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COGNITIVE DOMAINS OF COMMUNITIES ON MUNICIPAL SOLID WASTE MANAGEMENT SYSTEMS IN METU TOWN, SOUTH-WEST ETHIOPIA

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Abstract

Urban waste management is drawing increasing attention in emerging cities of Ethiopia. Accurate and reliable information on cognitive domains of communities is a very important element for efficient and effective planning of solid waste management (SWM) system. Therefore, we assessed the cognitive domains of communities on SWM system in Metu town. A cross-sectional study design and simple random sampling technique was employed on 252 households (HHs), and 65 commercials and institutions (CIs). Data was collected through face to face interview using a structured questionnaire and checklist. A survey from sampled HHs and CIs revealed that 79.8% of HHs and 38.5% of CIs were separately stored solid wastes, capable of being sold and/or exchanged. Nevertheless, 26.2% of HHs and 94.6% of CIs didn't practice recycling and reusing of solid waste, only 24.2% of HHs is currently doing home composting as recycling. Out of the total, 19.8% HHs and 16.9% of CIs were accessed to door to door municipal solid waste collection service, 75% of the HHs and 80% of CIs were used Micro and small scale enterprize (MSE) for door to door solid waste collection service. The vast majority of the communities in Metu town unsatisfied by the service rendered by municipality and MSE, only 1.2% of HHs and 3.1% of CIs respondents were 'satisfied' with solid waste collection services of the municipality. In general, the town should emphasize the cognitive domains of communities to improve SWM activities by promoting waste segregation, recycling/reusing, and providing waste transfer stations with collection containers.

Key words: cognitive domain, Metu town, satisfaction level, waste management service

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1. Introduction

Increasing attention of Urban waste management can easily be observed by the greatest environmental health challenges and overwhelms local authorities and national governments as urban populations continue to rise and consumption patterns change (Gutberlet, 2017; Yoada et al., 2014). Similarly, the ever-increasing volume of municipal solid waste and their improper disposal invite great social costs as well as bring massive worry (Fathi et

al., 2014). In developing countries, about 30 to 60% of all the municipal solid wastes are uncollected and as much as 80% of the collection and transport equipment is out of service and in need of repair or maintenance (Endalew and Tassie, 2018; Monyoncho, 2013). These resulted in inadequate service provision, inadequate and unacceptable levels of practice in waste handling and disposal systems existed (Endalew and Tassie, 2018). So far, wastes generated from different sources and inefficient management system cause disease transmission, contaminate ground and

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surface water, create greenhouse gas emissions, damage ecosystem services, affects the perception of public space (feeling getting less attention and lack of citizenship) and furthers the sense of exclusion, discourages tourism and other business activities (Alam and Ahmade, 2013; Gutberlet, 2017).

The emerging cities of Africa (particularly Ethiopia) are characterized by rapid urbanization and population growth caused by the natural increase of population and rural to urban migration (Gedefaw, 2015; OECD, 2020; Saghir and Santoro, 2018). Such high rate in population and urbanization of the towns have produced huge amounts of solid wastes and have created limited financial resources of municipalities to deal with the provision of solid waste management services. Due to this, municipal solid waste management is becoming a major public health and environmental concern in urban areas of Ethiopia (Damtew and Desta, 2015; Erasu et al., 2018). However, due to lack of sufficient data on cognitive domains of communities on the solid waste management systems, most of the emerging cities found in Ethiopia have poor municipal solid waste

management practice. Moreover, studying cognitive domains of solid waste management system is among the hub activity of finding sustainable solid waste management options and are very relevant as input for efficient and effective planning of a solid waste management system. Therefore the objectives of this study were to assess the cognitive domains of communities on municipal solid waste management and to evaluate service delivery potential, institutional arrangement, and capacity of the town municipality.

