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Solid Waste Generation and Its Management Challenges: In Case of Gabella Town, South Western Ethiopia

[1]*Duol Nhial Luak & [1]Dr Prem Kumar Dara

Abstract

Many cities in Africa, dealing with the environmental costs of rapid growth of population and urbanization represents a phenomenal change. Gambella town is characterized by rapid population growth caused by natural increase and migration from rural areas. Furthermore, this rapid increase in population together with rapid development of the town in term of economic, construction as well as social lifestyle has produced increasing volumes of solid waste in Gambella town. The purpose of this study was to assess the solid waste and its management challenges in Gambella town. A simple random sampling technique was applied for sample size selection of 150 households. The data were collected through both primary and secondary sources. The analysis of this study was carried out using Statistical Package for Social Science. The finding further showed that lack of awareness, improper waste disposal and insufficient household storage was found to be very low in study area. Integrated solid waste management systems which combine a range of solid waste treatment like source of reduction, composing, recycling and waste energy transformation is needed. Moreover, institutional factors such as solid waste facilities and equipment, manpower, rules and regulations, and accessibility to the waste collectors determine the challenge of solid waste management among sample households of this study. Since there are no studies made on rate of solid waste generation and its management further study is needed, generally household solid waste management of the town is poor and then timely measures must be taken.

Keywords

Solid Waste, Challenges, Factor Affecting Waste and Management

[1]Environmental Science Department, Gambella University, Ethiopia

INTRODUCTION

Background of the Study

Many cities in Africa, dealing with the environmental costs of rapid growth of population and urbanization represents a phenomenal change. This is particularly true in the area of solid waste management. While cities are generating an ever-increasing volume of waste, the effectiveness of their solid waste collection and disposal systems are low. In urban centers throughout African region, less than half of the solid waste produced is collected, and 95 percent of that amount is either indiscriminately thrown away at various dumping sites on the periphery of urban centers, or at a number of so-called temporary sites, typically empty lots scattered throughout the city (Girma, 2008).

Although many cities the over world use 20-50% of their budget in solid waste management, only 20-80% of the waste they produce is collected (Achankeng, 2003). The uncollected or illegally dumped waste constitutes danger to human health and is a recipe for environmental degradation. Not only are the quantities but also the variety of waste is increasing as consumption habits are fuelled by globalisation (Achankeng, 2003). Solid Waste generation within households, markets and communities is as a result of human activities (Jiya, 2013). These human activities

***Corresponding Author:** Duol Nhial Luak

which directly or indirectly produce waste could be agricultural, commercial, or domestic.

The insufficient handling of solid waste represents a source of water, land and air pollution affecting the urban environment and the health of the people living in the cities and is one of the most critical environmental problems that cities in Africa are facing today. The current capacity of most solid waste management systems in Africa is inadequate and too slow to meet the increasing demand of the solid waste generated (Bjerkli, 2005).

In Ethiopia, like other developing countries, the increase of solid waste generation is resulted from rapid urbanization and population booming. According to (Dawit. Alebel and Bayrau, 2003), the amount of solid waste in Addis Ababa and other fast-growing areas in the country has been increasing over time, largely attributed to rapid population growth rate.

RESEARCH METHODOLOGY

Description of the Study Area

Bio-physical characteristic of study area

Geographically Gambella town is located at 7° 49' 59 N latitudes, **34° 30' 0 E** longitudes and at 766 km Southwest of Addis Ababa. Gambella town is comprised of five administrative kebele which is namely (01, 02, 03, 04 and 05 kebele).

