

Review Paper

# An Assessment of Practice and Challenges of Solid Waste Management in Lideta, Addis Ababa, Ethiopia: A Preliminary Study

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Article history

Received: 01-03-2017

Revised: 16-03-2017

Accepted: 20-03-2017

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Abstract

Waste is a serious problem in developing countries where generation of waste per unit of output is much higher than that in the developed countries because of inefficiency in manufacturing processes, bad design, and public involvement, financial, institutional and ultimately bad decision-making. The purpose of this paper is to identify the challenges facing solid waste management in Addis Ababa city in Lideta assembly and its effects on solid waste management practices. This research was both exploratory and causal. Out of a total population of 30123 household in lideta and 414 staff management and 280 micro and small enterprise worker in woreda and subcity. From the household 3013 (10%) household were taken and from the total waste management worker 75 sample size was considered with a total of 3087households were considered for this study. Self-Administered Questionnaire instrument was used to collect data. Quantitative data analysis technique (such as mean, percentages, frequencies and standard deviation) and qualitative data analysis technique (such as content analysis) were used to analyze the collected data. It was found that, all the challenges facing solid waste management practices only institutional arrangement and adequate solid waste management laws were found not to be major challenges. The rest are all major challenges in solid waste management practices in the lideta subcity from Addis Ababa. Based on the findings of this study, it is recommended that, the management must put measures in place to overcome the challenges facing solid waste management practices.

**Key words:-**Waste, generation, Challenge, Household, Worker, Waste management practice

Introduction

Municipal Solid Waste Management constitutes one of the most crucial health and environmental problems facing governments of African cities (Achankeng, 2003). This is because, even though 7 African cities are using 20-50% of their budget in solid waste management, only 20-80% of the waste was collected. The uncollected or illegally dumped wastes constitute a disaster for human health and environmental degradation. According to Tsiboe and Marbell (2004), the problem of waste in urban cities of Africa can be better understood in the light of recent rapid urbanization worldwide and political pressures from outside Africa to deal with the governance and management problems related to waste (urbanization creates the waste and market forces serves as to the waste problem). Whilst urbanization was not a new phenomenon in Africa, the current rate of uncontrolled and unplanned urbanization in Africa has given rise to a huge amount of liquid and solid wastes being produced, so much so that these wastes have long outstripped the capacity of city authorities to collect and dispose of them safely and efficiently (Wetherel, 2003).

Addis Ababa, whose population grew from about 3.1 million in the year 2007 to 4 million in 2009, is one of the fastest growing cities in Africa. Its current population is estimated to be exceeding 4 million and, apart from its sheer population size, the city is playing significant economic, social and cultural roles both at the national and international levels. Accordingly, the City has significant contribution to the national GDP owing to the concentration of various urban-based service orientated and manufacturing activities. The city, which is the Federal Capital, accounts for almost a quarter of the national urban population that is a mosaic of Ethiopia's multi-ethnic and multi-cultural identities.

On the other hand, being the home of the African Union, the Economic Commission for Africa, several specialized UN agencies and other international organizations and more than one hundred diplomatic missions, it is among the few most culturally and ethnically diverse cities in the world. The city's rapid population and economic growth, coupled with discernible changes in lifestyles and consumption patterns of its residents and visitors that are associated with globalization and improved information and communication technology, contribute to dynamic changes in both the quantity and composition of solid waste to be generated in the city. In particular, the rapid growth of industry, trade and services including the recent proliferation of ICT and expansion of mobile phones has accelerated the generation of industrial, hazardous/toxic and Electronic Waste (EW). Yet, the city does not have a comprehensive, integrated and sustainable solid waste management plan to effectively respond to the complexities associated with such dynamics.

Although the city has one of the most progressive solid waste management policies and rich experience in adopting decentralized solid waste management systems that gave impetus for the participation of the private sector, current waste management practices still focus on mitigating the public health effects of solid waste and improving the city's image as a clean city. With the envisaged development of an ISWM plan since started from 2000 to now, the City Administration will move to the highest level of solid waste management, namely generating and managing value from solid waste by adopting the 3R (reduce, reuse and recycle) principle. The city is divide by 10 subcity Lideta is one of the subcity of the city it has 10 woreda administration. It was pop>280,000 and its area 918.27 he (source- Lideta fana magazine No9 Sep, 20005) the area most crowded and highest population as a result there is difficult to manage sold waste. In addition to most of the people low economic growth and there is a lock of infrastructures (Example internal road with derange system) most of the house is old and resident for the past>47 years.