2. Materials and methods

2.1. Study area

The study was conducted at Metu town, located in South-West Ethiopia, about 590 km from capital city Addis Ababa (Fig. 1) which is found in Illubabor zone of Oromia regional state, Ethiopia. Administratively, Metu town is divided into three urban subdivisions called kebele. According to the Metu town administration bureau, the populations of the town were 48,765, and housing units of 9,753.
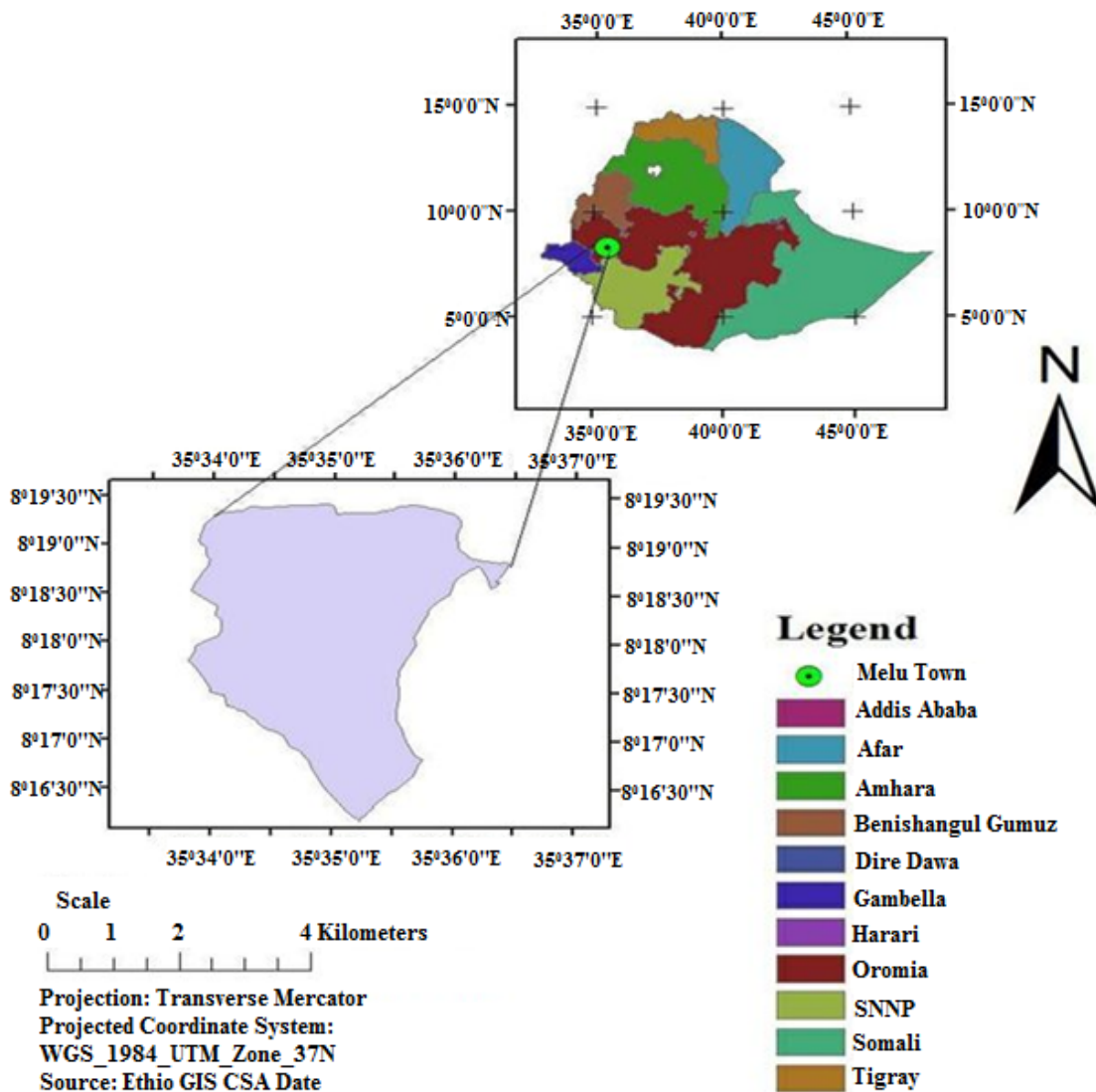

Fig. 1. Map of the study area (Gobena et al., 2020)

2.2. Sample size and sampling techniques

Metu town has 9,753 housing units; these are stratified based on geographical setup into three kebeles by town administration. The required households (HHs) and commercials and institutions (CIs) sample size was computed using a single population proportion formula by considering 5% desired level of precision (d) at a 95% confidence interval and a 10% non-response rate. The formula that we used for determining sample size is Eq. (1):

$$n = \frac{NZ^2 PQ}{d^2(N-1)+Z^2 PQ} \tag{1}$$

where: n = sample size of the study; $Q = 1-P$; $N =$ Total numbers of housing units; $P = HHs/CIs$ housing unit variable; Q = housing units used for commercial activities, offices public centers, etc. Z = Standardized normal variable and valued that corresponds to 95% confidence interval equal to1.96; d = Allowable error (0.05).

