EJED 3(1) 2020: 1–12
Ethiopian Journal of Environment and Development
http://www.du.edu.et/duj
E J E D

URBAN SOLID WASTE MANAGEMENT: PERSPECTIVE FROM DILLA TOWN, SOUTHERN ETHIOPIA

Daniel Gebretsadik[*1] **and Tefera Tesfaye**[1]

[1] *Department of Geography and Environmental Studies, Dilla University, Dilla, Ethiopia*
Email: teferatesfaye180@yahoo.com (T.T)
[*] *Corresponding author; Email: daniel.gebretsadik@yahoo.com*

Received: 13th January 2019, Accepted: 26th May 2020

DOI: **10.20372/ejed.v03i1.01**

Abstract

This article aims to examine solid waste management practices in Dilla town, Southern Ethiopia. The empirical data is gathered through repeated fieldwork carried out in 2017 with 120 households in Dilla town. Observation, questionnaires, interviews, and focus group discussions were used to obtain the primary data. This study has also benefited from various secondary sources. As the study shows, in Dilla, there is a paucity of basic infrastructure to collect and safely dispose solid wastes. As a result, scenes of scattered wastes, the heap of wastes, and overflowing containers are common in the town. These problems are linked to lack of containers, improper use of transfer stations, limited municipal waste collection service, apathy towards environmental sanitation, a gap in law enforcement, low municipal budgets for the sector, and lack of strategic planning. Thus, the existing rules and regulations of solid waste management have to be strengthened and enforced. There have to be mechanisms by which the government and private sectors work together to ensure sustainable solid waste management.

Keywords: Dilla, Environmental education, Solid waste, Solid waste management, Solid waste sorting

1 Introduction

Managing solid waste is a major challenge for countries worldwide. This problem is often magnified in cities where a dense concentration of people leads to a substantial amount of waste generation. The implementation of effective waste management practices has been identified as essential for economic development in low-income countries in particular. The solid waste management problem is an issue mostly witnessed in urban areas. Urban areas are usually the hardest hit as efforts to develop and grow lead to an influx of economic opportunities and people (UNEP, 2007; Shafiul and Mansoor, 2003). Over recent decades one of the characteristics manifest in the developing countries has been the disparity between urban population growth and sanitation infrastructure provision. This disparity is being worsened by the challenges of poor waste management practices impacting on the public health and environment of the rapidly transforming cities (Chatterjee, 2010). Today, dealing with the environmental costs in rapidly growing economic development, urbanization, and improving living standards in cities have led to an increase in the quantity and complexity of generated waste, representing a phenomenal challenge (UNDP, 2004). Consequently, it has put human life and the environment at stake.

It is commonly agreed that managing solid waste in an environmentally sustainable manner is essential for keeping cities healthy and livable. In light of this, solid waste management remains an integral

part of basic urban services. The health implications of poor waste management are negative to the people exposed to unsanitary conditions. Diseases such as cholera, typhoid, dysentery and malaria are all related to the practice of poor waste management. This can result in the loss of human resources needed for development. Despite the fact that developing countries do spend about 20 to 40 percent of municipal revenues on waste management, they are unable to keep pace with the scope of the problem (Zerbock, 2003). This is particularly the case in the developing world where poor infrastructure, bureaucratic competence and limited institutional capacity impede the effectiveness of solid waste management (Yohanis and Genemo, 2015). In fact, calls have been made to prioritize environmental and public health concerns (UNDP 2004), but solid wastes continue to be one of the major problems in African. Like the other cities of developing countries, due to failure to effectively implement waste management systems, most urban areas of Ethiopia are suffering from the adverse effects of solid wastes thrown away everywhere.