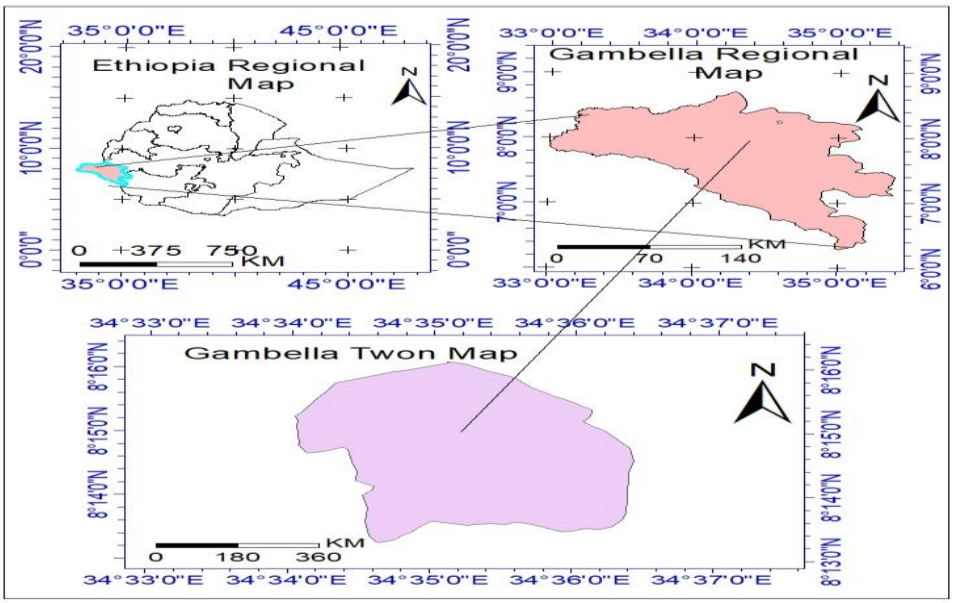


Figure 1. *Description of study area*
Source: *Ark GIS data, (2019)*

Socio-Demographic Condition

The total population of Gambella town was 70,099 (CSA, 2016). Among the total population in the town 37,076 are female and 33,023 are male. With an estimated area of 29,782.82 square kilometres, this town has an estimated density of 10 per square kilometre. For the entire town 6492 households were counted which results in an average for the town of 4.6 persons to a household (CSA, 2016).

Research Design and Approach

This study was carried out based on mixed design approach. This means both quantitative and qualitative method of data collection and analysis were used in order to accomplish the research work. This mixed-method approach because, the researcher with wider degree of freedom in applying different method of data acquisition and analysis from both the quantitative and qualitative approaches so as to better address the issue under investigation (Crosswell, 2009).

Target Population of the study

The target population is the specific population about which information is desired. According to Ngechu (2004), a population is a well-defined or set of people, services, elements, and events, group of things or households that are being investigated. Mugenda and Mugenda, (2003), explained that the target population should have some observable characteristics, to which the researcher intends to generalize the results of the study. This research was carried out in Gambella town, south western Ethiopia, and the total target population was 70,099 beneficiaries which living in study areas.

Source of Data collection

In this study, household and commercial were the major source of primary data, as part of primary data; information was collected from town environmental expert, municipal expert, traders, kebele leaders, development agent and nearby resident area. Secondary data was collected from all available published and unpublished material like, Books, Journal, manuals, various research paper and government publication which was found in the library, web-site and report from stakeholder.

Sample Size and Sampling Technique

The purpose of the sampling was to secure a representative group which enabled the researcher to gain information about an entire population when faced with limitations of time, funds and energy. In this study simple random sampling methods were used to select samples from the residents of the town. The study was using the descriptive research method and employed survey in determining the current solid waste management practices and extent accumulation of solid waste.

Method of data Analysis

In order to interpret the raw data collected from the field, first it was clean, coded, keyed in the computer and analysed. All the administered questionnaires were collecting and systematically organized and cleanse for analysis. For the purpose of empirical or quantitative analysis, the responses were assigned numerical values especially for the closed questions. For the open-ended questions, all responses were organized and numbers value was assigned to them.

RESULT AND DISCUSSIONS

Household Demographic

Among the total of 150 household, (56.0%) were males and the remaining (43.0%) were females. These findings indicate that both genders were fairly involved in this study and thus the results did not suffer from gender biases.

From the total sampled households, (35.3%) of the respondents were belong to the age range between 18 and 29 years, (54.7%) of the respondents were between 30 and 50 years, (9.3%) of the respondents were between 51 and 65 years, and the remaining (0.7%) of the respondents were over 66 years and above

In terms of the level of education, (30%) of the respondents were illiterate (are those who does not read and write), (7.3%) of the respondents had primary education of grade 1 to 8, (9.3%) of the respondents were at a high school level, (6.7%) of the respondent were earned their certificate, (12%) of the respondents were a diploma, (34%) of the respondents were first degree and above class.