According to data obtained from housing development section and municipality of the town, there were about 9,753 housing units (N), out of these more than 80% (P=0.8) are residential and the rest 20% (Q=0.2) are non-residential such as commercials, institutions and others.

Based on Eq. (1) and considering 10% non-response rate the sample size (n) of 252 HHs and 65 CIs were selected and proportionally allocated for all three sub-divisions (kebeles) found in the town. A Systematic random sampling technique was used to draw a participant individual HHs and CIs by considering high, middle, and low-income groups of the town. Additionally, to study the institutional arrangement and capacity of the town municipal solid waste management system all workers/employees of the sanitation and beautification department (11 employees including head of the department) and MSE workers (12 MSE workers) were selected purposively for this study.

2.3. Data collection and analysis procedures

The data collection was done using a structured questionnaire, checklists, interview guide, and field observation by data collectors, Metu town urban health extension professionals which were properly trained on data collection techniques and tools. The questionnaire, checklist, and interview guides were developed by the authors based on the objectives of the study using available literature and it was evaluated and approved by Ethiopian Environment and Forest Research Institute environmental pollution management research directorate research evaluation team. The questionnaire was pre-tested in Bedele town that shares similar characteristics with the study area to check the suitability of the questions.

After the pre-test, some changes were made to a few questions to make them clearer and more understandable. As data collection and analysis were conducted carefully using standard operating procedures and double-entry of data was performed to assure the quality of data. The performance of the data collectors and the completeness of the filled questionnaires were closely supervised by the investigator and supervisors daily. Furthermore, randomly selected households were cross-checked by the researcher against the filled questionnaires to verify the collected data.

Quantitative data was entered into a database using an access-based data template. Thereafter, the data were analyzed using the Statistical Package for the Social Science (SPSS) software version 20.0. Qualitative data was analyzed based on interviewee responses and was the basis for the detailed explanation of the quantitative aspects of results in this report.

3. Results and discussion

3.1. Socio-demographic characteristics of respondents

A total of 252 HHs and 65 CIs were surveyed in this study with the response rate of 100%. The study result reported that 169(67.1%) were female and 83(32.9%) were males, among it 73.8% of the participants were in age group of 25-44 with the mean age of 36.45. And 114(45.2%) of HHs study participants were government workers and 80(31.7%) of the respondents had grade 9-12 educational status.

Another important variable that could influence communities' cognitive domains about the SWM system in the town is the average income of respondents. Accordingly, about 39.3% of the respondents had an income level (>3500 ETB), about 32.1% had income level of 600-1200 ETB/Month while 28.6% had low income <1200 Br. 56.3% of the HHs respondents were having a family size of 3-4 persons and 32.14% of them had 5-6 persons in their families (Table 1).

With regards to CIs, 37(56.92%) of respondents were female and the rest 28(43.08%) were male participants (Table 1). The majority of study respondents 32(49.2%) were owners of CIs and 11(16.9%) of respondents were managers of the organization. Among the study CIs, 11(16.9%) government office, 3(4.6%) non-government office, 3(4.6%) bank/financial institution, 19(29.2%) restaurant/hotel/cafe, 5(7.7%) beauty salon, 1(1.5%) university/college and others. More than 74% of HHs' respondents lived in Metu town for more than 10 years and about 59% of CIs respondents worked for more than 10 years in the organization (data not shown). So it was assumed that respondents could give reliable information and ideas about the issue.

