

Rubbish, Resources and Residues - Field Report 01 (May 2022)

An overview of solid waste management systems in the city administration of Addis Ababa: past to present

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1. Introduction

Addis Ababa was built as an administrative center in 1886. Since then, it has been the center of most of Ethiopia's economic and political activities. Unplanned physical development with no sanitary and utility facilities characterized the development pattern of the city. Rural tradition of disposing of waste in the open air was instantly transferred to the emerging city.

The capital of the Federal Democratic Republic of Ethiopia (FDRE), a seat of the African Union and a variety of international organizations, Addis Ababa is the largest as well as the political, economic, cultural and historical city of the country. The city is located in the heart of Ethiopia. It has an area of 540 square kilometers. The elevation of the city lies between 2,000 and 2,800 meters above sea level and is located between 9 degrees latitude and 38 degrees longitude. The mean minimum and maximum temperature of the city are 100C and 250C respectively, and the mean annual rainfall is 1,200 mm. The city with its population of about 4.5 million is considered a metropolitan city by the standard of any developing country. With the current structure, the city has three administrative structures: city administration; 10 second administrative strata, locally named sub-cities; and 120 third administrative strata (districts).

As the quality of life is an important element of their competitive advantage, cities have to ensure a clean and safe environment for residents. Dealing with pollution caused by improper management of solid

wastes should therefore be given priority. In the early days of its establishment, the problem of sanitation in Addis Ababa might not have been a significant problem because the population was low at the time, and householders were in a position to dispose easily of their rubbish and other generated wastes. But later when the population increased, the problem became worse and the government started trying to minimize the problem by establishing a municipality in 1909, as a council of Addis Ababa to administer the city. The council was entitled to look after and remove the poor unsanitary condition of the city. The year 1948 marked the establishment of a full-fledged national health service system, ie, the Ministry of Health with the environmental health wing. In 1950, the Ministry of Public Health was then established in Ethiopia with Proclamation No. 147, to address the sanitation issues. Later in 1954, the government granted the city of Addis Ababa a city charter.

Until 1994, solid waste management was the task of the Sanitation Division of the Department of Environmental Health and Social Services under the City Council (municipality). The Sanitation Division was responsible for all aspects of solid waste management. From 1994 to 2003, the mandate for the management of solid waste was transferred to the Addis Ababa Health Bureau. First, it was organized as Sanitation Division and later established as Environmental Sanitation Department in the Health Bureau. In January 2003, the municipal solid waste service was shifted to the Sanitation, Beautification and Parks Development Agency with its decentralized power to sub-city levels having solid waste divisions in the 10 sub-cities. Then the agency

was replaced by the current Cleaning Management Agency in 2011.

Solid waste management services are one of the services that are essential for the smooth running of urban areas. Solid waste management is thus one of the services that is being carried out by the city administration in Addis Ababa. Currently, however, solid waste management is one of the most important problems of Addis Ababa. The main problem is the pollution of the city's environment, especially streets, rivers, roadsides, ditches and sewerage systems. The riverbanks especially serve as outlets for household solid wastes and this practice is polluting the rivers that cross the city. In addition, open access for the direct release of solid wastes on the roadsides is blocking waterways and causing flooding in the city. Pollution increases the health risks of the population and reduces the value of the environment. Thus, examining the past and present management of solid waste management in Addis Ababa may help improve the current and future management systems.

2. Situational analysis of SWM (past and present)

Currently, Addis Ababa is one of the rapidly urbanizing cities among developing countries. However, the provision of solid waste management services has not increased to the level demanded in line with the expansion of the city and the growth of the city's population. From this perspective, the unmanaged wastes in the city are one of the major areas of the city's environmental concern. Thus, solid waste management is one of the major challenges facing Addis Ababa.

At the end of the 1990s the waste generation rate was very low as it was estimated to be 0.15 to 0.252 kg /capita/day, with the daily waste production of the city being 851 tonnes or 2,297 m³. The density was high, averaging 333 kg/m³, varying from 205 to 370 kg/m³ during the wet and dry seasons, respectively. The past and present solid waste generation and storage status in the city are shown in Table 1.

Table 1. The past and current status of solid waste generation and storage, Addis Ababa (source: AACMA).

Waste generation and storage	1995	2020
Per Capita waste generation rate (kg/cap/day)	0.252	0.3-0.4
Total daily generation (tonne/day)	851	2168
Sources of waste	<ul style="list-style-type: none"> • 76% households • 18% institutions (commercial, factories, hotels, and health facilities) • 6% street sweeping 	No change
Physical composition	<ul style="list-style-type: none"> • Organic 60% • Recyclables 15 % • Others 25% (vegetable, paper, rubber/plastics, wood, bone, textiles, metals, glass, combustible leaves, non-combustible stone) 	No change
Type of storage bins	<ul style="list-style-type: none"> • No standardized bins • Households prepared different types of receptacles such as baskets, card boxes, bamboo containers, cans, plastic bags, barrels, etc. • Some micro-enterprises were distributing different sizes of plastic receptacles to households 	Own plastic bags
Collection systems	<ul style="list-style-type: none"> • Three modes of collection systems (communal container collection, institutional collection and door-to-door collection system) • Daily street sweeping is also provided. Pre-collection is also provided by micro and small enterprises. 	Door-to-door, street cleaning and institutional collection systems

There were three modes of collection systems in the past, namely communal container collection, institutional collection and door-to-door collection system. In most parts of the city, the households and other waste-generating sources were delivering their waste to containers placed at various collection points (see Figure 1) by the municipality. Out of the total generated waste, about 65% also had been collected up before through container, door-to-door and institutional collection systems using skips

The ever-increasing economic, social and administrative activities in cities generate various types of solid wastes that need to be properly managed. In Addis Ababa, it is estimated that 3,200 tonnes of solid waste are generated per day. Yet, only 65% of solid waste reaches the city's open dump site. Currently, the collection of these wastes in the city is also carried out in three different types of collection systems: primary (Figure 2), secondary (Figure 3) and street sweeping (Figure 4).



Figure 1. Photographs of primary and secondary collection systems in the past.

located at different collection points in the city. In most parts of the city, the communal collection points have been located at roadsides and vacant plots (Figure 2). Of the total generated waste, 25 % is still dumped in riverbanks, empty sites, drainage channels, ditches, etc. In the early 2000s, about 33% of households in the city were provided with door-to-door collection services. A comparison of the city's past and present solid waste generation and disposal is shown in Table 2.



Figure 2. Solid waste collection from households in condominium areas for transportation to transfer sites.



Figure 3. Loading of solid wastes from transfer sites for final disposal at Koshe disposal site.

Table 2. Waste generation and disposal.

Waste generation and disposal	2003	2016	2020
Collected and transported landfill annually	5.4x10 ⁶ m ³ (65%)	8.4x x10 ⁶ tonnes per year	7.92x10 ⁶ tonnes per year
Unauthorized and open dumping	574 m ³ / day(25%)	25%	25%
Recycled and reused	115 m ³ / day (5%)	5%	35,725 (5%)
Composted	115 m ³ /day (5%)	5%	5%

The primary collection system is the one that is carried out by Micro and Small Enterprises (MSEs) from door-to-door in households. It is estimated that there are about 707,817 households at present in the city. The secondary collection system is the block (container) collection that is carried out by private companies in hotels, hospitals, schools and other service delivery and manufacturing organizations. The third is the street sweeping system that is conducted by the sub-city (Figure 4). About 25% of the solid waste generated in Addis Ababa is still indiscriminately dumped within residential neighborhoods as before, while the remaining 65% is collected but disposed of in an unsanitary manner at Reppi/Koshe controlled dumping site. Currently 95% of the city's solid waste is collected through the door-to-door collection system by MSEs and the remaining is collected by private companies.



Figure 4. Street cleaning activities at different areas in the city.

Previously, it was proposed to raise the collection system above 65% of the total solid waste generated

in the city until 2011. However, it was identified that the annual solid waste collection rate was not increasing along with the increasing population and the subsequent waste generation rate. Yet, the percentage of illegal dumping also has not shown an improvement since 2003 though there are some improvements in the service delivery.

At the city level, from 1995 to 2011, there were containers of different sizes. Some were large (8 m³) open steel containers and some were smaller plastic containers with covers (1.1 m³). There were 512 larger 8 m³ containers which were metallic, open, and transported by lift trucks, and 479 smaller 1.1 m³ wheeled waste storage containers with lids. One container was serving 7,367 in population. The containers were placed along the main streets based on the established criteria and waste generation rate though the recommended distance between communal containers was 50 to 100 meters. But people were traveling between 0.5 to 1 km because of a shortage of containers to reach the municipal collection points. There was no properly designed collection route system using maps, collection program and schedule, thus wastes were not collected according to schedules.

The communal containers usually did not have surface covers because of the assumption that they might serve for short periods (usually 2 to 4 days), that they might create inconveniency during loading and unloading operations by the trucks and that they were believed to be unsuitable for usage by the beneficiaries. Containers were not properly and timely emptied when they got full. These were causing dirty corners, littering of the ground around the containers, and illegal dumping around. The containers were not protected from rain and sun. The surroundings of the containers were not properly cleaned and, in most cases, had no assigned

attendants. This made the garbage causing odor, unsightly urban scene and disturbance through scavengers and waste pickers who were trying to find any recyclable and edible materials in it. There were no communal collection point facilities with a platform for an efficient and effective collection system until 2011 though there was some attempt later (Figure 2). In general, solid waste categories and management responsibilities in Addis Ababa are shown in Table 3.

