awareness about your service?
23. What are the mechanisms that you participate users ?
24. Are there supervision committee members from the service users?
25. Does the MSE have specific schedule for waste collection service? How is frequent?
26. Are you satisfied with your existing salary of the MSE?
27. Are you interested to work in MSE for a long time?
If yes, what makes you more interested to work for a longer year in MSE?
28. Is there anything that does not satisfy in your job?

If yes, what make you more dis-satisfied?
29. What is your main source of income?
30. Have you seen any improvement in your way of life after joining the MSE?
If not, can you mention the basic reasons that you can't improve your life?

Environmental Sustainability

31. Do you have information about how much percentage of waste is generated and collected on a daily basis?
32. Does the MSE perform reuse and recycling activities?
If yes what materials do MSE reuse and recycle?
33. Does Your MSE promote composting practices in the area?
34. Does the MSE buy recyclable waste materials from users?
35. Are the transport vehicles closed type or open type? How many vehicles are closed types?
36. Are there a monitoring and supervision mechanisms for the waste collection service?

Institutional sustainability assessment of MSEs

37. Are there policies & laws that support MSEs?
38. Does your MSE have contract agreement with BDM and MSEs?
If yes, does the contract agreement clearly state the roles & responsibilities of BDM and MSEs?
39. Are there certain rules in the contract agreement that create obstacle to the activity of MSEs?
If your answer is yes, can you paraphrase some words in the agreement which are obstacle to the MSE activity?

40. How do you rate the support of the municipality to MSEs? high/ medium / low?
41. Do you conduct customer satisfaction (need assessment) survey?
If yes, what does the result show?
42. Do MSEs have complaint & feedback mechanisms?
If yes, what are these complaint & feedback mechanisms of the MSEs?
43. Do the users use the complaint and feedback mechanisms?
44. Have you received any training related to your job or waste collection?
If yes who provides the training?
45. How many times did you receive training?
46. Are the workers evaluated and promoted based on their performances?
47. Do MSEs have reward mechanisms for their workers?
If yes what are the reward systems that you use?
48. Is there any competition mechanism with other MSEs service?

Financial sustainability assessment of MSEs

49. Are there any mechanisms used by MSEs to generate revenue?
If yes, what are these mechanisms?
50. Does the MSE internal revenue cover the cost of MSE?
51. Does the government provide incentives for MSE?
52. Are there financial institutions/NGOs which can support MSE?
If yes, who are the institutions?
53. Does the MSE have access to credit?
54. Do all the service users pay for the service delivered by MSE?
55. Who determines the waste collection fee?
56. What is the method of fee collection?
57. Do you think that the existing fee collection system facilitates the collection of fee?
If not, what do you suggest?
58. Does the waste collection fee cover the cost of MSE?

59. Do the households and business areas pay the same amount of service charge?
If not, which payment method do you use?
60. Is there a delay in payment from the government for the service delivered by the MSE?
61. Do users cooperate by paying their fee on time?
If not, why they can't pay on time?
62. Is the service charge revised every year?
63. What is the total annual revenue and cost of your MSE?

Thank you for your cooperation and valuable information

Annex 4: Questionnaires for MSEs workers

This questionnaire is prepared only for academic purpose which is an instrument for this thesis entitled **''Assessing sustainability of Solid Waste Collection Service delivery by MSEs ; The case of Bahir Dar city.** You have been selected as a main respondent because of your experience and knowledge in solid waste collection and transport service delivery. So your input is very valuable in this survey and hence you are kindly requested to spare a few minutes to answer this questionnaire.