Table 1. Socio-demographic characteristics of respondents in Metu town

Variables	Categories	Households		Commercials & Institutions	
		Frequency	*%*	*Frequency*	*%*
Age of respondents	18-24	12	4.76	6	9.23
	25-34	93	36.905	18	27.69
	35-44	93	36.905	28	43.08
	45-54	41	16.27	13	20.0
	55-64	12	4.76	-	-
	>64	1	0.40	-	-
Sex	Male	83	32.9	28	43.08
	Female	169	67.1	37	56.92
House ownership	Government rental house	50	19.8	1	1.54
	Private rental house	80	31.7	26	40.0
	Private house	108	42.9	34	52.31
	Other	14	5.60	4	6.15
Educational status	Grade 1-4	39	15.48	-	-
	Grade 5-8	49	19.44	-	-
	Grade 9-12	80	31.74	8	12.31
	Certificate & diploma	48	19.04	22	33.85
	First degree	29	11.5	24	36.92
	Second degree & above	7	2.80	11	16.92
Family Size	1-2 members	21	8.33	-	-
	3-4 members	130	51.59	-	-
	5-6 members	81	32.14	-	-
	≥7 members	20	7.94	-	-
Occupation of the respondents	Government employee	114	45.2	-	-
	NGO employee	1	0.40	-	-
	Business Company employee	8	3.20	-	-
	Private Business	38	15.1	-	-
	Farmer	17	6.70	-	-
	Other	74	29.4	-	-

3.2. Cognitive domains of communities on solid waste separation and storage

Proper waste storage at generated area is a key aspect of effective solid waste management (Tassie, 2018b). Type and quantity of storage materials of solid waste in HHs and CIs of Metu town were assessed and the result showed that majority 130(51.6%) of HHs and 25(38.5%) of CIs had one storage material, while the remaining 96(38.1%) had two and 16(6.3%) of HHs had three and above storage materials. Similarly, 17(26.2%) and 20(30.7%) of CIs had two and above two storage materials respectively (Table 2). But, the types of storage materials used by HHs and CIs are different. This was mainly because of the nature of storage materials that depends on the rate of solid wastes generation, physical and chemical composition of waste, collection frequency and types of collection equipment, space available for placement of the storage materials, and economic power of solid waste generators (Solomon and Yirgalem, 2011).

In the town primary waste collection is done by the residents inside their home premises. The survey and observational results showed that for primary on-site storage of solid waste at home, 99 (39.3%) of HHs and 35(53.8%) of CI respondents were using synthetic sack (locally known as "Madaberiya") as waste storage and this is expected due to easily available in the market, the lower cost of a sack, and suitability for holding a large volume of solid wastes (Gedefaw,

2015) whereas, next to sack, about 51(20.2%) of HHs use stationary storage means (private pit) of solid waste in their home. This is due to the availability of space in their compound and households need to prepare compost for vegetable growing. Following these 50(19.8%) and 34(13.5%) of HHs use plastic bags and basket as waste storage materials respectively, because of their frequent but low generation of waste and economic power to utilize replicable storage materials such as plastic bags. However, these all mentioned waste storage containers were not appropriate for HHs and CIs to handle the solid waste because some of them were unsuitable handling, drop out of solid waste around storage material, and prone to the entrance of flies and rodents (Damtew and Desta, 2015; Lemma and Tekilu, 2014). But, none of the communities in Metu town used metallic containers as storage material. This is vital because of its difficulty in transportation, high cost and low access to the market.

The investigators tried to observe solid waste separation activities performed by Metu town communities and finding out those solid wastes, capable of being sold or exchanged and organic wastes were separated. Similarly, responses from sample HHs and CIs revealed that about 201 (79.8%) of HHs and 25(38.5%) of CI were separately stored solid wastes, capable of being sold to Quraleos ("Quraleos" means a local name which is given to individuals that buy/collect reusable and recyclable wastes items from

the communities informally through door to door visit) or exchanged with liwach ("Liwach" means a local name given to individuals that exchange recycled solid waste in terms of goods used for different purposes informally through door to door visit) (Table 2). According to those respondents, the dominant types of such wastes include: metals (10.45%),plastics (69.15%),glass, bottles and cans (6.97%),broken electronic waste (5.97%) and textile and old shoes (6.47) (Table 2). Respondents' awareness about the usefulness of such discarded wastes for Quraleos and Liwach together with their low income led them to separately stored such wastes in order to make money and purchase new equipment to their house (Gedefaw, 2015; Tassie, 2018a). These contributed that the actual volume of waste to be disposed of outside the house would be decreased.