Most of the cities in Addis Ababa practice the open dump system of waste disposal, which is in a more or less uncontrolled manner. Since the system is not highly engineered, it poses numerous challenges to both public health and the environment. The areas so many organization and business activity as a result handling this municipal solid waste (MSW) has assumed the proportion a major's organization structure, financial, environmental, political, public involvement and social challenge.

### Materials and Methods

The present study was based on case study method, which is one of the research methods that focus on few sample size. This method is selected to generate in-depth information about the issues within the given time for study. This research was both exploratory and causal. The strategies used were survey and single case embedded studies. The case study was waste management the choice was made because of strategic location of lideta as a commercial center of the country and easy access to information.

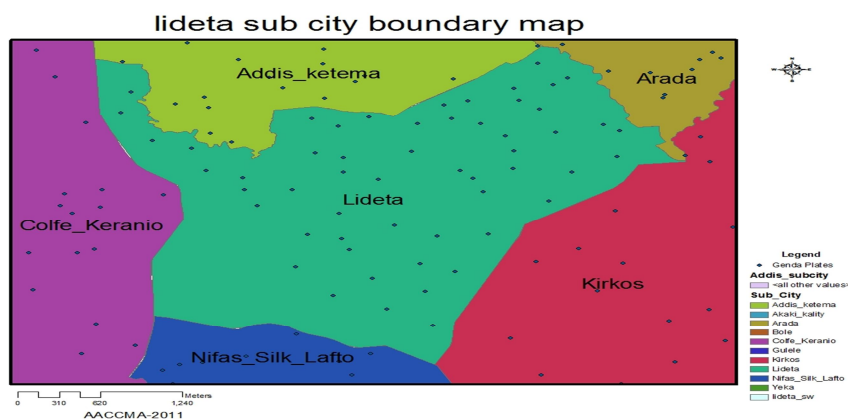
The case was important because, it was the department responsible for ensuring that lideta was kept clean after this study was studied from September to March 2008 E.C. The population of the study was made up of the workers of waste management at Addis Ababa. The total population was 30123 comprise management staff, conservative workers (including sweepers, refuse truck drivers, and drain desilters) and public participation. The sample size used was 3087 because, according to Saunders et.al (2007) cited in Otchere et al, (2014). For a population of 30123 household took 3013household and 414 staff worker took 46 and small and micro enterprise 280 took 28 a minimum sample size of 3087 should be used to achieve a 10% margin of error. This was rounded up to 3087 for both easy calculation and in anticipation of positive response. Convenience sampling method (a non-probability sampling method) was used to obtain data from the employees. This technique involved selecting samples of convenient elements by the interviewer which meant that respondents were selected because they were coincidently in the right place at the right time for the questionnaire (Saunders et.al, 2007). The researchers stopped administering the questionnaires after achieving the desired sampling size. However, purposive sampling method was used for Management Staff and Supervisors.

### Data Source and Collection Instrument

Both primary and secondary data are required for this study. Therefore, primary data was collected through questionnaires, interview and physical observation. Secondary data was collected from published and unpublished materials relevant to this study.

### Sampling Techniques

In this study purposive sampling method was applied. In total 3087 households did participate in this study which is selected based on land use. Thus 2913 households from residential area, 60 from commercial areas, 17 from institutions and 10 from small industries and 13 health and other working areas total number 3013 and 28 took from micro and small enterprise and 46 from management staff



**Fig 1.** Study area and the surrounding subcity which was transboundary

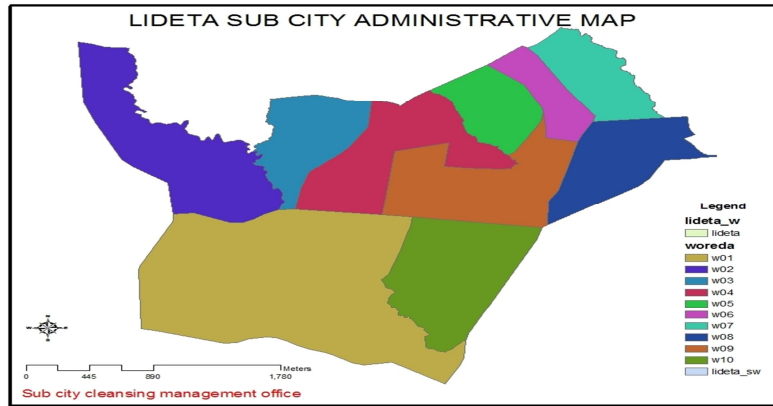


Fig 2. The real study area and select from 10 woreda and their intuitions under them