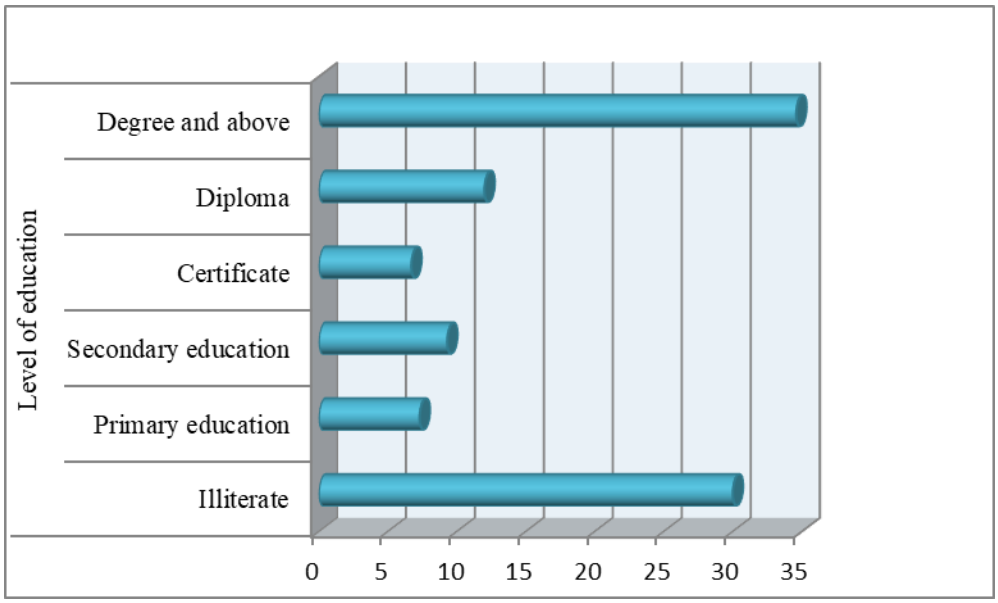


Figure 2. *Household Description*
Source: Field survey, (2019)

Types and Source of Solid Waste Generated in study area

The result from the surveyed households revealed that solid generation by source are more from households, shops (commercial), hotel and restaurants, and street cleaning, which according to (41.7%), (29.17%), (27.78), (1.39%) of the respondent respectively. This is also more or less is also similar with other towns. According to AASBPDA (2003), the sources of solid waste in Gambella town are: households (76%), institutions/commercial, factories, hotels and health centre's (18%) and street sweeping (6%). Waste production completely varies depending on the living condition of business/households.

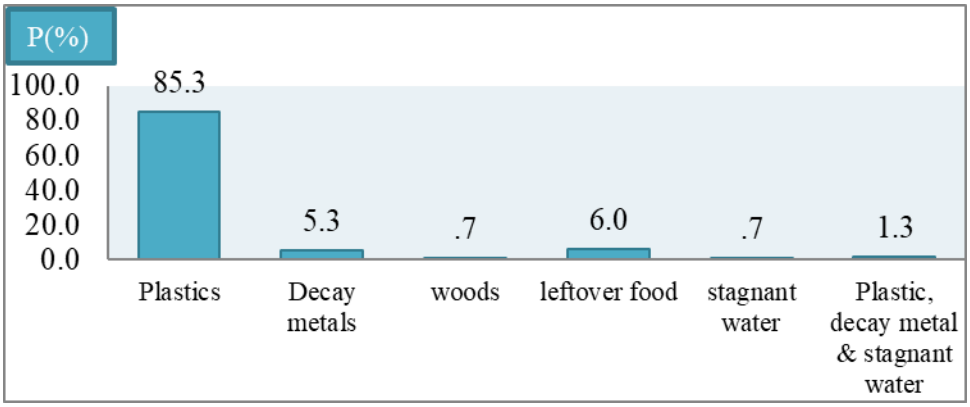


Figure 3. *Generated Solid Waste*
Source: Field survey, (2019)

Categories of solid waste generated in Gambella town majorly consists of polythene & other plastic materials, food remains, old newspapers and other papers, woods, and used bottles and cans. However the categories of wastes generated, rank with (85.3%) of the households indicated that

polythene and plastic materials formed the bulk of solid waste they generate most of the time. The second one was followed by (6.0%) for food remains and (5.3%) for decay material and other non-plastic papers with (1.3%). The least generated solid wastes by households/Business were stagnant water and used wood cans each at (0.7%).