Shortage of containers, poor access to some parts of the city and lack of proper and suitable vacant land for containers were the major problems in the collection system of solid wastes up until the end of 2011. This was making the people dump their wastes at any accessible places such as riverbanks, empty sites, drains and roadsides due to the lack of environmental awareness, lack of easy and attractive alternatives and inadequate functioning of the waste collection and transport system though most of the people knew that was illegal. Because of these problems, containers have been taken out of the current SWM system from the different parts of the city. At the city level, there were only 72 various types of vehicles such as container lifter trucks, side loaders and 10 compactors that were used to transport the collected wastes to the disposal site. During the period, there were 38 lift trucks to transport wastes collected from open containers, and 10 compactors to transport and to daily empty wastes from containers to the Reppi (Koshe) disposal site. Currently, however, private companies are involved to transport the collected wastes to the disposal site. At the city level, there are 36 private companies engaged in SWM (collection and transportation) in

the city. Sub-cities are responsible for follow-up activities. At present, there are about 128 trucks owned by MSEs and 106 trucks by private companies to transport the collected wastes to the disposal site. MSEs are responsible only for the collection of solid wastes, but the transportation to the disposal site is carried out by private companies. In 2020, 66.75%, 19.8%, and 13.5% of the collected wastes have been transported to the disposal site by government, private and outsourced trucks, respectively. The outsourced ones are 26 in number which operate only in two sub-cities (Bole and Yeka).

One of the main problems for the solid waste collection system is associated with the geographical and urban structure of Addis Ababa and the socio-economic status of the population. Varying topography and lack of proper road networks in some parts of the city is making some neighborhoods inaccessible for collection trucks. However, there is an attempt from the municipality side to bring progress towards alleviating the problem and modernize the SWM service delivery system in the city.

2.1 Actors involved in SWM

To achieve sustainable management of solid wastes, better public participation in the planning and decision-making process is needed. Planning proposals that may lead to large-scale socio-economic instability require broader public participation at the planning and decision-making stages to reach a common understanding and reduce difficulties of implementation.

Table 3. Solid waste categories and management responsibilities in Addis Ababa

Category of waste	Management responsibilities
Municipal solid waste	<ul style="list-style-type: none"> • Municipality • Micro and small enterprises • Disposed of in landfill
Non-hazardous waste	<ul style="list-style-type: none"> • Generator of waste • Disposed of in landfill
Demolition waste	<ul style="list-style-type: none"> • No specifically prepared a site for demolition waste, • Generator of waste • Sometimes by the municipality
Discarded vehicles	<ul style="list-style-type: none"> • Sold to private garages and companies
Hazardous waste including clinical waste	<ul style="list-style-type: none"> • No specially designed facility is available, but the waste generator is responsible • Practically disposed of in existing landfill

The previous city development plan had proposed the need for the involvement of private companies, MSEs and Non-Government Organizations (NGOs) to scale up the solid waste collection in the city. Thus, per the city's plan proposal, the city government has encouraged the private sectors to participate in solid waste management since 2004. In this regard, it was recorded that there were 11 private MSEs engaged in solid waste collection services, operating in eight districts of Addis Ababa in the late 1990s. These had created only a few job opportunities and had the capacity of collecting about 204 m³ each week with a monthly charging of 10 to 30 Birr for the service they were rendering. The service was being determined by a kind of bargaining with the household head.

Solid waste management requires the active involvement of private sectors, different NGOs and civic societies. Concerning the involvement of the private sectors in SWM, there was no enabling environment and legal system that was established for private sector participation in waste collection, storage, recycling, composting and final disposal until the early 2000s. There was no need for the private sector, NGOs and Community Based Organizations (CBOs) for better service achievements. Finally, the need has come out to improve SWM services (waste collection, transportation and disposal services) with anticipating the privatization of SWM service to relieve the financial and administrative burden of the government. In the beginning, the private sectors' involvement with appropriate incentives was envisaged considering one of the following ways:

- Contracting out solid waste management, through a franchise, competitive contracting, commercialization or public/private competition;
- Development of the essential technologies for SWM;
- Maintenance of truck, equipment and materials of SWM; and
- Involvement in composting, recycling, and materials recovery.

In 2010 it was recorded that there were six private companies and 521 MSE unions with a total number of more than 10,000 operators working on solid waste collection. The method of collecting service charges was also changed to the rate of water consumption rate. Since 2011, the service charges for solid waste

collection have been changed from the willingness and ability to pay. Thus, it has become compulsory across all income groups. Accordingly, almost all of the households get the service of solid waste collection with direct service charge with the water bill. The solid waste collection service fee for households and institutions was and is still 20% and 40% of their monthly water consumption rate respectively.

These service charges have been considered to discourage illegal dumping in the city. Hence, the city's plan to implement charging fees for solid waste collection services has been achieved and become successful. In this regard, sanitation service fees of 30 Birr per cubic meter for MSEs and 70 birrs per cubic meter for private companies (240 Birr for MSE and 560 for private companies) were paid as the rate per an 8 m³ container of solid waste collected. But it has been investigated that the existing means of payment have not been made applicable for all waste generators across the city. This is because commercial centers in the city such as Merkato, Piassa and other open marketplaces (e.g., Figure 5) do not all use water supply services, yet they are huge generators of solid wastes in the city. Therefore, the practice has been changed so that the solid waste management issues have now been connected to the coordinated efforts of the city.



Figure 5. Waste is collected from open markets by members of the MSEs.



Figure 6. Improper temporary waste storage site.

Table 4. List of NGOs and their intervention areas since the late 1990s.

No	NGO	Areas of intervention
1	ENDA	<ul style="list-style-type: none"> • Awareness creation, community-based solid waste management schemes, minimization of waste through composting and recycling and waste and urban agriculture since 1995
2	Lem Ethiopia	<ul style="list-style-type: none"> • Environmental awareness raising, enhancing community participation and environmental advocacy that involves the private sector in solid waste management
3	Gash Abera Molla	<ul style="list-style-type: none"> • Local initiative since 1998 • Cleaning up and beautification activities
4	Addis Ababa Chamber of Commerce	<ul style="list-style-type: none"> • Provides support to community initiations
5	Clean and Green Initiative	<ul style="list-style-type: none"> • Initiation by prominent persons in clean and green projects
6	Merkato Participatory Clean up	<ul style="list-style-type: none"> • Community initiative in the Addis Keteme woreda (currently named as sub-city)
7	Red Cross Society	<ul style="list-style-type: none"> • Sanitation
9	NACID	<ul style="list-style-type: none"> • Sanitation facilities
10	CCF	<ul style="list-style-type: none"> • Sanitation and Solid Waste Management
11	Plan International	<ul style="list-style-type: none"> • Solid waste management

Given this fact, the solid waste management practices by the City Government of Addis Ababa Cleaning Management Agency involves the 11 sub-cities' respective offices and various government institutions as its stakeholders and private companies and many MSEs to have the proper solid waste collection and disposal mechanisms in the city.

Earlier, there also were encouragements from the municipality to involve NGOs and CBOs and develop strong partnerships for planning, implementation and management of SWM programs and projects, especially in the areas of waste sorting, recycling, composting and disposal methods at household and community (neighbourhood) levels. In Addis Ababa in the 1990s, 11 NGOs were working on sanitation, solid waste and the environment (Table 4).

2.1.1 Micro and Small Enterprises (MSEs)

There was no well-coordinated effort with the municipality before 2003. The proper relationship was absent in reporting and networking of MSEs. Some MSEs were disposing of wastes surrounding the municipal containers, drainage lines, riverbanks, streets, etc. They were not involved in street cleaning. They lacked capacity in undertaking proper waste collection in the city as compared to the present condition. Previously, licenses for MSEs were given by several government bodies; however, the Cleaning Management Agency was giving temporary licenses

until directives were issued. Small and micro enterprises were participating in primary waste collection. Appropriate incentives for the involvement of MSEs in the primary collection were established.

MSEs were not involved in street cleaning. They lacked capacity in undertaking proper waste collection in the city as compared to the present condition.

Until 2003, MSEs were providing the service collection to households once to twice a week with no regular collection hours due to the lack of daily vehicle availability. About 74 MSEs were engaged in the primary collection of wastes from households to the municipal containers in 2003. The collection of waste through MSEs had provided job opportunities for many jobless youths. About six MSEs had commenced collecting and transporting solid waste from households to the final disposal area. The majority were operating in the middle- and high-income residential houses using the door-to-door method by charging an average of 12 Birr per household per month.

However, the service was only given to users living on the accessible and main roadside, thus inaccessible areas were not reached. There was also a lack of a properly designed collection program and schedule, thus users did not know the time of collection. When

trucks came for collection, the crew used their vehicle horn for calling users. Then people would bring their wastes for unloading to the trucks. However, the drivers did not wait for an adequate time. So, people who brought their waste but did not meet the truck would be forced to dump on the undesigned areas such as the streets, ditches and rivers. There was no properly designed collection route system using maps and pertinent data, thus there was high unproductive time and the trucks were not used with proper frequency. There were no standard operating procedures manual. Currently, members of the MSEs collect wastes every other day from households. When they come, they blow the horn as a signal of their coming, and then residents bring their wastes out and put them in a common place in the villages (Figure 7), and then they will be transferred to the transferred stations by MSEs.



Figure 7. Wastes collected from households, to be transported to the temporary storage sites.

2.2 Institutional collection

Major commercial and manufacturing centers and government and private institutions were provided with containers to collect and empty their wastes upon request through telephone or going physically and were charged. The service provision was not carried out according to the schedule. Such unsatisfactory conditions were causing several complaints and appeals. For service provided to institutions, institutions were paying a service charge of 11 Birr per cubic meter of the waste they generate. Because private sectors were not involved in the collection and transportation of institutional wastes,

the service delivery was entirely dependent on the municipality. Thus, the municipality was obliged to spend its limited resources on institutions where the private sector could do it. This has been changed by the current Cleaning Management Agency.