Table1:-Sample Size and Sampling Method

Unit of Analysis (Population Groups)	Population Size	Sample Size	Sampling Method
Management Staff	414	46	Purposive
Micro and small enterprise	280	28	Purposive
Public	30123	3013	Convenience
<b>Total</b>	<b>30817</b>	<b>3087</b>	

*Data Gathering Procedure*

To make the information coherent first the questionnaires were distributed to the households and at the same time observation on the household solid waste management condition was carried out. Then interview with municipal officials and other key informants was conducted. Finally, observation to spot sites of waste transfer and disposal areas were performed.

**Results and Discussion**

In this study carried out in lideta subcity the data collected from 2913 household, 17 institution, 10 small industries and health and other workers place,46 staff management and 28 micro and small enterprise did participate in this study which is selected based on land use. The survey shows variations in the type of waste produced by different income groups. The waste from low income households is mainly composed of soil and ashes. Medium and high income households generate higher amount of paper, plastic and glass showing variation in composition pattern among households in different income group. However, in terms of volume of solid waste generated there was no significant variation among high and low income groups.

**Sources of solid waste in the study area**

*Residential solid waste generation*

Primary storage at source was one of the issues assessed during the interviews among the participant households in this study. Through analysis of responses from the sample households from the study area and other sample Kebeles, it was found out that at household level solid waste is mostly stored in sacks (75%) and cartoons (18.8%). There are few households that use plastic bags (6.2%) for collecting solid waste at home. As far as regulation is concerned except service providing institutions like cafeterias, restaurants, hotels, and the like which are sometimes inspected by health department of the city, others (households, educational institutions, offices, and the like) are not regulated whether or not the primary storage receptacles they use and the way they handle it are as to the required standard set in the regulation.

*Commercial, Industrial and Institutional areas solid waste generation*

In this study five small commercial areas: shops, two small industries: metal and wood workshops and three institutions: schools were covered to assess the way by which solid waste was disposed. In commercial areas the type of solid waste generated is similar to the residential area and the owners of the business collect it and take it to the cooperative for transportation and disposal. Solid waste generated from market areas is collected by the cooperatives providing the solid waste collection and transportation service. In schools the type of solid waste principally generated are papers and soil and which are collected periodically and occasionally by the students and then incinerated in an open space. Small industries such as metal workshops and wood work workshops produce by products during their operation. In Metalwork workshops the small iron materials produced as by-product are collected by the informal collectors or being re-used by the workshops to produce small household materials. In woodwork workshops the major solid

wastes include by-products like: small wood materials and saw dusts that are mainly used as fire wood or being used by the workshops to produce household materials.

### Functional Elements of Municipal Solid Waste Management in the Study Area

#### *Primary Collection and Sorting at source in the Study Area*

Primary collection operation enables transfer of solid waste materials handled and stored at the sources of generation to transfer stations and secondary collection facilities. In the study, solid waste collection and transportation to transfer stations/sites was cooperatives have geographical designation for provision of the services ranging from house to house waste collection, transportation and delivery to transfer station.

#### *Waste Reduction, Recycling, Reuse and Transformation*

An integrated solid waste management system involved waste reduction at the sources, diversion of waste materials or recycling, reuse of diverted materials and transformation technologies. The solid waste in developing countries and in the study area mostly contains high proportion of organic matters, which make the solid waste ideal for recycling through waste transformation technologies. In this regard in the study area there was composting of decomposable waste in landfills and reuse of some waste by the informal sector for limited items including plastic bottles. Apart from this there are no practices, technologies and waste transformation centers in the study area.