Personal information

1. Age a. < 15years b.15-29 c. 30-40 d. >40
2. Sex a. Male b. Female
3. Educational level a. Illiterate b. Primary school c. Secondary school d. College or University
4. Name of MSE……

Technical sustainability issues

5. Which equipments type is mostly used in your daily waste collection and transport service? a. locally available technologies such as hand carts ,donkeys etc b. imported technologies c. both
6. Do the waste collection trucks have access to reach your waste collection site? a .Yes b. No
7. Have you ever faced difficulties in using imported equipments? a. Yes b. No

7.1. If yes, what is the type of equipment that creates difficulty?

8. Is there happening of an irregular collection and transportation service? a. Yes b. No
9. If yes, rank the main reasons that makes irregular solid waste collection and transport services?

a. Vehicles' frequent damage b. Disposal sites are far away from collection sites c. Shortage of means of transportation c. Problem of inaccessibility d. Lack of cooperation from users e.Specify others

10. Most of the waste collection equipments that I use fit with the existing roads or topography of the city. a. I strongly dis-agree b. I dis-agree c. Agree d. I strongly agree
11. The waste collection and transport equipment is sufficient for the service required. a. I strongly dis-agree b. I dis-agree c. Agree d. I strongly agree e. I don't know
12. According to your estimation how far users walk to take their garbage to the community bins on average? a. <100m 2.100-200m 3.201-300m 4.301-400m 5.>401m
13. Is there a complaint from users about the distances of the community bins? a. Yes b. No c. I don't know
14. How do you get the waste mostly when you are moving door to door collection? a. waste stored separately b. all waste types stored together in one bin's. c. Poorly handled/dispersed
15. Do you perform separate waste collection? a. Yes b. No

15.1. If not, what is the basic reason for the failure to collect waste separately? a. There is no attention from MSEs/BDM to collect waste separately b. Low users awareness to segregate the waste at source c. Both(there is no attention from MSEs/BDM to collect waste separately & low users awareness) d. specify others

Social sustainability

16. Do you have specific schedule for waste collection service? a. Yes b. No
17. Do users cooperate when you are working door to door collection? a. Yes b. No

17.1.If yes, Who usually cooperates with you among the householders? a. Woman (wife) b. man (husband) c. children d. servants

18. To what extent the users cooperate while you were collecting the garbage? a. very high b. high c. very low d. low
19. Are you satisfied by the existing salary of workers in MSEs a. Yes b. No
20. Are you interested to work in waste collection service for a long time? a. Yes b. No

20.1. If yes, which of the following makes you more interested to work for a longer year ?
a. Fair monthly income b. safety of workers is well kept c. specify other
21. Is there anything that does not satisfy you to work in waste collection service? a. Yes b. No
21.1 If yes, which of the following make you more dissatisfied?
a. healthy/ safety of workers is poor b. very low payment c. the community does not respect us d. the job is very challenging e. specify other
22. What is your satisfaction in the current waste collection job? 1. High 2. Medium 3. Low
23. Do you have protective clothing such as gloves, boots and uniforms? a. Yes b. No
23.1. If your answer is yes, how frequent you use these materials while you are working?
a. Always I wear protective clothing while working b. Sometimes I do not wear
24. Have you ever faced any contact with hazardous waste material and injury during waste collection? a. Yes b. No
24.1. If yes, do you have medical support by your organization a. Yes b. No
25. What is your main source of income? a Monthly salary from MSEs b. any other extra job
26. How do you rate your monthly salary in MSEs compared to a similar waste worker in the municipality? A. low b. high c. fair
27. Have you seen any improvement in your way of life after starting the waste collection job in MSEs ? a. Yes b. No

Environmental Sustainability

28. To what extent the existing environmental laws in your working area functions with related to waste management? a. very low b. low c. high d very high
29. Do users prepare compost from organic waste materials in your working area? a. Yes b. No c. I don't know
30. Do you collect recyclable waste materials from users during door to door collection? a. Yes b. No
30.1. If not which of the following is the main reason among the choices .a. There is not any recycling project that receives the materials b. Users can't separate the reusable materials c. I do not want to buy d .Specify others
30.2. Where do you collect and store the primary collected waste from users until final disposal?
a. Just on any free space b. at specific site which is safe and protected. c. specify others
31. Have you ever tried to teach households about recyclable materials during door to door collection? a. Yes b. No
32. How frequent is your program to collect the users waste? a. daily b. twice a week c. three times a week d. once a week e. not collected within a week
33. According to your observation, does all the neighbourhood in the working area are benefited from the service? a. Yes b. No
33.1. If your answer is no, those who do not get the service, where they dispose their garbage?
a. On the roads and street b. In ditches and canals c. In the rivers and streams d. On open fields e. They bury and burn in their premises
34. What type of container do you observe at households for storing their waste?
a. Plastic container b. Metal container c. sack container d. They do not store in any container e. Specify others