Frequency of solid waste discards

The researchers also attempted to identify the source where wastes were generated by the residents of Gambella town. Among the total 150 participant, (90%) of them replied that the sources for the waste generated in the town are household/business areas; (35%) of the respondent has also responded that they generate waste from their area weekly and the final least (25%) percentage of the waste generated was generate the waste twice a day from household and commercial enterprise. Therefore, the daily and annual waste generation rate of household and commercial base of the town is much greater than the above estimation of the solid waste source.

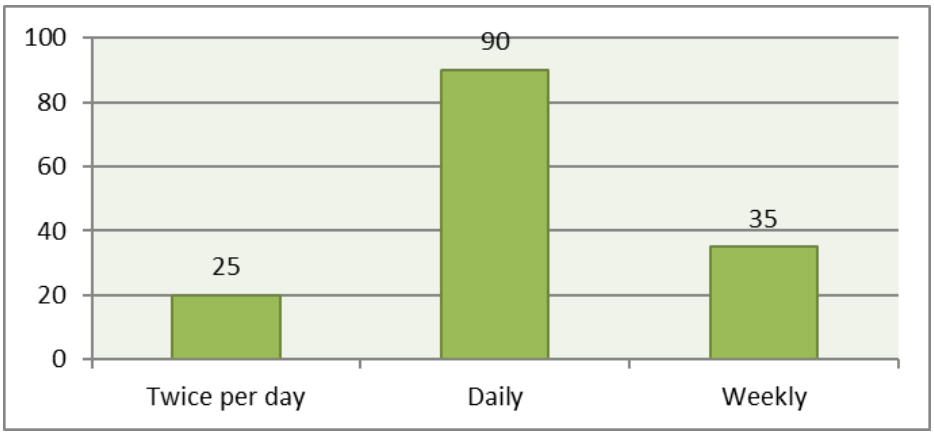


Figure 4. *Frequency of solid waste discard daily, twice per day and weekly generated*
Source: *Field Survey (2019)*

PRACTICES OF SOLID WASTE MANAGEMENT IN GAMBELLA TOWN

Solid waste composition in the study area

The focus group discussions were noted that physical composition of solid waste generated in Gambella town is predominantly made up of organic (left over food and fruit etc.). Component (82%), followed by paper (7%), plastic (6%), (textile, old clothes, shoes and metal (2%), and other wastes (3%). That is, most respondent showed that solid waste in Gambella town is largely biodegradable.

Solid waste disposal system and transportation

Before the waste collector starting their work, the community use different types of management system from burning in open areas to the paying for the collector to collect waste from their compound (Kassa et al, 2015).

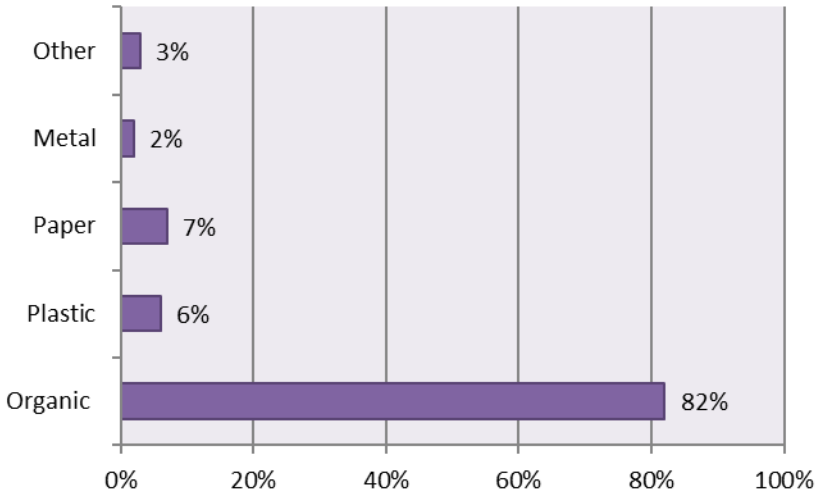


Figure 5. *Major Waste Generated*
Source: *Field survey, (2019)*

Rather than burning of the waste, collected by collector are improved from time to time but still up to now there is no any well-organized private collector in the town. The municipality hold the existing trend of collection and communities collect their waste in plastic bag or polyethylene bag and keep it at the side of the road. The collectors collect with donkey cart and transport to the temporary storage sites that found in kebeles of the town.