### Real challenge and practice of solid waste management

#### *Challenges*

The following challenges were found to be worth mentioning in relation to solid waste management in the study area, lideta subcity:

- *Low capacity in planning and system development for cost recovery. This coupled with low revenue mobilization limit the service provision to only a portion of the city.*
- *Increase rate of urbanization with parallel increase of population size was leading to rapid increment in volume of solid waste generated in the city*
- *Uncontrolled illegal dumping of solid waste was practiced in those areas with no solid waste collection service including old which were with poor road infrastructure and new settlements.*
- *There was no solid waste segregation practice at household level nor at transfer stations thus there was a chance for indiscriminate collection of hazardous waste with municipal waste*
- *Lack of proper truck maintenance: this disrupt the transportation of solid waste from transfer station to landfill sites.*
- *Low public awareness in proper solid waste management*
- *Low collection coverage and irregular collection service*
- *Low control on open burning which was caused for air and water collection*

#### *Constraints*

The major constraints faced by the existing municipal solid waste management system include:

- *Inadequate technical staffing:*
- *Financial constraints*
- *Institutional constraints*
- *Economical constraints*
- *Technological constraints*

The existing institutional setup goes down only up to sub-city level. However, the existing low level of service coverage and situation demand for having broad community level participation which is currently not available. The recent technological development is enabling utilization of waste for energy generation and there were also developments on recycling and reuse technologies. However, the low economic status and technological advancement is limiting the current practice only to composting of recyclables.

#### *Financial Factors*

The managerial implication is that management of solid waste in lideta invests funds in wastes management but do not get all the investment back let alone profit. This may be consistent with the observations made during our previous work (Otchere et al, 2014) where we analyze waste management practices, it was discovered that most wastes are disposed but not converted to generate energy and other important waste recycle products which can then be sold at a profit. This was the only way of recovering huge investment in waste management. Each cooperative was responsible for covering its service costs by collecting and fee from Government. The fee based on volume of waste collected birr 50.00 per meter cube.

#### *Personnel Issues*

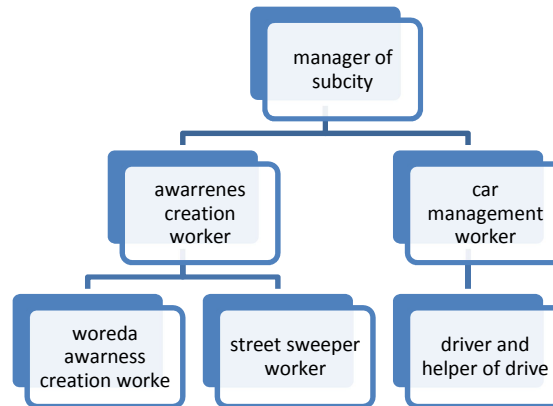
The managerial implication is that personnel issues are a major challenge to solid waste management practices

*Technical Issues*

Implies that technical issue was a major challenge to solid waste management system in Addis Ababa.

*Institutional Arrangements*

The managerial implication is that institutional arrangement was not a major challenge or obstacle to solid waste management system in Addis Ababa. However, it must be noted that the mean figure for this factor was 3.43, this clearly shows that even though on the basis of the figures recorded, institutional arrangement was not a major challenge, it cannot be totally ignored. As well that Institutional arrangement was not seen to be a major challenge to solid waste management.



**Fig 3.** Structure of solid waste management in the subcity and woreda level

*Legislation and Enforcement*

The managerial implication here was that lideta has adequate legal framework for regulating waste in the city. The implication is that the laws are moderately current; however, this clearly shows that the waste management a law of lideta do not “bite” (that was not enforced) even though, laws was adequate and not too outdated. From the above it was clear that whiles legislation was not a major challenge, enforcement was.

*Good Governance and Civil society*

This indicated that the citizens did not adequately participate in waste management decisions leaving management to takes decision without considering the point of view of the citizenly. ‘Poverty was not high among the citizenly’; this was an indication that the people were generally and did not have the financial empowerment to manage their own waste generation as evidenced when testing the waste generation constructs. ‘Civil society exert adequate influence on waste issues’ also indicates the lack of civil society interest in propagating the need for adequate waste management in Lideta. This meant that lack of good governance and seemingly inactivity of the civil society on environmental issues was a major challenge to waste management in Addis Ababa. This seems there was a relatively appropriate good governance structures and involvement of civil societies to manage environmental issues of waste management practices in Addis Ababa.