Financial/economic sustainability

35. Do you think that the existing service payment can cover the cost of MSE? a. Yes b. No
36. Do all users pay for the service delivered by MSE? a. Yes b. No

36.1. If no, what is the reason that others service users can't pay for the service? a.low economic status b. cheating
37. The existing fee price determination is fair among users. a. strongly agree b. agree c. disagree d. strongly disagree
37.1. If your answer is disagree or strongly disagree, what do you suggest? a. higher waste generators such as commercials should pay more b. the payment should be equal to all citizens c. the poor should not pay for the service d. specify others
38. Do you get your payment on time? a. Yes b. No
38.1. If delayed, what will be the possible cause for the delay?
a. MSE b. Service users c. Municipality d. Long bureaucracy e. Others Specify
39. What is your monthly income from MSE in ETB?
a. < 150 ETB b.151 - 300 ETB c. 301- 450 ETB d. 451-600 ETB e. > 601 ETB
40. What do you do with the money you get from the service delivery?

a. mostly for subsistence living b. More goes to saving and investment c. Specify others
41. How do you compare your current living conditions (after joining MSE) with the previous one? a. highly improved b. Medium improvement c. Satisfactory d. Insignificant
42. What do you suggest to make MSE financially sustainable?

Institutional sustainability

43. Choose the main institutional problems faced by MSEs.
a. Lack of support from the municipality b. Workers motivation is poor c. Lack of appropriate policy for MSEs d. Lack of clear roles and responsibilities between BDM and MSE d .specify others
44. Are there certain rules in the contract agreement that is obstacle to the activity of MSEs? a. Yes b. No
44.1. If your answer is yes, can you paraphrase some words in the agreement which is obstacle to the MSEs activity?
45. How do you rate the support of the municipality for the MSE? a. High b. Medium c. Low
46. Are workers evaluated and promoted based on their performances? a. Yes b. No
47. Do MSEs have reward mechanisms for their workers? a. Yes b .No
48. Were you ever supported by supervisors of BDM while you were working or collecting the waste? a. Yes b. No
48.1. If yes how frequent? a .Regularly in a specified time b. sometimes c. very rarely d. specify other
49. Have you take any training related to your job or waste collection? a. Yes b. No.
49.1. If yes who provides the training? a. BDM b. MSE c .both BDM and MSEs d. any other NGOs and BDM
50. How many times did you receive training? a .only once b. twice c. three times d. more than three times
51. What solutions do you suggest to improve the service of MSEs in the future?
a. Increase the service payment to cover the cost and provide quality service b. Improve waste collection equipments c. promote public/users awareness d. Integration with other stakeholders e. Implement the environmental laws in to action. f. Specify other

Thank you for your cooperation and valuable information

Annex 5: Focus group discussion points for service users

1. What are the weaknesses of the present waste collection and transport system/services of MSEs?
2. What are the strengths of the current waste collection and transport system of MSEs?

Is it satisfactory service?

Does the MSE provide service for all inhabitants in your neighbourhood?

Does the MSE have regular schedule time for waste collection?

Do you observe any improvement in the cleanliness of the city after MSEs has started the service of waste collection?

3. What are the weaknesses that you observe from service users?

4. What are the strengths of service users? (Do users pay their service charge on time?

Do users separate their waste?

5. Do users have access to supervise and control as well as to complain the service?

6. What is the waste collection method that users mostly preferred?

7. How do you rate the current service charge of waste collection? high /low/ fair ?

8. What should the MSEs improve in the future?

9. What should the BDM does /support for the future so as to improve the service?