Figure 6. *Solid waste transportation*
Source: *Field survey, (2019)*

Through this study, attempt was made to identify the responsible bodies for collection of wastes and where the waste is collected or stored with in both households and businesses. Finally, during waste collection researcher has also identified the kind of waste transportation material available for collection of waste and the distance to waste disposal sites. The findings are presented in figure below.

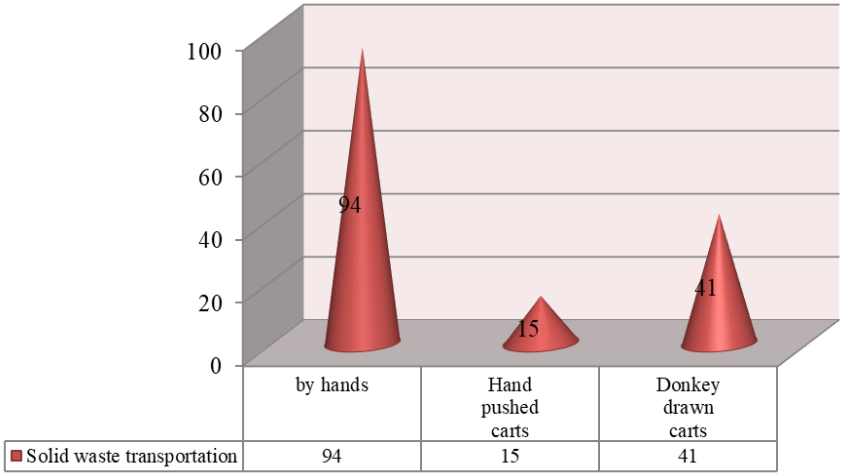


Figure 7. *Waste transportation method*
Source: *Field survey, (2019)*

From the above figure indicate that about (94%) of households said that their waste is collected by private collector (Seventh Day Adventist youth groups association), a position that was supported by the area community leader, assistant chief and community health worker. (15%) of the respondents indicated that registered private waste collectors collect their wastes while unregistered waste collectors and government were reported by (41% each) as the service providers of solid waste collection. The study revealed that there is low collection rate of solid wastes for both households and business enterprises in Gambella town.

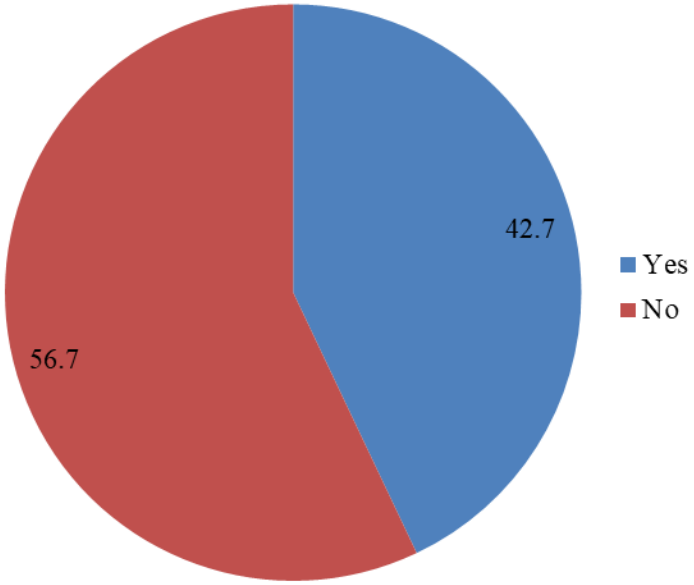
Finding of this study are more less similar with the finding of (Tesfahun, 2007) who showed that traditionally the most common elements of waste management system in developing countries like Ethiopia is manifested by segregation, reuse and recycle, primary waste collection and transport to the station, secondary collection and transportation to waste disposal sites and waste dumping in landfill (Tesfahun, 2007).

CHALLENGES OF SOLID WASTE MANAGEMENT IN GAMBELLA TOWN

The study sought to discover the challenges facing solid waste management in the study area and its management practice. This was done by examining challenges at collection equipment material, awareness, and disposal levels of the solid waste management value chain.