**Stakeholders role in solid waste management***Community role*

The waste generated by a population is primarily a function of the people’s consumption patterns and, thus, of their socio-economic characteristics. At the same time, waste generation is conditioned to an important degree by people’s *attitudes* towards waste: their patterns of material use and waste handling, their interest in waste reduction and minimization, the degree to which they separate wastes and the extent to which they refrain from indiscriminate dumping and littering. People’s attitudes influence not only the characteristics of waste generation, but also the effective demand for waste collection services, in other words, their interest in and willingness to pay for collection services. In the study area the participation of the community in bare minimal in the whole waste management and disposal process: only limited to waste generation and primary collection to cooperatives collection area in those areas where there was such service and to collection and indiscriminately disposing it n areas where there was no such services. The level of participation in waste transportation, sorting/segregation and recycling is insignificant. In addition to this the current cost recovery system was inadequate to generate enough funds to manage and dispose solid waste safely and is highly dependent on the government or municipality budget. Attitudes may be positively influenced through awareness-building campaigns and educational measures on the negative impacts of inadequate waste collection with regard to public health and environmental conditions, and the value of effective disposal. Such campaigns should also inform people of their responsibilities as waste generators and of their rights as citizens to waste management services. Awareness-building measures should also be coordinated with improvements in waste collection services. In addition to this, community’s involvement in substantially sharing the cost has to be considered.

*Private sector: Cooperatives (MSEs)*

The private sector was now becoming a key player in a number of industrialized nations. Private sector participation can help upgrade technical and managerial expertise, increase efficiency in operation and maintenance, and improve customer services, apart from bringing in the capital to support the government in its efforts at waste management. Of these only three were currently engaged in door to door solid waste collection and transport to transfer stations. In the study area, there was a strong direction for comprehensively involving the cooperatives (MSEs) in the form of out sourcing door-to-door solid waste collection, and transportation of collected. The major problem faced by the cooperatives was poor road infrastructure in the old settlement areas that limit the service coverage only to accessible areas. In addition to this the road to transfer station was also dry weather road that make transportation of collected solid waste difficult during the rainy season.

*Municipality*

The role of municipality in solid waste management was vast including: outsourcing solid waste collection to cooperatives, monitoring the service provided by the cooperatives, deploy street sweepers to clean out streets, management of transfer stations and landfill sites, transportation of solid waste from transfer station to landfill sites, awareness raising on appropriate solid waste management practices, soliciting and managing fund for solid waste management and enforcing appropriate rules and regulations in relation to solid waste management.

*Community satisfaction on the current solid waste disposal service*

One part of this study was to assess the level of community satisfaction with regard to solid waste management service especially in relation to the solid waste collection services. The level of satisfaction was assessed in terms of quality and cost of the service. There was inconsistency in timely collecting waste and the programmed/date by which the cooperatives were coming to the localities for solid waste collection is not well known thus waste stay in household for long time. Such incidence leads to health concerns by the household as it created conducive environment for insects and flies multiplication;

- As the collection was carried out during working hours, for household with working family and students it was difficult to be at home and miss out the service. This sometime force the households to dispose solid waste illegally; and
- The waiting time in which the cooperative stayed in a given time is very minimal and the household has to be always alert or either wise miss the service. This coupled with the inconsistency in timeliness was also one major source of dissatisfaction. In terms of cost, as most of the households were not paying for the service there was no much complaint. The recommendations by the households to improve the existing service include:
- The door to door waste collection service by the cooperative should be timely and with well known programmed; off-working hours should be included in the timing for collection to accommodate working families; and more time should be allocated per point to avoid rushing and missing out. In areas that were not getting service from the cooperative were recommending that the municipality provide communal waste bins in appropriate location to minimize indiscriminate dumping of waste

*Political Factors*

'Government accord high priority to solid waste management' clearly indicates that government moderately accord high priority to waste management. On the construct 'waste management was among the top 5 priorities of government and Addis Ababa. This may not be surprising because the first construct was somewhat linked with the second one. This was because if government places much priority to waste management then it must be among the top 5 priorities. This suggests that a political consideration was not a major challenge to waste management. However, going by their recorded means, it may not be far-fetched to list political will as one of the challenges confronting waste management. Political factors were not a major challenge to waste management. Both government and Addis Ababa. accord high priority to solid waste management. Not with standing, what may be lacking is the political will.

*Effect of the Challenges on Solid Waste management Practices*

For this part, the effect of the challenges on the waste management practices are presented and analyzed. There seemed to be a relationship between solid waste management practices (SWM) and the challenges to the waste management practices. That was the challenges to the waste management practices seemed to have links the inefficiency in the solid waste management practices. This shown that there was a positive relationship between solid waste management practices and challenges. That was the higher the challenges, the higher the inefficiency in the waste management system.