2.3 Hazardous, special and industrial wastes

Municipal solid wastes are not supposed to be disposed of together with hazardous wastes. But there have been no effective institutional system and specific regulations dealing specifically with hazardous and industrial wastes for their proper collection. Thus, they are ending up with municipal wastes at Koshe open disposal site. They also are discharged into the nearby watercourses from the industries and hospitals without any form of prior treatment and special consideration in conjunction with the urban non-hazardous wastes. On top of this, there are no specialized facilities and institutions for such wastes in the city. There is also no competent, well-staffed regulatory department that deals with such wastes. Studies, inventories and records have not been made of the generators of these wastes as well. At the household level, there is also no segregation of household hazardous waste at the source in a separate bin. Producers are not fully responsible to prepare facilities for such wastes.

2.4 Transfer stations

A transfer station is an intermediate place at which waste is deposited and stored before being transported to the final disposal site. Because the dump site for waste disposal was and still is within the city, there has been no transfer station materialized for long. In a waste management scenario, transfer stations must be considered in the planning approach. However, transfer stations were uncovered in the plan component of the former development plan of Addis Ababa. With the plan to move the disposal site to another far area, there was a plan to construct appropriate transfer stations in different parts of the city per the existing development plan.

To enlarge the level of solid waste collection geographical area coverage at the city level, the waste collection trucks increased by 45.83% from 2003 to 2010. However, there is still improper storage of solid

wastes in open spaces until they are transported to the disposal site (Figure 6).

Thus, as part of tackling this shortage of waste containers, the existing Cleaning Management Agency has not yet finalized the set-up of transfer stations based on the selection criteria such as road accessibility, areas' slope, sensitive areas such as schools, churches, mosques, etc. in the city. Several efforts had been made in the then Development Plan implementation period to improve the efficiency of solid waste management services. However, the issue has not yet reached the level demanded to alleviate the existing solid waste problems in the city. Currently, however, transfer stations are proposed in the existing development plan to ensure efficient delivery of solid waste collection and disposal services to serve as a bridge between community-based solid waste collection endeavours and a waste disposal facility (Figure 8). At present, there are 311 transfer stations in Addis Ababa.



Figure 8. Sample new transfer sites being built in different parts of the city

2.5 Waste processing and separation

Various concepts and principles need to be used in developing sustainable waste management. Sustainable SWM is the guiding principle to improve the poor waste management services and environmental quality of a city. The concept of sustainable solid waste management recognizes waste as a resource and makes use of a hierarchy of options. The most preferred waste management option is prevention and minimization followed by reuse, recycling and resource recovery. However, the dominant waste management practice employed in the city of Addis Ababa is the least preferred option, ie, only collection and disposal. Per the Cleaning Management Agency, 84,643,000 Birr and 99,267,299 Birr were generated in 2019 and 2020 respectively from waste processing activities. The solid waste generated contained items such as bottles, papers, plastics and metals that can be directly reused or used after some recycling processes (Table 5).

Moreover, a large part of the solid waste is composed of organic matter that can be transformed into composts. Successful implementation of sustainable solid waste management, however, requires the separation of waste at the source and the active involvement of the public in the process. Proper implementation of such a strategy creates job opportunities and minimizes burdens on the natural environment (eg, Table 6). However, very little has been done so far at the waste generating sources to reduce the volumes of waste through efficient sorting, recycling and composting activities. Most of the sorting and recycling of waste at the moment have still been done by the informal sector as before.

Table 5. Wastes processed for recycling and reusing (in tonnes) in 2020.

Types	2020
Plastics	26,887
Glass	196
Compost	591
Paper	1,856
Metals	5,912
Electronics	286
Total	35,725

Table 6. Job opportunities created by waste processing (recycling and reusing).

Sub-cities	Area in km ²	Job opportunities	
		Reuse and recycled	Collection
Akaki	118.08	642	77
Gulele	30.18	119	*
Yeka	85.98	40	17
Bole	122.08	187	19
Kirkos	14.62	85	4
Lideta	9.18	184	*
Arada	9.91	73	29
Addis Ketema	7.41	295	*
Nifas-Silk	68.30	165	37
Kolfe Keraniyo	61.25	111	53
Sub-total	526.99	1,901	236

* Data not available

2.5.1 Recycling and reuse

Earlier studies indicated that the recyclable portion of the total generated waste was 15% in the city. Yet, the practice of waste separation at source is only 10% of the solid waste is reused/recycled, including organic waste that is composted. However, only 5% of the waste was recycled informally. Recyclable materials with direct commercial value were widely separated from the waste stream, especially at the household level. The collection of recoverable waste was highly organized with its huge network of dealers and wholesalers throughout the city. The amount of solid waste used for recycling and reusing for the years 2016 to 2020 and the money generated are shown in Table 7.

An extensive network of actors pick, collect and transport salvaged materials, and then sell separated and selected materials to small recyclers. It employed a great many workforces. The recyclable items were

metal products, some types of glass products, bottles, paper, plastics, rubber products and clothes (Figure 9). The items were sold to the informal sector of recyclable collectors moving around the city known as "Koraleos". Koraleos are informal itinerant buyers going from door to door to collect recyclable and reusable materials such as pieces of metals, plastics, glasses, corrugated iron sheets, tins, car batteries and others. They buy these materials and sell them to one of the middlemen, who in turn sell them to recycling companies in Addis Ababa. These middlemen are registered at the Bureau of Trade and Industry, thus have a license for trading materials and need to pay taxes. In the poorest families, this recycling formed part of the actual family subsistence. Sorting of valuable recyclables in commercial and institutional facilities also was widely practiced and the items were sold directly to informal or formal sector dealers of recyclable materials to whom also Koraleos (recyclable materials collectors) sold their collections.

Table 7. The amount of solid waste used for recycling and reusing and money generated.

Year	Amount of solid waste used for recycling and reusing (in tonnes)	Money generated (in Birr)
2016	3,057	8,239,460
2017	14,584	36,066,200
2018	23,365	61,869,000
2019	30,321	84,643,000
2020	35,727	99,267,299



Figure 9. Collected plastic bottles (in condominium sites) for reuse and recycling.

Recyclable materials without direct commercial value and/or immediate reuse were usually not separated from the waste stream. Some craftsmen recycled metal, wood, rubber tire, clay, etc. to provide essential goods including usable spare parts to a great number of customers. The nucleus of these activities was and still are Merkato areas in Addis Ketema sub-city. Although there were no formally organized Western type of recycling centers and big enterprises, there were informal recycling activities. In Reppi (Koshe) landfill, 200 to 300 scavengers practiced waste recovery by collecting salvageable materials in 2003. NGOs such as ENDA were engaged in organizing the informal recycling sector through community-based waste management schemes in earlier times.

Though the former City Government of Addis Ababa Development Plan had proposed the encouragement of the participation of informal waste collectors and recyclers in the sector, nothing was done as a means of improving the city's solid waste management problems by minimizing wastes through recycling as one of the integrated solid waste management practices. It is known that composting of organic

wastes is very important for fertilizer and energy (methane) generation so that it can be managed at various levels like household, community or city level composting. As various studies indicate, the organic content of solid wastes in Addis Ababa is about 70% of the total solid waste generation. This indicates that composting could be one of the feasible disposal methods for solid wastes in Addis Ababa. With this benefit, it is considered as one of the components of the municipal solid waste management activities in the City Government of Addis Ababa Development Plan. The former development plan had proposed to bring a state of composting up to 30% of the total 70% of all organic solid wastes generated in the city. However, it was found out that nothing was done in the area of encouraging composting at the city level with the exception of establishing compost-making demonstration sites by the EPA of the city.

Very little has been done at the waste generating source and community levels to reduce the volumes of waste through sorting of recyclable materials from the waste stream. There have been no well-organized and formal type recycling centers. However, there were some attempts by the city administration to:

- Encourage small-scale entrepreneurs to venture into plastic waste recycling;
- Promote community-based plastic recycling schemes; and
- Organize and support the development of informal sectors such as “Koraleos” (recyclable materials collectors); craftsmen (recyclers of metal, wood, rubber, tire, clay, etc.); vehicle recycler (dealers of those vehicles that are scrapped); and landfill scavengers; to reduce waste disposed of in disposal site.

There were also some promotion activities with the aim to:

- Reduce the use of plastic bags (“festals”) in shopping;
- Use of bags and baskets made out of environmentally friendly and locally available materials;
- Avoid dumping of “festal” with other wastes, but sort it and keep it in one place for recycling and recovery;
- Reuse of plastic bottles and containers;
- Remanufacture of glass;

- Reuse of tyres for shoemaking;
- Reuse of beverage bottles;
- Discarded vehicle recycling by selling its parts;
- Charging more tax on plastic bag producers and importers;
- Setting up of recycling centers close to shopping areas especially by organizing waste pickers and koraleos; and
- Formation of recyclers' network to coordinate and enhance the recycling activities.

Addis Ababa's recycling sector currently faces several challenges which limit its expansion. Local recycling activities have difficulties to acquire land to establish recycling facilities. Various financial barriers also exist such as equipment and facilities, and limited access to finance. Financial, technological and human capacity constraints further prevent local recycling companies from participating in the entire recycling value chain. If adequately supported, the recycling sector could help address the city's long-standing solid waste management problem while at the same time creating jobs (e.g., Figure 10) and helping the city shift towards a more circular economy.



Figure 10. Teaching aid materials (source: District Waste Management office, Bole sub-city).