Lack of Awareness toward solid waste management

This is whether the respondents are aware about solid waste management should be assessed. Because it's important to know how the living community can handle or manage the generated waste. Data gathered from focus group discussion have shown that problem of poor awareness and the lack of well-organized system of solid waste management practice made the solid waste management much more complicated.



Picture 8. *on solid waste awareness*
Source: *Field survey, (2019)*

As it is illustrated in figure 9 above, (42.7%) of the respondent say that they have got full awareness and other (57.3%) of the respondent did not get any awareness creation from municipality. Awareness about the solid waste management is low in study area. Such a gap of unawareness to the community shows that the people have fallen into the habit of dumping waste in the rivers side, open field areas, drains, roads side and ditches; this is known to be the only approach possible to deal with waste management.

Improper Waste Disposal Practice in the Study Area

As per the findings of the study, about (18.7%) of the respondents accumulate their waste nearby home until they get container service, (26.8%) simply burn the waste inside the compound and (9.4%) of the respondents dispose the waste near full containers. Many of the respondents (45.1%) stated that they regularly use the MSE's service, and are without a say with regard to the above question.

Improper waste disposal at Transfer Station is one of the most challenges of solid waste management practices which need to be carefully planned. The safe and reliable long-term disposal of solid waste residues is an important component of integrated waste management (Tchobanoglous *et al.,* 1977).

Figure 9. *Improper waste disposal in jebjebe river bank with in study area*

Distance of Waste Disposal Sites

Solid waste disposal management passes through five stages: generation, storage, collection, transportation and disposition. Therefore, to know whether the overall solid waste management service delivered by the Solid Waste Management Team if it is sufficient or not, questions were forwarded and the results were presented on figure below.

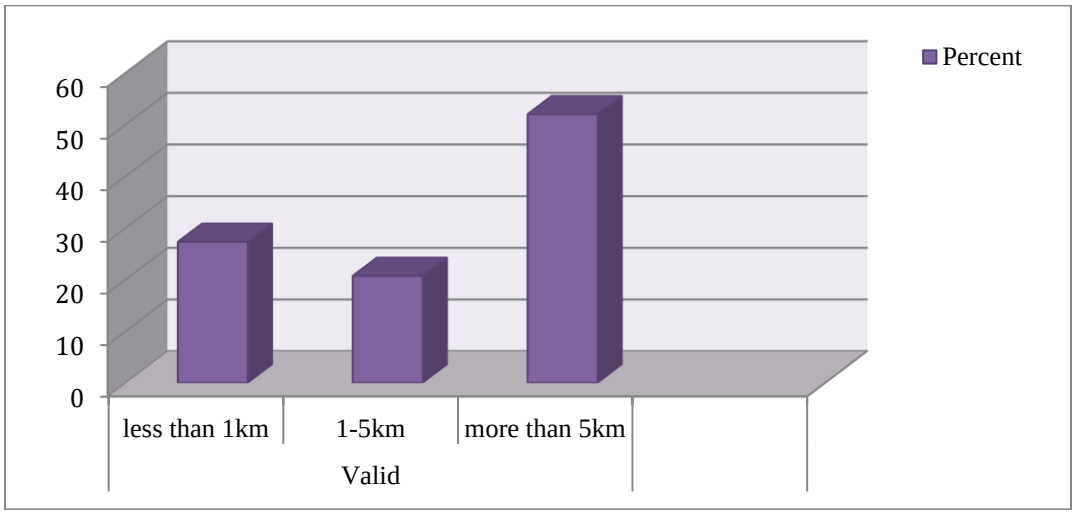


Figure 10. *Distance of waste disposal site (land fill) from home*

About (23.3%) of the respondents replied that waste disposal site is located at a distance of less than 1km from their village, also about (20.7%) of them replied that waste disposal site is located at the distance of 1-5 kilometres and (52.0%) or the highest percentage of the respondent response that the area of their waste disposal is far away more than five kilo meters from their resident areas.

Figure 11. *Openly accumulated solid waste along street sides.*

Shortage of solid waste storage materials in the household level

The material/technique of waste collection and storage were ranked by sample of respondent according to the frequency of use for the purpose. Thus, plastic bags (58.7%), basket (12%), trash bag (7.3%), plastic bags and dumping hole (7.3%), dumping hole, plastic bags and basket were the common materials used for collection and storage of solid waste in study area (figure 12).