Dilla town started its solid waste management some three decades back. The service cannot meet changing demands. As the estimate of the municipality shows, only 65 percent of the waste generated in the town is collected, having the rest being carelessly disposed of. The residents in the town to same extent are mobilized from time to time to clean their immediate neighborhoods. Nevertheless, all these efforts ended up with limited success. The solid waste management service is inadequate, and scenes of scattered waste are common in most part of the town. The piles of wastes dumped illegally in open places, roadsides, sewerage courses and drainage channels are shreds of evidence of the poor waste management system of the town. Poor solid waste management affects the life of people living in towns, particularly those who live in overcrowded areas. The solid wastes left uncollected everywhere are causing the closing up of sewerage canals leading to spillage, and creating odors, (identified as one of the health threats) and in general, make areas filthy and unattractive for a living. Poor solid waste management has remained one of the problems Dilla continues to face. This paper attempts to bring to fore the status of solid waste management in Dilla town. First, the paper outlines the research methodology and fieldwork context. This is accompanied by the presentation of empirical findings focusing on the practices and challenges of solid waste management. Finally, the paper highlights the implications of the research for solid waste management practice.

2 Solid Waste Management System

Waste is often found as a liquid or solid form. Rouse (2008) considers solid waste as material that no longer has any value to its original owner, and is discarded. Waste also refers to "an item, material or substances that are considered useless at a given time and place" (Mugambwa, 2009). In Ethiopia, according to the Federal Democratic Republic of Ethiopia Solid Waste Management Proclamation (Proclamation No. 513/2007), "Solid Waste" means anything that is neither liquid nor gas and is discarded as unwanted. Solid wastes are wastes arise from human and animal activities, including the heterogeneous mass of garbage from the urban community as well as more homogenous accumulation comprising of countless different materials such as food wastes, packaging material such as paper, metals, plastic, glass, construction wastes, pathological wastes, and hazardous wastes. Rapid population growth and urbanization in developing countries have led to the generation of enormous quantities of solid wastes (Yohanis and Genemo, 2015). If it not disposed of safely and appropriately, solid waste can create significant health problems and unpleasant living environments (Endrias and Solomon, 2017). The primary objective of waste management is thus to give adequate protection to the general public and environment from the harmful effects of waste.

The term solid waste management has been viewed differently by various authors. Kumah (2007) defines solid waste management as “the administration of activities that provide for the collection, source separation, storage, transportation, transfer, processing, treatment, and disposal of waste”. Solid Waste Management (SWM) could be defined as the art of

managing garbage in a specific location which may include; waste collection, recycling, treating and disposing of in accordance with the agreed national or international standards such as the best principles of public health, conservation, aesthetics and other environmental considerations (Nathanson, 2000, the emphasis is mine). The functional element in solid waste management includes waste generation (the stage at which materials are identified as no longer being of value (materials become valueless) and are either thrown away or gathered together for disposal), storage (a system for keeping materials after they have been discarded and prior to collection), collection (how waste is collected for transportation to the final disposal site), transportation (the stage when solid waste is transported to the final disposal site), and finally disposal of solid waste in an environmentally sustainable manner (safe disposal where associated risks are minimized) (see Momoh and Oladebeye, 2010; Kreith, 1994; Coffey and Coad, 2010; Momoh and Oladebeye, 2010). All these activities combine to minimize the health, environmental and aesthetic impacts of solid waste.

3 Materials and Methods

3.1 Study Design and Sampling Technique

Since the intention was to assess the solid waste management practices in Dilla town, the author selected all three sub-cities for the study (Figure 1). Then, three kebeles were randomly selected to represent the respective sub-cities: Weldina kebele from Badcha sub-city, Bereda kebele from Sessa sub-city and Buno kebele from Haro Wollabu sub-city). The sample size for the survey was 120 households; determined at a 5% margin of error using Yamane's method. These households were selected using proportional simple random sampling method. Accordingly, the required 44 sample households were selected for Weldina kebele (Badcha sub-city), 36 from Bereda kebele (Sessa sub-city) and 40 from Buno kebele (Haro Wollabu sub-city).