2.5.2 Composting

Very little has been done at the waste-generating sources to reduce the volumes of waste disposal through the processing of domestic waste into compost as there have been no well-organized and formal type composting centres. Earlier studies indicated that 60% of the wastes generated were organic and degradable materials. Sorting of compostables from the waste stream was practiced but only by a small minority of the households and other waste-generating sources. Some did garden composting for agricultural use at the household level but in some areas, community-level composting activities were promoted by NGOs. Some community-based interventions on composting were done by some NGOs such as ENDA especially on how to prepare compost and use it for vegetable gardening. Some were working on bio-intensive gardening for households and high schools. The estimated composting rate has been 5% of the waste generated for a long time. The city administration was encouraging small-scale composting by organizing income generation and selling it to farmers for urban agriculture and encouraging communities and private sectors in composting through various incentive mechanisms. In 2020, about 1,015 tonnes of solid wastes were used for composting purposes across all sub-cities in the city (Table 8).

The cleaning management also has prepared a procedure, manual and standard for recycling and reuse of solid wastes in the city. In all sub-cities, 1,066 households are currently working on composting.

Table 8. Compost produced in 2020 by sub-cities.

Sub-city	Composted produced (in tonnes)
Akaki	143
Gulele	150
Yeka	47
Bole	70
Kirkos	49
Lideta	33
Arada	19
Addis Ketema	34
Nifas Silk	15
Kolfe	452
Disposal Site (Koshe/Reppi)	3.4
Total	1,015.4

Table 9. Number of workers in street cleaning in the year 2020.

Levels	Number of workers
Cleaning Management Agency	279
Sub-cities	786
Districts	7,253
Total	8,318

2.6 Street sweeping

Street waste is directly related to the aesthetic appearance of the city. However, special attention has not been given to street cleaning services in the Development Plan. Yet, streets requiring cleaning have increased since 2003. The service delivery also has been expanded along with the expansion of urban areas to address the street sanitation problems in the city. The current manpower engaged in street cleaning is indicated in Table 9.

Sub-cities are responsible for urban cleaning, concentrating mainly on street sweeping. They are doing the cleaning mostly manually using a wheelbarrow, metal or straw brooms and shovels. This is undertaken by sweeping teams on strategic roads only. The sweepers are working with simple manual equipment and dispose of the sweepings in communal containers in their respective areas. Street sweepings are about 6% of the total waste generated. Out of the total 575 km main roads to be cleaned in 1999, 503 km (87%) were swept daily. The total workers deployed were 1,642, out of which 30 were street cleaning foremen and container attendants. The street cleaning service was only for a small part of roadsides; it did not include the whole street areas, drains, pedestrian roads, etc. and thus only specific areas were swept. The workers were not given specifically measured streets, so the distance of streets is not properly known.

The streets and roadside to be cleaned are not properly swept; windblown paper, plastics and other debris were left uncollected on the street. The working time is mostly early in the morning before 9 a.m. The supervision and control of sweepers are weak. Street sweeping is not based on an operational work plan and schedule. It has no modern street cleaning equipment such as suction cleansing, drain cleaning, road cleaning, mall and street sweeping and highway sweeping vehicles. Shortage of street cleaning materials such as a wheelbarrow, broom and

shovel and lack of protective devices for workers are some of the challenges in the area.

2.7 Landfill

There has been one open dumpsite, named "Reppi" or "Koshe", which has been giving service since 1964. The site has served beyond its design period and has been a source of serious public and environmental health threats. It has a surface area of 25 hectares. The site is located in the southwestern part of the city in Kolfe Keraniyo sub-city, some 13 km away from the city center. Until 2002, the estimated disposal of solid waste in the landfill was more than 9.5 million cubic meters. The past method of disposal was unsanitary open dumping: hauling the wastes by truck, spreading and leveling, and compacting by compactor or bulldozer. After four decades since its establishment, the disposal site was faced with major problems such as getting full, surrounded by housing areas, creating nuisance and health hazard for people living nearby, absence of daily cover with soil, absence of leachate containment or treatment, absence of odor or vector control, etc. About 200 to 300 human scavengers per day were working continuously and interfering with the operation of the work for the collection of salvageable materials such as wood, scrap metals, discarded food, etc. in the year 2000. Currently, however, some improvements have been made such as burning waste to generate heat and energy, establishing a weighbridge for accurate weighing of waste, record keeping, venting gas (methane) emissions to prevent the occurrence of fires, and preparing proper and adequate road access to the site. The solid waste disposal service at the disposal site and power plant are shown in Table 10.

The present Reppi/Koshe dumpsite has been getting full for the last 10 years. It has been partly surrounded by houses and institutions. The site is also exposed to animals such as dogs, cats and others, which in scavenging are scattering the waste in the surrounding area. In the past, no planning has been

made for the establishment of a new landfill before the existing landfill becomes in the worst condition. Finally, when considered a problem, a new landfill was proposed through proper selection of the site, design and construction. Due to the urgency of the landfill question, the first new landfill has been established though it has not yet been under use.

It is believed that the generation of solid wastes in a city can never be stopped; hence, solid waste management must use landfills for disposal. As has been stated above, the existing single open disposal site in Addis Ababa has served the city for more than 55 years so that it has now reached its full level. Having recognized the problems, the former Development Plan identified sites for the construction of four new landfills at various locations namely in the eastern part of the city (Bole-Arabsa), western part (Fili-Doro), northeastern (Yeka-Abbado), and southeastern (Dertu-Mojo). These sites were selected for the final treatment and disposal of solid wastes generated in the city. However, none of them was constructed as planned. The city government of Addis Ababa still utilizes the Reppi (Koshe) site as the only open solid waste disposal location. The site has no daily cover with soil, nor any odor or vector control, so that it can have a negative environmental health impact as it is an open site in the city.



Figure 11. Koshe solid waste open disposal site view.

It was recognized that this dump site had posed a negative physical and health impact on residents living around the city. Thus, the city government had not given attention to the establishment of a new sanitary landfill site until 2009. But a new landfill has been established in the Oromia National Region State some 35 km away from the city center in the Sendafa area locally named Chobe Woregenu. However, it has not yet been under operational practice due to administrative boundary issues. Yet, its long distance away may cause fleet-management problems even when it becomes operational. This might affect the efficiency of the collection system and also increase operating costs (fuel, oil, grease) when it comes to operation.



Figure 12. The internal condition of Koshe open disposal site.

The small proportion of the solid waste that must be disposed of should properly be buried in a well-designed sanitary landfill. A sanitary landfill site should be developed and operated in such a way that it would not pose a threat to public and environmental health. Sanitary landfill sites that can serve Addis Ababa and the surrounding towns have been proposed as they constitute both environmentally and fiscally sound waste disposal options.

Table 10. Solid waste disposal service at the disposal site and power plant.

Activities	Waste in tonnes
Solid waste supplied for power generation	513,968.56
Solid waste disposed at the disposal site	230,646
Fly ash removed at the disposal site	12,729
Sludge ash removed at the disposal site	86,886

3. Environmental problems / challenges related to solid waste

Environmental problems have attracted the attention of the city administration of Addis Ababa for the past two decades. Yet, people are not fully becoming increasingly conscious of the variety of environmental problems about solid waste generations in the city. Population growth and urbanization are the main causes of environmental problems in the city. These are making the provision of urban environmental services very difficult. These coupled with the existing management of solid waste systems are posing pressures on the environment from time to time and damaging the environmental quality of the city.

The management of solid waste is one of the major challenges facing Addis Ababa. The city has a range of solid waste problems, including inadequate waste collection systems, open dumping and other forms of improper final disposal and the resulting environmental pollution. The existing environmental problems in Addis Ababa have been the results of many contributing factors. Like many other towns and cities of the developing countries, the city is facing serious environmental problems, one of which is related to solid wastes. The amount of solid waste generation in the city has been increasing over time because of the rapid population growth rate and expansion of the city.

One of the main challenges concerning the city's environment is the sanitation problem associated with poor solid waste collection and disposal practices. The core problem of solid waste is the pollution of the city environment because of insufficient waste collection, ie, about 25% of the solid waste is dumped illegally into undesignated areas in the city, especially the river, vacant lands, streets and drains. This causes health risks for the city's residents and reduces the quality of its environment. Illegal dumping has two such causes as having insufficient collecting service and lack of awareness by the residents. Poor institutional capacity for enforcement and monitoring also has contributed to poor waste management in the city. The open dumpsite of Reppi is also a source of pollution to the city's environment. The improper solid waste disposal is aggravating Addis Ababa's

vulnerability to flooding, especially during rainy seasons, as a result of blocked drains due to solid wastes disposed of in it. This has damaged houses and infrastructure in the city. The gas generated from Reppi landfill causes spontaneous fire (Figure 11) and air pollution. Studies indicate the Reppi/Koshi disposal site is contributing an enormous amount of methane (greenhouse gas) to the atmosphere.

Consequently, the problems and issues associated with waste management have been given priority in the city. The population in the city continues to increase and the city along with its activities are also expanding so that the issue of waste management must always be given due emphasis. The city administration has the responsibility to manage the wastes to protect public health in particular and the urban environment in general. Therefore, urban cleaning services are currently one of the major issues in Addis Ababa that is given priority by the city administration.

4. Solid waste management institutional structure

4.1 Institutional framework

Improved solid waste management means making waste collection and disposal systems more efficient, raising public awareness and enforcing solid waste management laws. These interventions could be achieved through a well-operating institutional framework that is capable of generating the financial resources required and technical skills to meet operating, maintenance and investment costs. Hence, enhancing inter-organizational integration is very important to improve SWM through creating functional interdependences such as experience sharing and supportive activities.