3.3. Cognitive domains of communities on solid waste reuse and recycling

Among the study participants, 214(84.9%) of HHs and 56(86.2%) of CIs knows the idea of solid waste recycling and reuse (Table 3). As we observed from households' solid waste separation activities in the town, only solid wastes that are sold to Quraleos, exchangeable to Liwach, and to some extent organic wastes are separated.

The response of sample respondents also showed that about 158(73.83%) of HHs and 3(5.36%) of CIs were separately stored solid wastes which are sold to "Quraleos" and exchangeable with "Liwach". Out of the total sampled respondents, 56(26.17%) HHs and 53(94.64%) of CIs did not practice solid waste recycling and reusing due to lack of adequate space and time for recycling and reusing, incapability to afford separate bins, and lack of ready market for recyclable materials (Table 3).

For proper management of solid waste, composting organic waste at households, and organization level is highly recommended (Fetene et al., 2018). From the study findings, 34(13.49%) HHs and 5(7.7%) of CIs had no idea about compost can be prepared from solid waste, whereas, only 61(27.98%) of sampled HHs are currently doing home composting.

Table 2. Cognitive domains of communities on solid waste separation and storage in Metu town, South-west Ethiopia

Variables	Households		Commercials & Institutions	
	Frequency	%	Frequency	%
Types of storage materials				
Sack	99	39.3	35	53.8
Basket	34	13.5	25	38.5
Metal container	0	0	0	0
Plastic container	50	19.8	2	3.1
Private pit	51	20.2	0	0
Don't use	8	3.2	3	4.6
Other means	10	4.0	0	0
Number of storage materials				
0	10	4.0	3	4.6
1	130	51.6	25	38.5
2	96	38.1	17	26.2
3 and above	16	6.3	20	30.7
Separation of solid waste for sale & exchange				
Yes	201	79.8	25	38.5
No	51	20.2	40	61.5
Items separated for selling & exchange				
Metals	21	10.45	2	8.00
Plastics	139	69.15	21	84.00
Glass, bottles, cans	14	6.97	1	4.00
Organic waste	2	1.00	1	4.00
Electronics waste	12	5.97	0	0.00
Textile & Old shoe	13	6.47	0	0.00
separation of solid waste produced in their compound apart from for sellable & exchange				
Yes	95	37.7	4	6.15
No	157	62.3	61	93.85
For what purpose they separately store solid waste				
Using as fertilizer	10	10.53	0	0
Giving to other users	21	22.11	1	25
To use as fuel	6	6.32	0	0
To use as feeding animals	21	22.11	0	0
To recover waste resources	17	17.89	2	50
Reducing volume of waste	18	18.95	0	0
Others	2	2.11	1	25

Table 3. Cognitive domains of communities on solid waste reuse and recycling in Metu town, Southwest Ethiopia

Variables	*Households*		*Commercials & Institutions*	
	Frequency	*%*	*Frequency*	*%*
Knowhow on reusing and recycling				
Yes	214	84.90	56	86.20
No	37	14.70	9	13.80
Reuse and recycle practice				
Yes	158	73.83	3	5.36
No	56	26.17	53	94.64
Type of materials Reused and recycled				
Used Paper	16	10.13	1	33.33
Used glasses, bottles & glass materials	18	11.39	2	66.67
Used metallic materials	9	5.70	0	0
Used plastics and plastic materials	114	72.15	0	0
Textile and used umbrellas	1	0.63	0	0
Knowhow on compost prepared from Solid waste				
Yes	218	86.51	60	92.3
No	34	13.49	5	7.70
Composting practice of communities				
Yes	61	27.98	0	0
No	157	72.02	60	100

Some of the solid wastes, separated by such a small number of HHs for composting practice, including agricultural and food wastes to be used for home gardens and grass, leaf, sugarcane wastes, cattle waste, and wood scraps to be used as fuel. Out of the total sample, 157(72.02%) HHs and 60(100%) of CIs did not practice solid waste composting (Table 3) due to lack of adequate spaces and time for recycling and reusing, incapability to afford separate bins, and lack of ready market for recyclable materials.