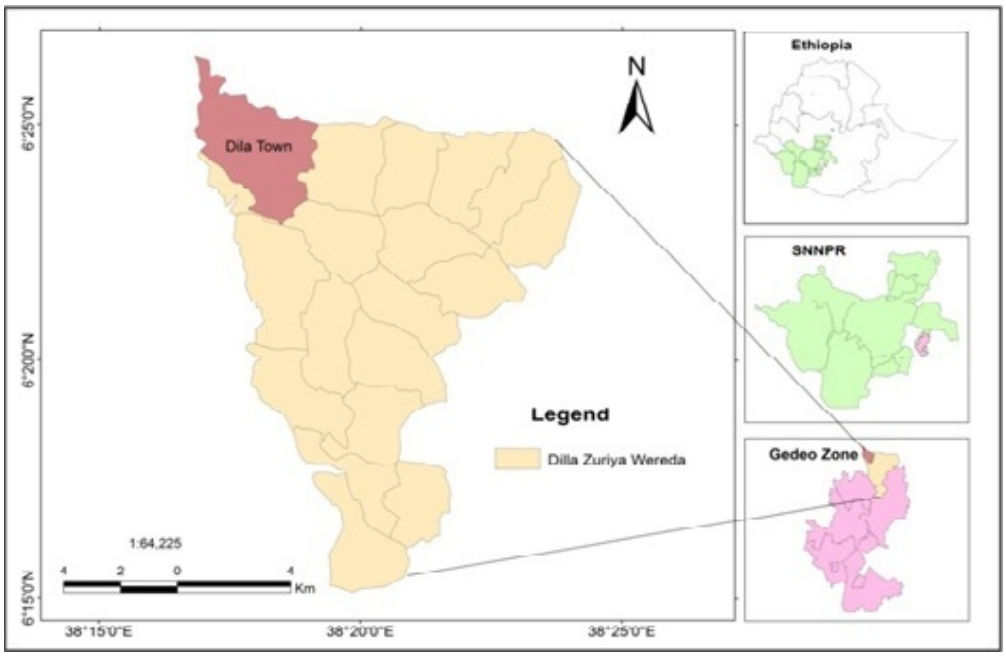

Fig. 1 Location map of the Study Area. Source: Daniel (2015).

The empirical data upon which the author draws is gathered through repeated periods of fieldwork carried out in 2017 in Dilla town, Southern Ethiopia. Using a descriptive cross-sectional research design, the study has adopted a mixed research approach to assess the current solid waste management practices in the study town. The purpose of the study and the selected methodology for addressing the problem have played a significant role in the decision as to whether the author should concentrate on one sub-city or consider all sub-cities of the town.

Purposive sampling was applied to select key informants which include government officials from Dilla Municipality, Environmental Protection and Land Administration Bureau, workers of Micro and Small Enterprises (MSEs), and community representatives. These individuals were selected based on length of experience in solid waste management and their life experience. Questionnaire survey (120 households), in-depth interviews (8 key informants which include government officials/officers and experts), and focus group discussions (24 participants which include MSE workers, municipal workers, community representatives, traders and market/street vendors in 4 groups) were used to solicit the required data. Being inspired by phenomenology, the author conducted field observation to have a first-hand view of solid waste management practices. Waste weight measurement (at source) and characterization (at the dumpsite) were done for seven days, and the waste generation rate and composition were presented in tables in the text. A combination of descriptive statistics and qualitative (thematic) analysis methods were employed to analyze the data gathered.

4 Results and Discussions

4.1 Solid Waste Management Practices

Solid Waste Composition

An attempt was made to know the types of wastes the study households generate. The result of the survey in the study town shows that residential waste is an aggregate of all materials or a heterogeneous mass of discarded materials ready for disposal. According to the survey data (based on seven sampling days), the waste generation rate was found to be 0.39kg/cap/day. As can be seen from Table 1, the household covered by the study generates different types of wastes. The bulk of solid waste from households in Dilla was found to be dominated by organics (35.8%). This was followed by ash and dust, with an overall average of 15%, plastic materials (14%), and papers and cardboard (10.8%). The other components (scrap metals, glass, and textiles/ worn-out clothes) generally have proportions between 5% and 9%, which are the least abundant waste items generated. Ashes are common types of wastes, particularly among poor households due to excessive use of biomass fuels. The waste aggregate more frequent in the whole mass of household waste was sticks and leaves. Dilla is a cash crop area and sticks and leaves of the chat are more in quantity than other wastes (see also Regassa, Sundaraa, and Bogale, 2011). This indicates that waste composition is geography-specific.

Table 1 Household solid waste composition.