The management of solid waste in Addis Ababa was being undertaken by the city council until it was transferred in July 1993 to the Solid Waste Management (SWM) team of the Environmental Hygiene Department under the region's Health Bureau. Later it was restructured to be managed by the then Sanitation, Beautification and Parks Development Agency (SBPDA) in 2004. As of 2011, it has been run by the City Government of Addis Ababa Cleaning Management Agency (CGAACMA), and the City Government of Addis Ababa Recycling

and Disposal Office (CGAARDO). Currently, the solid waste management service provider has been structurally stretched into three layers at the city level. The CGAACMA at the top, 11 sub-city administrations in the middle, and 120 Woredas/districts at the bottom are in place to provide solid waste management services. With the current development/structural plan of the city, the solid waste management system has been decentralized to the lower level of administration in the city level with the main intention of improving the solid waste collection and transport system in the city. Sub-cities are empowered with full responsibilities and authority about SWM. While ensuring a consistent approach within the city, effective decentralization has been developed to sub-cities in respect to operational solid waste management, but the Cleaning Management Agency is dealing with cross-cutting issues, regulatory function and facilitation at the city level.

Financial autonomy did not exist at the central and sub-city level to discharge for SWM service provisions. There was no also well-organized institution set up at the grass-roots level (formerly, woredas were divided into kebeles – but these have recently been abolished) either in the form of government entity and sanitation council. Until 2007, no federal institution formulated proclamation, policies, laws and strategies about SWM. Coordination to enforce sanitation rules and control illegal dumping was absent; the implementation (management and coordination) of SWM in the city was undertaken by establishing the Sanitation, Beautification and Parks Development Agency (SBPDA) in 2004. Subsequently, Sanitation Councils were established at all levels comprising different representations of the community, government bodies, MSEs, NGOs, CBOs, etc. to work together with:

- Code Enforcement Service to control cleansing and illegal dumping;
- Environmental Protection Authority (EPA) of the city for improvement and protection of the city environment;
- Education Bureau to introduce sanitation in schools, establish sanitation clubs in schools and mobilize students in sanitation programmes;
- Health Bureau to strengthen SWM content in health education programmes;
- Land Administration Agency to give proper emphasis of SWM in urban development,
- Infrastructure and Construction Authority to integrate SWM in the design and implementation of urban development;
- Agriculture Office to integrate solid waste composting with urban agriculture and promote hygiene and environmental awareness through agricultural agents;
- Micro and Small Enterprises Agency to organizing MSEs for primary waste collection; and
- Finance and Economic Development Bureau to ensure allocation of budget, control of financial matter and ensure project development with donors.

Recently, the regulatory role of solid waste management has been given to CGAACMA and the mandate of service provision has been given to sub-city solid waste management divisions. The reorganization of solid waste management has been envisaged to improve the solid waste management problems of the city. It is understood that the mandates of the CGAACMA to implement a wide range of activities in the area of solid waste management such as collection and transportation, controlling and monitoring, coordinating sub-cities, capacity building, awareness-raising and undertaking studies while CGAARDO is responsible for recycling and composting the collected solid wastes and managing solid waste disposal sites. It is found out that an enormous quantity of municipal solid waste (MSW) in the city is produced from three major sources such as households (76%), institutions (18%) such as commercial, hotels, factories, etc. and street sweeping (6%) (AACGCMA).

4.2 National level

The Ethiopian Constitution Article 44 says "all persons have the right to live in a clean and healthy environment". Formerly, there was no federal legislation dealing comprehensively with all aspects of solid waste management until 2007. The National Health Policy has given priority to the development of environmental health, promotion of intersectoral collaboration in developing safe disposal of human, household, agricultural and industrial wastes,

encouragement of recycling and attention to a healthy environment. At the federal level, the Public Health Proclamation No. 200/2000 has provisions on waste handling and disposal. Environmental Protection Authority (EPA) also deals with solid waste issues for sustainable use of natural resources in the country. It is mandated to develop standards and norms for the protection of the national environment. National Environmental Policy gives due attention to sustainable development, polluter pay principle, recycling, and other environmental issues.

At the federal level, the Ministry of Health plays a leading and direct role in matters related to "Public Health and Sanitation" for which solid waste management is part of public health. The provisions stipulated in the federal proclamation No. 200/2000 about solid waste management (SWM) had enabled the Ministry of Health to plan the way forward for SWM to meet the challenges of the nation. Currently, the Federal Solid Waste Proclamation (513/2007) aims to prevent environmental damage from solid waste while harnessing its potential economic benefits through the involvement of the private sectors for effective management and safe transport and disposal of solid wastes.

4.3 City level

Solid waste management activities such as collection, transportation, and disposal were solely the responsibility of the municipality of Addis Ababa for a long period. Experience in the past situation lets the city government recognize the fact that the problem of solid waste management cannot be solved with the single efforts of the municipality.

The city government of Addis Ababa transferred the service provision of solid waste management to the Sanitation, Beautification, and Parks Development Agency (SBPDA) in 2003. But the agency has been shifted to the Cleaning Management Agency since 2011. At the city level, the Cleaning Management Agency is currently mandated to act as a regulatory, policymaking and legislation formulation, set up standards and procedures, coordination among sub-cities and deal with cross-cutting issues, delivering appropriate technical support, capacity building, administration of landfill and undertaking public awareness program, advocacy and research. Addis Ababa Sanitation, Beautification and Parks

Development Agency (SBPDA) in the city government of Addis Ababa has taken the responsibility of SWM from Addis Ababa Health Bureau. The city government of Addis Ababa has issued Proclamation No. 2/2003 regarding the establishment of the organs of Executive and Municipal Services, in which Article 47 mentions the powers and duties of Sanitation, Beautification and Parks Development Agency including its authority on SWM. The objective of SBPDA was to make the city a favorable environment through integrated solid waste management among others.

Some improvements and changes were undertaken by SBPDA at the central level. Some of these were:

- Service delivery improvement plan and implementation;
- Intensive promotional activities and public education to raise public awareness on policies and regulations, waste reduction, recovery, reuse, recycling and composting;
- Improved system of control and supervision of workers for productive and efficient fleet management;
- Introduce waste collection route scheduling and daily work schedule for all garbage vehicles;
- Improve siting of communal containers with established criteria and construction of collection point facilities with a platform;
- Improve street cleaning and close control through effective implementation program and schedule;
- Orientation of workers at different levels on the improved service delivery;
- Development and use of various operational guidelines and manuals;
- Conduct discussion forums on SWM policy and regulations;
- Increase the number of MSEs, encourage strategic pre-collectors and support through training and any assistance required;
- Expand community-based recycling and composting in sub-cities and districts (Woreda);
- Reduce the scatter of garbage by setting dust bins along footpaths for passersby and pedestrians;
- Reclaim and restore the existing dumpsites for more years of infill capacity through

excavating the old sites, construct the access road and commissioning improved infilling service;

- Organise human scavengers in the dump site and deploy them in well-organised recycling and composting activity for their livelihood and improved waste reduction program;
- Integrating composting scheme with urban agriculture in conjunction with concerned bodies;
- Study and selection for a new landfill site in conjunction with French Embassy and other concerned and interested bodies.

However, there was no endorsed comprehensive solid waste management legislation in Addis Ababa by the SBPDA. The Hygiene and Environmental

Health Regulations No. 1/1994 issued by Addis Ababa City Administration explicitly has provisions on solid waste management. In 2003, the draft comprehensive Solid Waste Management Regulations was in the process of endorsement. Then, Solid Waste Management Policy has been endorsed by the City Government of Addis Ababa. The policy has such main issues as policy goals and objectives, principles, type and sources of solid waste, solid waste transportation, solid waste disposal, solid waste recycling, management information system, NGOs and civic societies participation, community participation and the role of research institutions. The number of employees engaged in SWM from Agency to District level in 2020 is shown in Table 11.

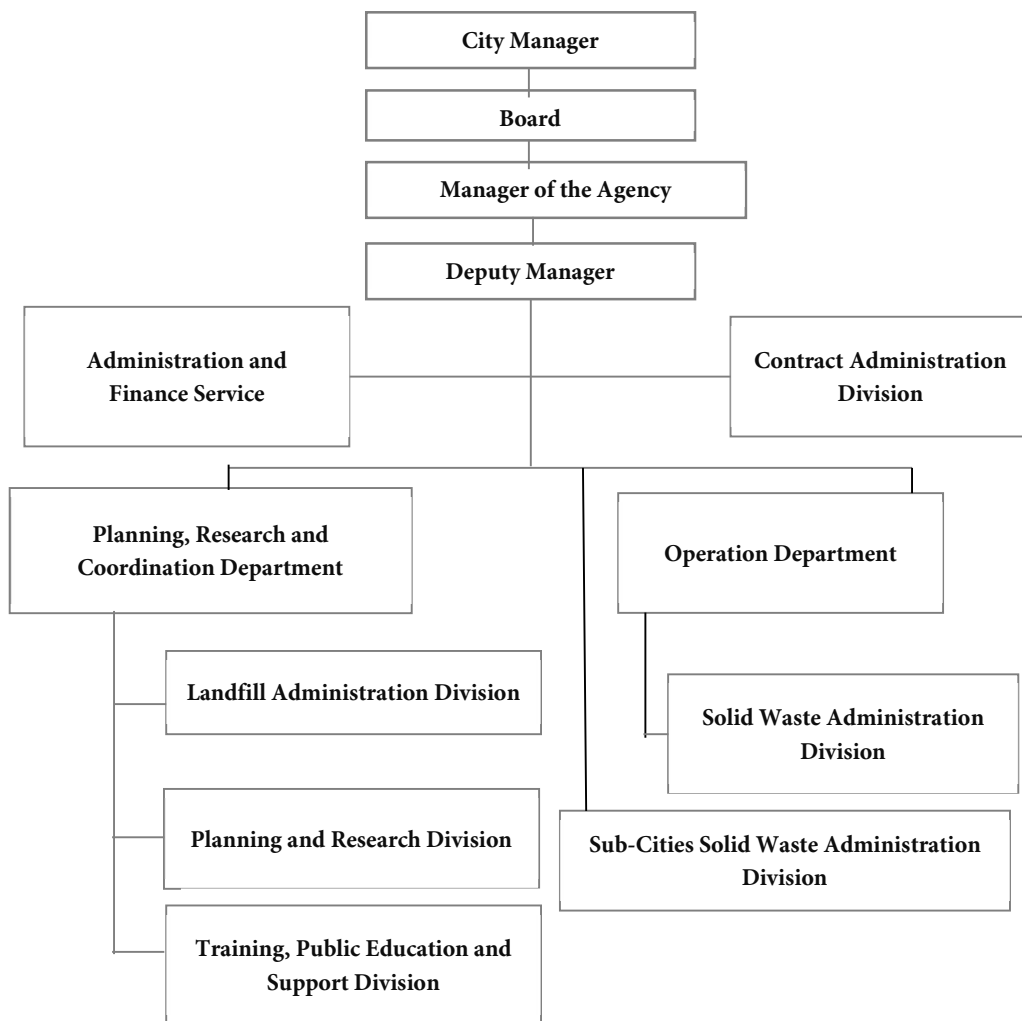


Figure 13. Organization chart indicating the structure of Sanitation, Beautification and Parks Development Agency (SBPDA) from 2004 to 2011.