**Finding from the study**

Design and implementation of Sustainable Municipal Solid Waste Management Systems (SMSWS) was a real challenge for developing countries. This was particularly so in places with very high urbanization rates and very low public awareness. Any management strategy in this sector will be sustainable only if it was cost effective, environmentally friendly, and implemented with the active and continuous involvement and participation of the public:-

- The type of waste generated by residential and commercial areas mostly composed of bio-degradable waste easily decomposable by applying composting. This has to be taken both as economic and spatial opportunity. By producing and marketing organic

fertilized produced through composting the municipality can generate additional income while the landfill will be able to serve for longer time as the cells for composting can be used again and again.

- Due to lack of appropriate road infrastructure considerable portion of the study area was not getting the door-to-door solid waste collection service provided by cooperatives/MSEs. This was leading those households without the service practice illegal dumping of waste to open land, side of gullies and rivers. In addition to this households also practice open incineration. Such inappropriate waste disposal practices have negative impact on the environment and can also cause health problem.
- The number of solid waste transporting truck owned by the subcity was few and most of them have been giving service for long. The down time of these trucks was long when there is breakage. This led to unwanted accumulation of waste in transfer stations that rose environmental and health concerns in the community residing near by the transfer stations.
- In the landfill site there was accumulation of non-degradable waste mainly plastics and bone due to lack of appropriate recycling technologies. This was creating concern on the lifespan of the landfill due to extended spatial occupation of such waste. In addition to this specially plastic bags were carried out to adjacent farm fields and affect productivity by impeding water infiltration
- The current solid waste management system was highly dependent on municipality's budget which makes its sustainability questionable. In addition to this any limitation of budget from the municipality can also limit the service coverage and aggravate improper waste disposal.
- The existing low level of community participation in the solid waste management system and cost recovery scheme has lowered the sense of ownership.

Private sectors, MSEs or cooperatives were allowed to carry out door-to-door solid waste collection based on strict criteria mainly availability of vehicle and capital. This has limited the chance for involvement of interested small entrepreneurs in solid waste management. This also limited the chance of extending door-to-door solid waste collection to inaccessible areas using carts and wheel barrows

### Conclusions

From the above it can be concluded that on the challenges confronting solid waste management practices, only institutional arrangement, legislation, and political factors were found not to be a hindrance. The rest: financial factors, personnel issues, technical issues, legislation enforcement, and good governance as well as civil society inactivity were detected to be a major hindrance to solid waste management system of Lideta. From the study carried out it was possible to understand considerable amount of waste was being illegally dumped in to open space, river and gully sides and openly burnt out. Such practice affects public health and aesthetic of the environment in the study area. Solid waste management was not top priority activity in the old settlements (pre urban areas) and newly established residential areas in the subcity. In these areas the priority were given to issues including land and housing tenure security and basic amenities. Nevertheless this poor handling of solid waste poses environmental hazard.

At present, responsibility of solid waste management lies with the city's sanitation and beautification core process, the role of NGOs, CBOs and community is very low and involvement of private sector limited as it was based on relatively high standard requirements including acquisition of trucks that limits potential involvement of the jobless poor youth and the small MSEs. To sum up, the positives in solid waste management service in the study area were:

- Collection of solid waste is outsourced to cooperatives. At present there were three cooperatives giving service over the entire city. These cooperatives mainly gave door to door solid waste collection service to residential and commercial areas, transport collected waste to transfer station, give transportation service to solid waste collected by street sweepers.
- Municipality was responsible for giving solid waste transportation service to major institutions
- There are one transfer stations in different parts of the city. These transfer stations were well fenced and guarded. The municipality was responsible for the overall management of these sites. The transfer stations were established in place of the communal waste bins for better management of solid waste.
- Transportation of solid waste from transfer station to landfills was the responsibility of the municipality. For this the municipality mobilizes the existing heavy trucks and whenever it is beyond its capacity outsourcing to private was another option followed.

The shortfalls in solid waste management in the study area include:

- The strict criteria for involvement of MSEs is limiting opportunity for the small and resource poor MSEs to get engaged in the solid waste management activity
- There was little activity and accomplishment in community awareness raising on safe disposal and proper management of solid waste
- There was little effort to involve NGOs an CBOs in this sector
- The insufficient solid waste management service coverage in old settlements and new settlements was encouraging residents to practice inappropriate disposal mechanism
- No clarity on cost recovery system at present

**Acknowledgements**

Author acknowledges Lideta subcity Cleansing Management Office for sponsoring this research. I would also respect the 10 woreda contribution and helping to collect the questioners from household and commercial center

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