Types of Waste	Frequency	Percent
Organics	43	35.8
Inert materials	18	15.0
Plastics	17	14.0
Paper /Cardboard	13	10.8
Textiles/ worn-out clothes	11	9.1
Glass	11	9.1
Metals	7	5.8
Total	120	100.0

Data source: 2017 baseline survey

Waste composition is also influenced by the economic context of households. 'Greater affluence leads to higher consumption levels, thus generating more waste amidst changes in waste composition' (UNEP, 2007). As populations become wealthier, the consumption of inorganic materials increases, while the relative organic fraction decreases. As observed during the fieldwork, low-income households have a high percentage of organic matter in the household waste stream like food left-over, vegetable and fruit peelings, onion seed coats, papers, cardboards soon. However, other component wastes show a reverse trend. Paper, plastic, glass, and metal fractions increase in the waste stream of middle- and high-income households. This pattern in the waste composition is attributed to high spending among better-off people on packaging materials and much disposed, while low-income households spend most of their disposable income for purchase of food items most of which are consumed (less wasteful in consumption), and a relatively high level of recovery of 'valuable' components such as scrap metals, plastics, card boxes and bottles for sale. Recovered/separated wastes are either reutilized at source or sold to itinerant buyers, locally known as korale (Daniel, 2015).

Solid Waste Sorting

Sorting of solid waste at the source (point of generation) is an essential component of solid waste management. Waste sorting is the process by which waste is separated into different elements. The purpose is to make waste management easy and simple. Waste sorting is an activity that aims at generating benefits out of waste. An attempt was made to assess to what extent households covered by the study practice waste segregation (sorting). In Dilla, solid waste sorting at the source is a relatively new activity, which has not yet become a common practice. As the data show, the majority (70%) of the households covered by the study do not separate waste at the household level or stored their waste without separation. Only 30% of the households practice waste sorting (Table 2); waste is separated at the household level into organic and inorganic. Nigatu et al (2011) also found the same result in their study of the challenges and opportunities of solid waste management in Addis Ababa City in that part of households covered by the study short wastes into organic and inorganic.

Communities understood reusable materials very differently essentially depending on the type of reuse mechanisms prevailing in their locality. As the interviews and discussions disclose, cans, and scrap metals are stored for sale; sorted and sold by weight to people, locally known as korale who export the collected materials to the capital, Addis Ababa and sold to factories for recycling. Organic wastes like plant origin are sorted for reuse in gardens and as fuel after the waste gets dried (common in low-income households). Animal source (meat and bone) is used to feed domestic animals like dogs. Some households give the waste away to their neighbors who use it

for animal feed. The manure is used to plaster walls and floors and for fuel when dried up whereas grass is fed to domestic animals. Chatt leaves can also be used for fuel when dried up. In some households, vegetable and fruit peelings are used as manure in the back yard gardens or used for animal feeds. As indicated by participants during focus group discussions, 'metals, plastic materials, worn-out clothes, and shoes are potentially reusable materials'. Recyclables are removed by some households before collection. It is also removed by waste pickers during the collection process and at disposal sites.

Table 2 Practice of waste sorting.

Practice of waste sorting		Frequency	Percent
Practice of sorting	Yes	36	30.0
	No	84	70.0
	Total	120	100
The reason for not sorting	Lack of understanding	29	34.5
	Lack of sensitivity	23	27.3
	Little practical value	17	20.2
	Difficult and time taking	15	17.8
	Total	84	100

Data source: 2017 baseline survey

In Dilla, sorting is relatively set to increase. However, the practice is far from expected. The households gave the reason why they failed to practice sorting. These include a lack of awareness regarding the importance of waste sorting (34.5%), lack of sensitivity (27.3%), and little practical value (20.2%). For 17.8% of surveyed households, waste sorting is difficult and time-taking activity. As the interviews and discussions disclose, 'some households are not familiar with waste sorting; others are familiar with waste sorting but do not have the willingness to source separate waste materials or do not agree on the importance of waste sorting due to the belief that separation of solid waste is of limited practical value because all types of waste will eventually mix. Some people believe that sorting of waste materials is the responsibility of the municipality or waste collection crew'. Key informants considered 'lack of attention and sensitivity to waste segregation' as barriers to proper management. They mentioned that 'households may be aware of the importance of segregation but they are sometimes careless and mix all types of wastes as one'. This indicated an attitudinal problem existing among the households. As one community leader put it; "there are factors that shape the willingness to source separate waste materials: (1) it consumes too much time, (2) it needs more containers and this has a cost implication, and (3) it requires more space in households. These factors combine to impede waste sorting at household level", which Regassa, Sundaraa, and Bogale (2011) confirmed.