Table 11. Number of employees engaged in SWM from Agency to District level in 2020.

	Agency	Sub-City	District Offices	Street Cleaning	No. of MSEs (No. of members)
Agency	11	-	-	-	-
Arada	-	38	29	487	3 (319)
Akaki	-	76	47	449	7 (559)
Addis Ketema	-	43	150	370	10 (497)
Bole	-	65	47	862	13 (825)
Lideta	-	27	22	355	3 (264)
Gulele	-	43	29	297	5 (483)
Kirkos	-	40	30	713	3 (400)
Kolfe	-	77	269	629	15 (813)
Nefas Silk	-	69	29	652	10 (854)
Yeka	-	73	50	804	10 (680)
Total	11	551	702	5,612	78 (5,694)

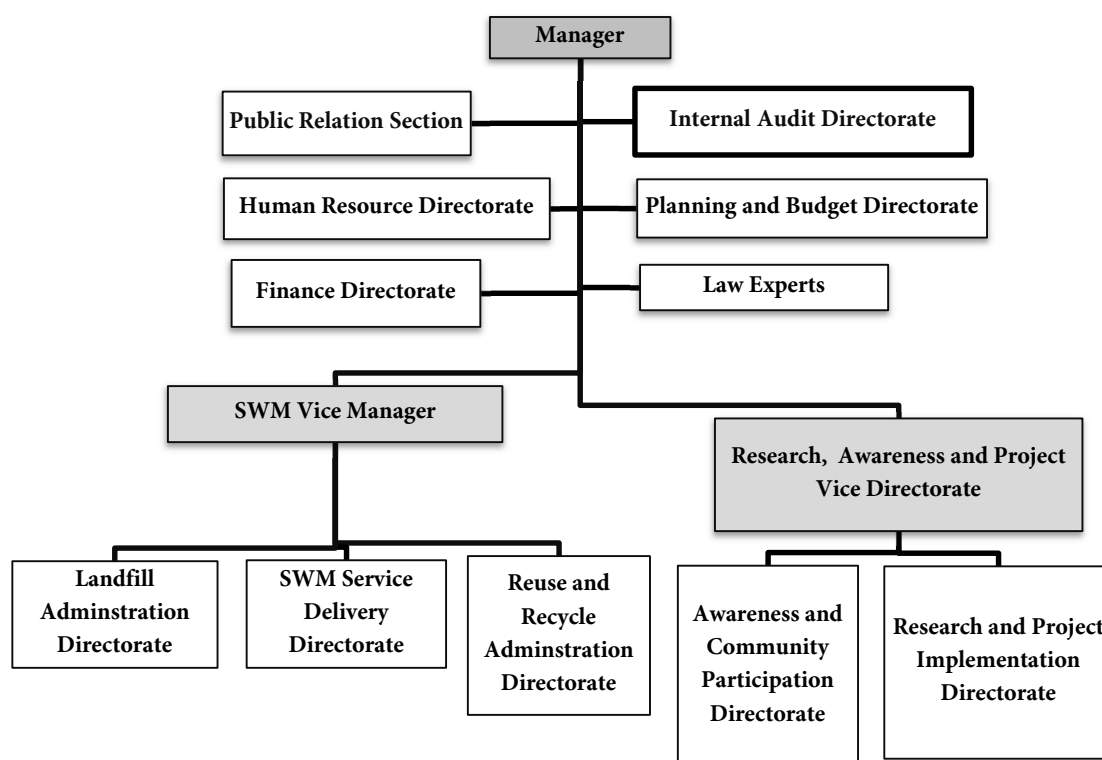


Figure 14. Existing organizational structure of the Addis Ababa Waste Management Agency.

Since 2011, solid waste management has been the responsibility of the Cleaning Management Agency. The following are some of its major responsibilities:

- Prepare solid waste management policy and laws, and upon approval, follow up their implementation;
- Prepare directives and systems for effective implementation of SWM;
- Prepare standard criteria, guidelines, and manuals on SWM;
- Prepare city-level solid waste management framework;
- Review and monitor the implementation of sub-city waste management plans;
- Coordinate the efforts and operation of sub-cities in implementation of solid waste management plan and program;

- Coordinate the activities of various sectoral agencies and NGOs operating on SWM;
- Provide technical and capacity-building assistance, support, and advice to sub-cities;
- Develop and prescribe procedures of appropriate permits and licenses for the private sector;
- Review the incentive scheme for effective solid waste management;
- Promote awareness creation and information campaign strategies on SWM;
- In collaboration with concerned bodies, propose fair, equitable and reasonable tariffs for SWM service delivery;
- Encourage and assist the participation of private sector and micro and small enterprises in solid waste collection, transportation and disposal;
- Propose and adopt regulations requiring solid waste collection, segregated collection, processing, marketing and sale of organic and designated recyclable material generated in each sub-city;
- Ensure that SWM programs conducted by various bodies comply with SWM rules and regulations;
- Develop and administer landfills, transfer stations and materials recovery facilities;
- Facilitate training and education on integrated solid waste management;
- Establish and manage solid waste management information base;
- Promote the implementation of waste minimization and reduction in sub-cities; and
- Prepare city-level solid waste management status report.

4.4 Sub-city level

Per the city's decentralization power delegation, a solid waste management team has been established in all 11 sub-cities. The sub-cities deal with the day-to-day operational activities such as solid waste collection, transportation and street cleansing; cleanse illegal dumping sites; conduct sanitation campaigns; undertake composting and recycling; carry out community-based activities; respond to public complaints and provide emergency services. Previously, sites were identified for construction of communal collection facilities with the platform and

design of the facilities, but not realized in the sub-cities as the container system has currently been removed from the system by the decision of the municipality though there is some attempt of constructing transfer sites (see Figure 8). In sub-cities, areas for door-to-door collection points have now been identified and collection schedules have been set in each village in the districts (Woreda).

Some of the major responsibilities of the SWM Team in each sub-city has included the following:

- Developing sub-city SWM plan and budget that ensure management of solid waste;
- Taking measures to ensure the effective implementation of SWM programs in sub-cities;
- Providing solid waste collection services;
- Cleaning streets, footways, public places, public drains, etc.;
- Cleaning open market grounds;
- Cleansing illegal dumping sites and working with other concerned bodies for the elimination of illegal dumping sites;
- Regulating, inspecting and monitoring the services of MSEs;
- Acquiring technical and material resources from governmental and non-governmental bodies to discharge responsibilities as effectively as possible;
- Providing emergency SWM services in cases of any emergencies;
- Undertaking recycling and small-scale composting and improved home-based composting;
- Coordinating the activities of various actors undertaking SWM in the sub-city;
- Establishing technical committees as required for effective implementation of SWM services in the sub-city;
- Providing information as well as advisory and technical assistance on SWM to district administration office;
- Organize and carry out public events on SWM issues in the sub-city;
- Submitting periodic reports to the city agency as well as to the sub-city manager.

5. SWM plans and implementation

The issue of the urban environment as one important component was considered during the revision of the 1986 Development Plan of the city. This was because there were many problems related to the provision of basic sanitation services and controlling pollution in the city. In addition, the 2003 - 2010 Development Plan proposed to set proper waste management practices following the city's vision to make Addis Ababa a "Safe and Clean Environment" whereby the inhabitants could live, work and recreate in an environment that was free from pollution. This plan provided a strategy for the general management of solid wastes generated within the city. The planning concerning environmental issues of the city had been based on SWM standards and requirements for the main aim of protecting public health and the general environment.

Given this, the former plan of the city had proposed what to do and when to do activities concerning its environmental components. However, some parts of the planned components were not properly addressed in the planning period. In this regard, the former Development Plan proposed the establishment of landfill sites at four different locations, namely, in the eastern, northeastern, western and southwestern parts of the city at the Bole-Arabsa, Yeka Abbado, Fili Doro, and Dertu Mojo areas respectively. The plan proposed to construct these new landfill sites at the stated locations but did not properly consider the environmental impacts of these landfill sites on the city residents. The former open disposal site has become within the city and is causing several environmental problems. Its leachate can leak into groundwater, polluting drinking water supplies and posing health hazards. Therefore, the plan to open additional landfill sites within the city did not recognize the impacts of the existing open disposal site. Yet, the plan to establish these landfill sites had not been implemented during the plan periods.

To alleviate the SWM challenges at the city level, the former Development Plan of the city proposed two main solutions, namely, better sanitation services and protection of the city from pollution. Specific tasks that were suggested in the Development Plan were part of the solutions to address the solid waste

management of the city to achieve the set goals at the end of the plan periods. That was the provision of better sanitation services through improving solid waste collection systems, and opening new landfill sites.