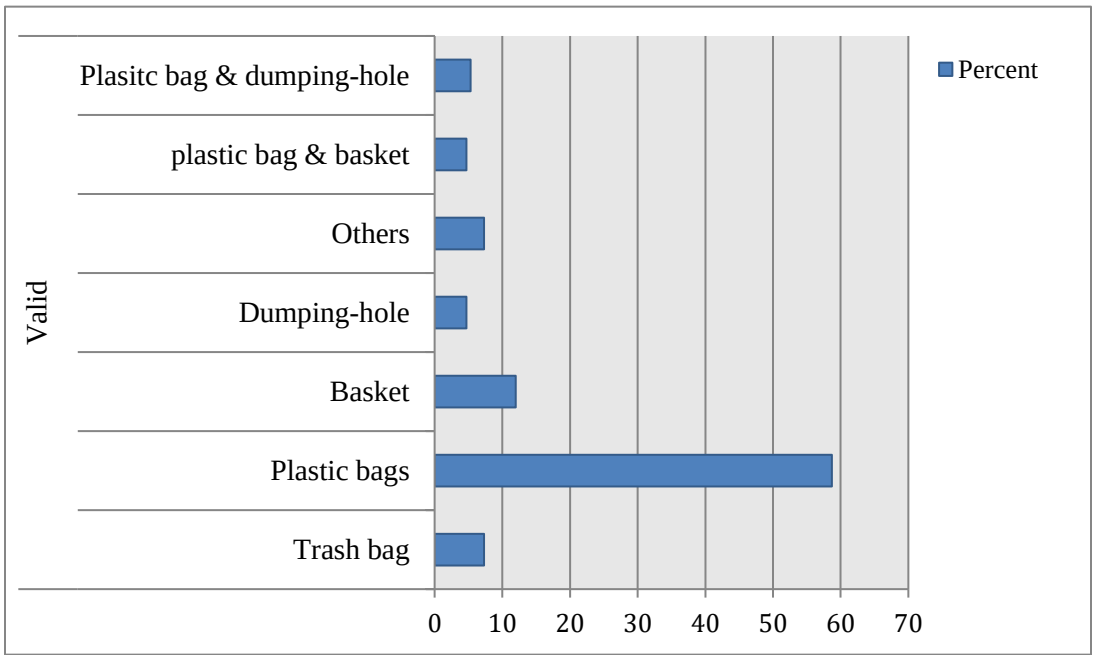


Figure 12. *Solid waste collection materials*

CONCLUSION AND RECOMMENDATIONS

Conclusion

Solid waste management is not a responsibility that is meant for only administrative bodies. It has repeatedly been pointed out that there is a need for a new approach from the societal viewpoint emphasizing consensus community participation and partnership. This social partnership stems from the following situation. Firstly, the continuing deterioration in the environment due to the intensification of population concentrations and rapid urbanization and development has challenged the capacity of local governments to work up to the expectation of the people. Secondly, under such circumstances, communities need to resort to searching for assistance from Community Based Organizations (CBOs) and NGOs in order to address the problems. Thirdly, the relationship between the administrative authorities and the local communities has changed, and it has become widely recognized that communities themselves come to play an indispensable role in urban environmental management.

Recommendations

Based on the findings of the study, the researcher forwarded the following recommendations.

- Integrated solid waste management systems which combine a range of solid waste treatment like source of reduction, composing, recycling and waste energy transformation is needed in Gambella town municipality.
- The households of Gambella town have low awareness and knowledge about solid waste itself and its management issues.
- In the survey, it was mentioned that the town had lack of vehicles. Therefore, since wastes are to be transported and timely disposed of the existing either vehicle have to be repaired and be ready for use or the town has to bring new vehicles from somewhere.
- Waste management can be best delivered only when the community takes active part in the service. To achieve this, there has to be an increase of public awareness not only on the importance of creating a healthy environment but also on the mechanisms of controlling waste generated at the source.
- In relation to the above recommendations, the issue of enforcement has to be considered in order to have a good management system. Therefore, the existing rules and regulations of solid waste management with penalties have to be strengthened

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