Solid Waste Storage

Storage of waste at the source is the first essential step of Solid Waste Management. The waste should normally be stored at the source of waste generation till collected for its disposal. During the fieldwork, the author tried to know what materials the households used for storing solid wastes. Table 3 shows that 49.2% of the total 120 respondent households store their solid waste in sacks, 25% deposited in plastic bags (use hard festal or small plastic bags locally known as *Madaberia*. As focus group discussions disclose, households use sack and plastic bags to store solid waste because of the cost-effectiveness of sacks and plastic bags, their availability in the

market, and suitability for holding and transporting large amounts of solid wastes. As Table 3 further shows, 19.2% households store their solid wastes in homestead yard, open spaces, near roadsides and vacant areas, in open sewers, banks of rivers and around buildings close to their homes. Others use carton box (5%) and metallic barrel (1.6%) to store the solid waste they generate. Obviously, the use of open places within the compound to dispose of solid wastes creates sanitary problems which in itself could lead members of the household to face serious health problems. In addition to it, it makes waste collection difficult.

Table 3 Materials used for collecting household waste in Dilla town.

SN.	Waste item generated	Frequency	Percent
1	Sack	59	49.2
2	Plastic bags	30	25.0
3	Homestead yard	23	19.2
4	Carton box	6	5.0
5	Metallic barrel	2	1.6
	Total	120	100

Data source: 2017 baseline survey

A huge amount of organic materials comes from the rural areas depraving nutrients from the rural soil to feed the urban population, the leftovers after consumption have no way to return to the source to build the soil, rather lost and create problems to human health and the surrounding environment in the town due to mismanagement. Different studies described that this waste is creating health and environmental problems (Tamiru, 2004). The study households dispose of solid wastes in uncontrolled and unplanned dumps (some of these storage areas are street sides and pedestrian walkways), which sprawls over a large area and this affects the surrounding scenery or makes the environment filthy. As one key informant puts it, 'in some households, there is no habit of waste storage. In the absence of a system of storage of waste at the source, the wastes are thrown on the streets, treating streets as the receptacle of waste'. Open transfer stations are major problems to the environment, especially on air that the people inhale and on the water runoff that results in the water supply.

Solid Waste Collection

Waste collection service is one of the components of solid waste management. It contains the process of gathering of waste from place of generation and taking it to transfer stations (UNEP, 1996). As can be seen from Table 4, the majority (68.3%) of use communal collection system where waste generators bring their waste to collection points which could be containers or open places including roadsides, 45% use block collection where waste generators are responsible for bringing their waste to collection vehicles and the rest 25% the households use door to door collection service. In the town, two basic types of solid waste collection system (human-powered and animal-powered) are used. Concerning the human-powered collection, transportation of wastes to the collection points (transfer stations) or collection vehicles is made using human labor. This is common among residents who cannot afford to pay for a door to door collection services. In addition to communal and block collection, households use door-to-door service provided by two-wheeler carts. Workers inform households to get their solid waste ready for the collection service and then workers collect the waste using two-wheeler carts, with

a donkey in front pulling the cart. Since municipality collection vehicles cannot reach all the areas, households living around roadsides were the only beneficiaries of the block collection service. As Table 6 shows, waste collection method Dilla is mostly self–delivered (82.5%); waste generators deliver their waste directly to collection points or collection vehicles.

Table 4 Types of solid waste collection system in Dilla.