The current city's environment is also one of the major components of the existing structure/development/master plan of Addis Ababa. To deal with SWM challenges in the city, the current development plan of Addis Ababa has also incorporated various environmental plan components that comprise the planning and managing of the proper and timely collection and disposal of solid wastes in the city. The presence of insufficient solid waste collection and disposal practices has been recognized as a challenge as well by the present development plan of the city. This has been envisaged to ensure a clean city environment through the proper and timely collection and management of solid wastes through providing and implementing efficient and sustainable solid waste management services with the aim to:

- improve the quality of life, raise the image of the city and create job opportunities;
- reduce the amounts of solid wastes that are indiscriminately dumped in residential neighborhoods;
- minimize the amounts of solid wastes that are to be transported to the disposal site; and
- responsibly manage the solid wastes that are to be transported to the disposal site.

For these effective and sustainable waste management services, the city's development plan aims to ensure that all condominium blocks, planned residential neighborhoods, large institutions, restaurants, marketplaces and unplanned settlements have adequate and appropriate solid waste management services. In addition, the current structural plan of the city envisages the following plans:

- develop and operate a sanitary landfill at Legetafo (Chembe) (Table 12), out of Addis Ababa in Oromia regional state,
- develop three transfer stations with material recovery facilities in the southern, eastern, and western parts of the city (Table 12),
- ensure three-way waste separation, namely, recyclable, bio-degradable and hazardous at

the source in 2025 (Table 12), and five-way waste separation, namely, paper, plastic, other recyclables, bio-degradable and hazardous at source in 2040;

- increase the percentage of recycling to 10% in 2025 and 20% in 2040;
- increase the percentage of organic waste transformation (eg, composting, animal feed) to 25% in 2025 and 40% in 2040; and
- close down the Reppi dumpsite and convert it into a public green space in 2040.

For the implementation of such sustainable solid waste management plans in the city, strategies include:

- encourage private sector involvement/participation in solid waste collection, recycling and resource recovery activities;
- develop specific and comprehensive regulations and guidelines on hazardous waste management;
- establish complaint reporting systems to ensure efficient environmental quality standard enforcement;
- equip relevant environmental institutions with adequate human and appropriate human and technical capacities; and
- conduct regular and continuous awareness-raising programs on integrated solid waste management systems at all levels.

The existing plan has suggested different measures to prevent and reduce risks associated with solid waste management in the city. These are:

- separation of solid wastes generated by households, industrial establishments and

hospitals; and promote waste treatment at source (organic wastes, hazardous wastes and recyclable wastes);

- coordination between institutions and development of integrated policies; and
- developing and enforcing quality standards for municipal solid wastes and composts to be produced by recycling municipal wastes.

6. Financial aspect

Previously, MSW management was entirely financed from the general revenue of the City Government. The allocated budget was 1% of the total city government budget from 1995 to 2003 (Table 13). The households did not pay the municipality any fees directly related to SWM. However, sanitation taxes were imposed on business centers as general government revenue. Institutional customers were paying fees related to the actual volume of waste removed to the collectors. Containers from institutions were collected regularly upon request, and they were charged 11 Birr/m³. Those institutions who brought the waste with their vehicles to the disposal site were charged 4 Birr/m³. The collected fees were only able to cover one-third of the service's real cost. Thus, there was a lack of a cost recovery system to achieve and sustain the desired level of service up until 2003. Some households who used MSEs were paying an average of 12 Birr (10 to 20 Birr) per month per household until the system was changed to the water bill system. Then, a new system has been developed since 2011 for cost recovery to achieve and sustain the desired level of service and to create an enabling environment for MSEs and private companies' participation in SWM service delivery.

Table 12. Effective, efficient, and sustainable solid waste management services

Services	Development time and location	
	In the first five years until 2025	In the second five years until 2040
Develop and operate a sanitary landfill	At Legetafo (Chembe)	-
Develop three transfer stations	Reppi, Bole-Arabsa, and Akaki	-
Waste separation at source	Achieve 40% separation at source using three methods (recyclable, bio-degradable and hazardous)	Achieve 100% separation at source using three methods (recyclable, bio-degradable and hazardous)
Increase the percentage of recycling	Increase organic waste transformation (eg, composting, animal feed) to 15% Increase inorganic recycling to 5%	Increase organic waste transformation (eg, composting, animal feed) to 25% Increase recycling to 10%

Table 13. The annual budget allocation for municipal SWM past to recent.

Year	1995	1996	2000	2001	2002	2003	2020
Budget allocation (million Birr)	4.1	4.9	8	10	9	12	?

There is also a lack of experience of sharing and information exchange practices in different implementing institutions working for the same goal of keeping the city’s environment clean. In the implementing institutions, there is also a practice of engagement in the unplanned seasonal activities, and still a capacity problem especially in the area of increasing the number of waste collection trucks to the amount required. All these and other technical skills of workers are not timely upgraded due to the lack of sufficient budget in the implementing institutions. The city administration has set up organizational structures to decentralize the sanitation implementing institutions to all lower levels of administration to improve the city’s environment. Organizing and encouraging the involvement MSEs and private companies and the establishment of a payment system based on the amount of waste collected by CMA are also encouraging. However, the cross-cutting issues for the whole solid waste management process have not been still addressed in line with sufficient financing and well-established cost recovery mechanisms although the city administration has been allocating an annual budget for SWM issues.

7. Legislation (policies and regulations)

The Constitution of the Federal Democratic Republic of Ethiopia is the supreme law of the land with proclamations, regulations, and directives at all levels. The constitution guarantees every person in Ethiopia the right to a clean and healthy environment (Article 44(1), Article 92(1) of the Constitution. The Solid Waste Management Proclamation (Proc. No. 513/2007) is the federal law that binds the management of solid wastes in Ethiopia.

According to the SWM Proclamation (No. 513/2007) of Ethiopia, promotion of ‘Solid Waste’ implies anything that is neither liquid nor gas and is discarded as unwanted and “solid waste

management” means the collection, transportation, storage, recycling or disposal of solid waste or the subsequent use of a disposal site that is no longer operational. Sources of solid waste include households, commercial and manufacturing industries, shops, hotels, garages, agricultural activities, institutions such as schools, hospital care homes, prisons, public spaces such as streets, bus stops, parks and gardens. This proclamation aims to prevent environmental damage from solid waste while harnessing its potential economic benefits. The proclamation indicates the need for involvement of the private sector for effective management and describes the safe transport of solid waste including hazardous waste.

The proclamation has explicitly described how integrated solid waste management should be put in place. In its Article 11.1, it has described that “Household shall ensure that recyclable solid wastes are segregated.” Collection and storage have been addressed in the proclamation with Articles 5.2.b and 5.2.c and Article 11.2 in that “Urban administration shall ensure that adequate household solid waste collection facilities are in place ensure the installation of marked waste bins by streets and in other public places ensuring the collection of solid waste from waste bins with sufficient frequency.” Transportation has been addressed under Article 13.2 in that “Urban administration shall set standards to determine the skills of drivers and equipment operators and prevent overloads of solid waste.” Disposal/landfill has been addressed under Article 14 related to construction of solid waste disposal sites, and Article 15 with auditing the existing solid waste disposal site. Recycling and reuse have been addressed under Article 7.1 in that “Manufacturer or importer of glass container or tin cans shall...collect and recycle used glass or tins.” Construction and demolition have been addressed under Article 12 concerning construction debris and demolition wastes. The summary of the SWM Proclamation is indicated in Table 14. Although this proclamation can apply to solid waste management

at all federal states, Addis Ababa can also enact its specific laws and regulations.

The base for SWM is the existing legal frameworks of the country and international standards. Ethiopia has an environmental policy that addresses different environmental issues including SWM. The bases for

the Environmental Policy of Ethiopia (EPE) are Articles 92.1 and 92.2 of the constitution of the Federal Democratic Republic of Ethiopia which reflected that the government should ensure that all Ethiopians have the right to live in a clean environment and citizens must protect the environment respectively.

Table 14. Summary on the SWM Proclamation (513/2007).

Solid waste management Activity	Law or Act	Description
Source reduction/segregation - households	Solid Waste Management Proclamation, Article 11.1	Households shall ensure that recyclable solid wastes are segregated
Collection and storage	Solid Waste Management Proclamation, Article 11.2	Urban administration shall ensure that adequate HH solid waste collection facilities are in place to ensure the installation of marked waste bins by street and in other public places guaranteeing the collections of solid waste from bins with sufficient frequency.
Transportation and Treatment	Solid Waste Management Proclamation, Article 13.2 (also addressed in the Environmental Pollution Control Proclamation, Article 5.1)	- Urban administration shall set the standards to determine the skills of drivers and equipment operators and prevent overloads of solid waste. - All urban administrations shall ensure the collections, transportation, and, as appropriate, the recycling, treatments, or safe disposal of municipal waste through the institution of an integrated municipal waste management system
Disposal/landfill	Solid Waste Management Proclamation, Article 14,15	Construction of solid waste disposalsites and auditing existing solid waste disposal waste
Recycling and reuse	Solid Waste Management Proclamation, Article 7.1	Manufacturer or importer of glass container or tin cans shall...collect and recycle glass or tins,
Hazardous waste	Environmental Pollution Control Proclamation, Article 4.2	Any person engaged in the collection, recycling, transportation, treatment, or disposal of any hazardous waste shall take appropriate precautions to prevent any damage to the environment or human health or well-being.

Although all federal and regional laws and regulations can apply for solid waste management at the local level, the Addis Ababa city administration has enacted its specific regulation for waste management.