SN.	Waste collection system	Frequency	Percent
1	Communal collection	54	45.0
2	Block collection	45	37.5
3	Door to door collection	21	17.5
	Total	120	100.0

Data source: 2017 baseline survey

As one community representative disclosed, 'municipal waste collection system has only one route and the truck makes one trip per day to the final disposal site. It is also unable to adhere to its collection schedule'. Carts provide the door-to-door solid waste collection services to the households, but it is not as they wish. As the discussions held with cart drivers disclosed, 'most of the carts are old and cannot travel at expected speed and delay in collection and disposal process is common.' The problem is particularly serious during rainy seasons. During the interview, some respondents stated that there is no door to door collection service in their area due to inaccessibility (unreasonable road surfaces and topography). This study further identified that high-income residential areas have more access to collection services than low-income residential areas. In areas where motorized collection service does not reach, an animal-powered collection system is mostly used. But, as study households indicated, 'there is still a lack of patronage in low-income residential areas as animal-driven carts do not regularly collect wastes as required and people forced to use human labor'. Variability in waste collection frequency reduces confidence in the waste collection service (Coffey and Coad, 2010). As observed during fieldwork, the number of waste containers is not enough, and sections of the neighborhoods are obliged to throw their garbage in open areas.

Solid Waste Disposal at Transfer Stations

The availability of waste transfer stations is a matter of concern in the solid waste disposal and management system of urban areas. The number and location of transfer stations have a direct impact on solid waste management service. There are communal containers in the town but in a few areas. In areas where there are no communal containers, residents use open places as transfer stations. As one of the key informants pointed out, 'disposing of solid wastes in open places, and drainage systems is a common practice in the town. There is punishment on individuals who dispose of waste in an unauthorized place. However, regulations are not obeyed by the households as desired.' The communities dump wastes in open places, and drainage systems indiscriminately and some transfer stations (places) are often overflowing with uncollected wastes. There is improper use of transfer stations because the stinky smell of the waste has forced dwellers not to reach transfer places to dispose of wastes properly. Some households resort to burning at pre-collection sites. The burning of waste produces toxic gases as well as smoke and these have been shown to have serious effects on the health of people (UN-Habitat, 2012:16). Households burn biodegradable organic wastes (that should be composted) together with other solid wastes. But, as MSE workers indicated, 'the problem with compost is that there is generally low demand for the product'.

During the focus group discussion, the people indicated that the frequency solid collection service provided by MSEs (the municipality) is very low given the large size of solid wastes that come from the households. As one of the key informants indicated, 'parts of the household wastes are carelessly dumped in open places before it reaches to transfer stations'. On the other hand, wastes that are collected in different containers (transfer stations) are not timely transported to endpoints. The problems related to limited carrying capacity the municipality tracks and downtime frequently caused by vehicle problem'. One street vendor noted the following: 'limited number of communal containers and low frequency of waste collection brought about heaping of waste in open space, sewers and other places particularly close to residential areas. These conditions create problems for the households, calling for the more efficient arrangement of transfer stations'. The long-distance covered or time spent to dispose of wastes goes to add up the dumping of wastes in illegal conditions. The uncollected solid waste has often the common cause of blocked sewerage which increases the risk of flooding and vector-borne diseases and reduces the aesthetic value of green areas.

Fig. 2 (a) Overflowing of uncollected wastes. (b) Waste dumped over open sewers.

Final Disposal

Waste management is dependent on a safe and reliable disposal system. Wastes that have different origins have to be collected in disposal sites. Safe disposal of waste material is very important if a clean and human-friendly environment is to be kept. Waste collected at transfer stations needs to be transported to the location of final disposal. Common transport mode in the study town is open and general-purpose trucks that transport and dump all types of waste materials together. Besides, the trucks are not convenient for workers during loading. Lifting of wastes is done manually. As one community representative put it, 'most often workers are not provided with protective materials which expose workers to various diseases.' Wastes on transit are often uncovered causing littering, odor, and aesthetics problems. The municipality is responsible for transporting wastes to the final dump site, locally known as *Walleme* by means of trucks. According to the interview held with one of the key informants, 'the main challenge in the transportation of solid wastes includes a few trucks, trucks that are very old, maintenance difficulties, and negligence of drivers'. *Walleme* dumpsite is located in an environmentally sensitive area; close to a valley that is not prioritized for other uses. As observed, *Walleme* receives mixed wastes of various origins. The waste dumps pose real hazards to workers, waste pickers, and stray animals that visit the sites. Most of the waste workers and scavengers do not wear proper protective gears which protect them from serious health risks.

Fig. 3 (a) Waste transport using open truck. (b) Expanded waste in dumping site.

Urban areas are supposed to have designated landfill sites. However, in Dilla, such terminal end sites are non-existent. Dilla's dumpsite is a natural valley. This site is on the outskirt of the city where poorly maintained roads present significant risks to waste transport. The trouble with this landfill is that there is little capacity to protect the surrounding environment from the hazardous chemicals and leachants (seriously polluting black liquid formed by the decomposition of organic wastes) that is released into the dumpsites. Leachants from these dumps can flow into lakes and drainage channels as runoff water and pose human health threats. Presently, waste management disposal is underdeveloped. This landfill operates near or beyond maximum capacity. Waste is not subject to compaction. The existence of plastic waste in the upper layer reduces the biological degradation of organic waste which reduces the life span of dumpsites and decomposition of the waste. Valleys are often the worst places for an environment-friendly waste disposal operation, because of difficulties in preventing the long-term contamination of water resources (UN-HABITAT, 2012). Wastes that are tipped down slopes into galleys or valleys tend to pollute or block watercourses, and offer very little opportunity for rehabilitation at a later date. To make matters worse, landfill sites are not fenced. This condition increases the impact of waste on the surrounding environment as a whole.

4.2 Challenge to Solid Waste Management

In Dilla, well trained human resources for solid waste management are scarce. People without or with limited technical training in waste management are simply assigned to handle it. There are limited numbers of service providers. The solid waste management department uses different types of equipment (vehicles, waste containers, dust bin) for solid waste management service. But the problem is associated with inadequacy and improper use of these materials. One serious problem that affected the solid waste management system is the problem of vehicles. The town has a limited number of municipal trucks and some of these trucks served for many years. Because of this, most of the vehicles are currently inefficient (they are not working with their standard capacity). The demand does not be timely addressed, resulting in a growing problem of waste management in the town. The people are unable to use the existing containers as they wish. Placing containers has problems. Containers are few in number and not evenly distributed. Besides, some of the containers are placed very close to residential houses and those residents living near the containers complain about the stinking smell. In addition, the filthy areas where the containers are placed continue to affect the public health and the beauty of the town. As one of the key informants put it, 'people continue to use containers improperly because of the stinky smell of the wastes that are left uncollected for long'.

The reasons why waste disposal is often so unsatisfactory, and why so little is being done to improve the situation are generally not only technical. As one of the experts put it, 'the reasons for the problems solid waste management are linked to legislation and its enforcement, the low priority given to waste disposal and environmental protection in municipal budgets, the lack of strategic planning, and the failure to develop the necessary human resources'. An important aspect that can play a significant role in the process of waste management is the issue of law enforcement. Of course, the municipality of the town is responsible for the enforcement of rules and regulations. The Constitution of the Federal Democratic Republic of Ethiopia (Article 92.2) indicates that "Government and citizens shall have the duty to protect the environment". But, in Dilla, there is no continuous education on solid waste management and the legal system that governs it to the residents. Even those who know the law, they never act accordingly (violate existing regulations). This affected the management system and created a negative impact on the performance of waste management. There is a problem of vehicles to dump the waste in due course. This problem is grave, especially during rainy seasons. Carts and municipal trucks cannot move as they want (the carts are old and road surfaces are not reasonable). This in turn takes much time hence the waste that is expected to be disposed of is not taken to the dumping site at the fixed time frame. There is improper use of transfer stations by some households. There is a lack of willingness from the beneficiaries' side to pay the fee the collection service deserves. Lack of community participation is also a challenge.