The key institutions involved in the management of Solid Waste in Addis Ababa City include:

- Addis Ababa city administration
- Bureau of Health
- Bureau of Urban Development, Housing, and Construction
- Environment Protection Authority
- Private sectors, including formal recyclers and informal recyclers

The Cleaning Management Agency has different roles in the city. It implements the endorsed SWM policy and proclamation. It maintains strong private community participation through opening public fora discussions on SWM policy. It endorses SWM regulations, develops different kinds of directives, guidelines, operational manuals, codes of practices, etc. in the city administration. Having in place the SWM Policy and Regulation, SWM Proclamation, EIA Regulation and Environmental Pollution Control Regulation at national and city levels are also considered as one of the contributing factors. The city has also established Code Enforcement Service having Code Enforcing Agents at grass-roots levels. It is envisaged that this institution is entitled to ensure strict compliance with violations according to the existing rules and regulations. The introduction of sanitation service fees by the Cleaning Management Agency has also enhanced the solid collection rate in the city. The low level of awareness of decision-makers, and the absence of enforcement policy on hazardous waste management are still the existing factors to the low implementation of SWM activities.

Although there are laws and regulations at federal and city levels, their implementations and enforcement are very weak. The current waste management system denotes sporadic and inconsistent collection, low coverage, technical means and lack of enforcement of laws. To improve this critical problem the city government must set maximum effort to incorporate modern techniques in the existing systems to tackle these challenges. The techniques to be integrated must encompass reducing the number of wastes at the sources of

generation, material recovering for recycling and producing other resources from the wastes towards achieving safe and sustainable waste management. To address the challenges of the city's SWM, the city government of Addis Ababa must therefore continue to exert every possible effort to put in place proper waste management practices to protect the city's environment from pollution.

8. Public awareness

Lack of awareness is one of the major problems aggravating SWM problems such as improper handling, collection and disposal of solid wastes in a city. Therefore, awareness creation is essential in solving SWM problems so that resources allocation for awareness-raising programs is one of the crucial issues to improve SWM practices in a city. The Addis Ababa Development Plan has therefore proposed in line with this issue a launching of continuous awareness-raising programs to be given regularly to the city residents through various means. Raising public awareness and active private sector involvement at all levels of environmental management have also been considered in the city's development plan as strong tools to strengthen the implementation of SWM processes.

However, illegal dumping has been still increasing due to a lack of proper SWM awareness and low community involvement in the control and regulation of such management activities. There is also a lack of continuous campaigns to raise the awareness of the population in the city. Thus, promotion activities have not been carried out as expected in the areas of waste reduction, segregation at source, recycling, reuse and composting. The few available promotional efforts to strengthening environmental awareness have not been supported well by several types of media, community leaders, religious institutions, various organizations and associations and learning materials. Well-coordinated efforts with different sectors are also absent in the city. The community expects the municipality to keep the city clean but often fails to understand how they can contribute their parts to this objective by not dropping litter on the streets, on open land, etc.

Yet, it is the responsibility of the Cleaning Management Agency of the city's municipality to:

- make the public continuously aware and understand the improper solid waste management problems and how they affect the environment in the city;
- make the public understand the Agency's role in sanitation activities;
- get support to control illegal dumping;
- get the public involved in waste reduction, recovery, reuse, recycling and composting;
- work with the Education Bureau of the city to introduce proper solid waste management principles and hygienic education in curricula of schools to make students understand the principles and practice of waste minimization, recovery, segregation at source, recycling and composting and initiate school hygiene promotion activities using schools' environmental clubs.

9. Management challenges and service improvement

Effectiveness and sustainability in the provision of sustainable solid waste management services are becoming major challenges in Addis Ababa. Even though there have been some improvements in some areas of SWM, the state of service delivery in Addis Ababa is still unsatisfactory. The lack of efficient and reliable solid waste management service is one of the pressing challenges that needs concerted efforts from the city administration. The challenges can be seen from policies, regulations, institutional, and financial aspects. There are various solid waste management-related challenges with regards to the public sector that are inhibiting the performance of SWM service in the Addis Ababa city administration. These can be:

- Separation of government branches: lack of decision-making structures and clear mandates that separate the corporate and political body of the city administration;
- Coordination among different levels of government bodies: lack of coordination between federal entities and the city government; and lack of coordination among the federal, sub-cities, and Woreda/district level administrations;
- Coordination among different sectors: lack of coordination between (sectoral and

spatial) planning entities; lack of coordination between planning and implementing entities; and lack of coordination among infrastructure/utility agencies;

- Institutional efficiency: shortage of trained manpower and inefficiency in service delivery;
- Stakeholder involvement: lack of sustainable public participation with regards to SWM planning and implementation, hence loss of potential development partners;
- Conducive environment and contract administration: lack of attractive business environment for engaging in various forms of partnership arrangement with the private sector in SWM service delivery; and
- Resource base: lack of appropriate user fee policy, structure, collection, and administration and lack of modern and integrated user fee information system.

The collection of solid waste was carried out until 2003 as a one-sided responsibility on the part of the city government burdened with financial & management problems. However, the establishment of a participatory approach using MSEs has become a dependable means since 2003. In this respect, one of the strong achievements considered is the start of encouragement of the private sectors to participate in the implementation of solid waste management to improve the city's sanitation service.

SWM is not a one-time activity, but a continuous process. Thus, it needs continuous improvements to enhance service delivery. After the establishment of the Cleaning Management Agency as a leading government body with its vision for a clean environment in the city, it has been making service SWM delivery improvements through mobilizing sub-cities, MSEs, local communities, and private companies, especially for door-to-door collection of solid wastes and cleaning the streets. Within the context of the overall socio-economic and the city's structural changes, a major typical shift has been adopted from a more central oriented plan to sub-city oriented SWM planning and management practices. Waste collection for institutions has also been changed to be done by private collectors replacing the municipality. Communal collection points (transfer

stations) have still been under construction at different areas in the sub-cities as the necessary services, using a budget from the city administration (see Figure 8). Responsibilities and implementing authorities for SWM has been decentralized to sub-city and district level to build their capacity. The Cleaning Management Agency is now providing support in terms of training, funding, developing systems, etc. The Agency has rehabilitated the existing disposal site and initiated actions and built a new disposal site out of Addis Ababa, some 35 km from the city centre to the surrounding Oromia region. It also has encouraged greater participation in the primary waste collection by MSEs. It also has encouraged the involvement of private companies in the transportation of wastes to the disposal site. However, environmental awareness about SWM (ie, waste segregation at source, waste minimization, recycling, reuse, recovery and composting) and communication strategy have not been developed and promoted strongly and continuously for the behavioral change of the wider public.

The city administration of Addis Ababa has expanded its service delivery coverages along with the expansion of the city to provide sustainable solid waste management throughout the city. Yet, in the past 20 years, only 65% of the waste was collected, with less than 10% recycled and composted, and 25% dumped illegally. Currently, however, this has not yet been changed due to the insufficient waste collection capacity along with the expansion of the city, and the city demand. Thus, the wastes are still polluting the rivers in the city and causing great sanitary and environmental impacts. Networking, information sharing, cooperation with several stakeholders and collaborators and establishing a sanitation committee at the local level have not been well promoted. There also has been no strict implementation of the existing rules and regulations by the Agency on the control of illegal dumping and littering the environment in conjunction with Code Enforcement Service.

But, in general, there are some signs of progress since 2003 in solid waste collection systems such as increasing solid waste collection rate, increasing coverage of street cleaning, etc. The following are typical examples:

- establishment of implementing institutions at the three levels of the city administration;

- active involvement of MSEs in waste management;
- attempting to enhance the awareness level of residents;
- reducing the percentage of the population lacking sanitation means, although not still to the level demanded; and
- development of a new landfill site although it is not yet under operation.

10. Conclusion

Waste generation is the result of the production and consumption of resources. However, proper management of wastes is not an easy task in cities of developing countries where rapid population growth and financial scarcity are the major challenges to urban environmental management. This is typically the case in Addis Ababa where urban environmental problems are the results of factors such as unplanned settlements and unplanned location of manufacturing industries. In Addis Ababa, the generated wastes are not all collected by the existing collection systems; there still exists the dumping of wastes in open drains, rivers, open spaces, marketplaces, etc. Effective and efficient waste management is therefore important to bring good quality to the urban environment.

Currently, the collection of solid waste is carried out in Addis Ababa by Micro and Small Enterprises and some private companies for transporting wastes to the disposal site. Although the performance level has shown some improvements since the end of the 1990s, the practice of waste management in Addis Ababa is not still sufficient to address and satisfy the city-wide needs. This is mainly because the efficiency of the waste collection system is not yet established to the level demanded because of the shortage of capacity to address the problem in the city.

In this regard, based on the evaluation of the existing situation of SWM practices the following recommendations are suggested in terms of public policy, public participation, conceptual evaluation of the environmental plan component of the city and implementation of planned proposals.

In general, the current waste collection capacity and disposal system are not keeping pace with the rapid expansion of the city and its corresponding waste

generation. The people have not yet given proper attention to SWM and they dump wastes along the roads and in open spaces. SWM status in Addis Ababa can be explained by the weak enforcement of rules and the lack of the strength of stakeholders' integration. The absence of standardized final waste disposal, poor handling of municipal wastes, poor dumpsite management, lack of manpower and technical skill remains the most important bottleneck in addressing waste collection in Addis Ababa.

11. Recommendations

The system needs to modernize Addis Ababa's solid waste management. Thus, in the coming years, the city needs to be prepared to accommodate and serve the growing population. To improve the quality of SWM services, it is further required to:

- promote and encourage reusing and recycling principles;
- create a conducive environment to attract the participation of more private sectors in waste recycling and composting;
- organize and encourage the participation level of informal waste collectors and recyclers;
- establish a separate disposal system for hazardous wastes;
- maximize further integration of income-generating activities into SWM activities;
- set a team for awareness creation and code enforcement in implementing institutions;
- set a system to collect service fees in commercial centers where there are no water supply connections; and
- organise and undertake sustainable awareness raising programs..

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