5 Conclusion

Solid Waste Management is one of the important obligatory functions of not only urban local bodies but also of rural local bodies. But this essential service is not efficiently and properly performed by the concerned bodies of Dilla resulting in sanitation, social, and environmental problems. The waste management problem is complex because it involves a multitude of scientific, technical, economic and social factors. In Dilla, there is a paucity of basic infrastructure to collect solid wastes and safely dispose of them. Lack of or limited number containers (compared to the demand of the community), in the proper use of transfer stations (due to overflowing and the stinky smell of the waste), limited waste collection service form the municipality side, (due to of vehicles problems and lack of motivation form workers side), resulting in a heap of wastes and overflowing containers, and stinking smell that pollutes the environment. It is observed that social problems associated with apathy towards waste segregation, environmental cleanliness and sanitation have made solid waste management service unsatisfactory in the study area. Extensive environmental education should be given for the public not only about the importance of creating a healthy environment but also about the mechanisms of controlling wastes generated. Besides, the existing rules and regulations of solid waste management have to be strengthened and enforced. Priority should be given to waste disposal and environmental protection in municipal budgets. It is necessary to have capacity building programs to develop the necessary human resources. There have to be mechanisms by which the government and private sector work together and continuous follow up and supervision to ensure sustainable solid waste management. The sector needs to have a well-defined strategic plan.

Acknowledgments

During our fieldwork, many people have generously helped me, and to list them all here would cover too many pages. But for the countless acts of kindness, hospitality, and support, I am profoundly grateful. I greatly acknowledge the households in the study town. I also appreciate the support of experts, administrators, and others who participated in the study.

Funding:
The authors received no financial support for the research, authorship and/or publication of this article.

Conflict of Interest:
The authors would like to declare that there is no conflict of interest.

References

Ahmed, S. A., & Ali, M. (2004). Partnerships for solid waste management in developing countries: linking theories to realities. *Habitat international*, 28(3), 467-479. https://www.doi.org/10.1016/S0197-3975(03)00044-4.

Chatterjee, R. (2010). Municipal solid waste management in Kohima city, India. *Iran Journal of Environmental Health Science Engineering*, 7(2): 173-180. https://www.doi.org/10.1016/j.wasman.2009.07.016.

Coffey, M. & Coad, A. (ed.), (2010). Collection of Municipal Solid Waste in Developing Countries. Nairobi, Kenya: UN Habitat.

Daniel, G. (2015). The lives of street working children: Perspectives from Dilla Town, Southern Ethiopia (Doctoral Dissertation). *Addis Ababa University, Addis Ababa*. https://www.doi.org/10.1177/2043610617694741.

Endrias, G. & Solomon, S. (2017). Generation rate and physical composition of solid waste in Wolaita Sodo Town, southern Ethiopia. *Ethiopian Journal of Environmental Studies and Management*, 10(3), 415-426. https://www.doi.org/10.4314/ejesm.v10i3.11

Kreith, F. (1994). Handbook of Solid Waste Management. McGraw Hill, USA.

Kumah, A.M. (2007). The Situation of Solid Waste in Ghana. Accra, Ghana.

Momoh, J. J. & Oladebeye, D. H. (2010). Assessment of Awareness, Attitude and Willingness of People to Participate in Household Solid Waste Recycling Program in Ado-Eketi, Nigeria. *Journal of Applied Sciences in Environmental Sanitation*, 5: 93-105.

Regassa, N., Sundaraa, R. D., & Seboka, B. B. (2011). Challenges and opportunities in municipal solid waste management: The case of Addis Ababa city, central Ethiopia. *Journal of human ecology*, 33(3), 179-190. https://www.doi.org/10.1080/09709274.2011.11906358.

Rouse, C. J. (2008). Planning for sustainable municipal solid waste management. *Appropriate Technology*, 35(3), 65. https://www.doi.org/10.1142/9789814354820_0027

UNEP-IETC, H. I. I. D. (1996). International source book on environmentally sound technologies for municipal solid waste management, United Nations Environment Programme (UNEP). *International Environmental Technology Centre (IETC)*.

United Nations Environment Programme. (2007). Global Environment Outlook: environment for development (GEO-4). https://www.doi.org/10.1017/9781108639217.

Yohanis, B. & Genemo, B. (2015). Assessment of solid waste management practices and the role of public participation in Jigjiga Town, Somali Regional State, Ethiopia. *International Journal of Environmental Protection and Policy*, 3(5), 153-168. https://www.doi.org/10.11648/j.ijepp.20150305.16.

Zerbock, O. (2003). Urban solid waste management: Waste reduction in developing nations. *Written for the Requirements of CE*, 5993.