In terms of recycling and composting, according to employees of the sanitation and beautification department, there had not been recycling and composting program at the town municipality level. Similar to the present study finding: study reports from Hawassa city (Dereje and Hameed, 2009) and Wolayita-Sodo town (Solomon, 2018) also showed the absence of recycling and composting practice at the municipality level. However, unlike these, the study in Bahir-Dar town reported that about 2.0% of the waste produced was composted at the city service compost site (Tassie and Endalew, 2018) and in Gonder town there were composting activities at town level (Gedefaw, 2015). The absence of such activity at the Metu town municipality level might be attributed to a lack of commitment, finance, material, and manpower resource. Furthermore, to fill this gap the municipality has not also played any role in organizing, encouraging, and giving incentives to different stakeholders such as informal workers, MSE, NGOs, and community members to participate in such activities.

Concerning solid waste handling in the house all family members found to be responsible in 139(55.2%) of the households to handle solid wastes while 42.1% of responsibility in household waste handling lies on Females (Fig. 2). This finding is in agreement with study done in Jimma town (Fetene, 2018), it showed that waste handling by family

members were an encouraging behavior because all family members have greater responsibility in handling solid wastes.
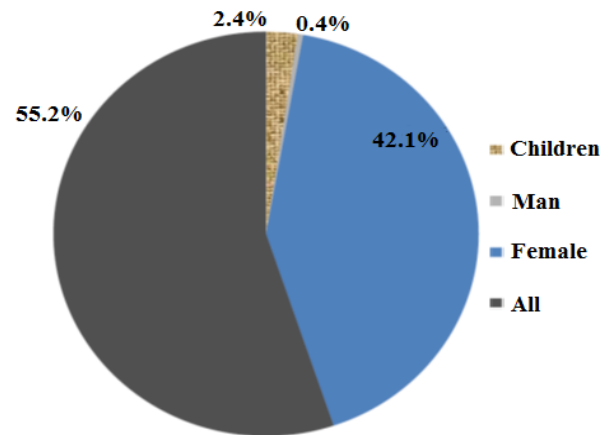

Fig. 2. Responsible person to handle Households solid waste in Metu town

3.4. Solid waste management services

According to the head of Metu tow sanitation and beautification department, the door to door solid waste collection of the town is insignificant in terms of both spatial coverage and efficiency, communities (households, commercials and institutions) claimed on the conventional solid waste management services provided by the municipality. The survey result showed that Metu town HHs and CIs have used municipal solid waste management services rendered by town municipality, MSE, and informal sectors. Out of the total, 80(80.95%) HHs and 41(63.08%) of CIs were accessed to door to door solid waste collection service delivered from the municipality solid waste collection services, 189(75%) of the HHs and 52(80%) of CI were used MSE for door to door solid waste collection service and 118(46.83%) of HHs and

41(63.08%) of CIs were used informal sectors such as daily labourers for door to door solid waste collection from their compound. And about 237(94%) of the HHs respondents and 64(98.5%) of CIs respondents believed that the MSWM issue was a major problem of Metu town.

Regarding service interval, greater than 189(75%) of HHs and 52(80%) of CIs were got service from MSE in irregular interval and all of the HHs and CIs were not got solid waste collection service within a week from MSE and Municipality. Similarly, among study participants about 105(55.56%) of HHs and 8(15.38%) of CIs were wait for more than 30 days interval to get solid waste collection service from MSE and municipality (Table 4). These might be due to shortages of internal roads for vehicle movements, shortage of collection facilities and the participants proved that the municipal trucks reached only the central parts of the town which situated along the main road. The scenario is strengthen by the report of the head of the town sanitation and beautification department that the town solid waste management efficiency are greatly depends on service provider capacity and the town municipality has only three open type trucks and one loading tractor for collection and transportation of municipal solid waste to final disposal site (Birhanu and Berisa, 2015; Getahun et al., 2012; Kassahunand

Birara, 2018; Lemma and Tekilu, 2014). Based on these the respondents satisfaction level towards municipal solid waste management services indicated that 64(31.4%) of HHs and 7(17.07%) of CIs were 'not satisfied at all' with their municipal solid waste management service provided by town municipality, and only 3(1.2%) of HHs and 2(3.1%) of CIs respondents are 'satisfied' with the services of the municipality (Table 4). The results of this study were lower than the study done in Jimma town that 74.7% of HHs respondents were 'unsatisfied' with municipal solid waste management service (Fetene, 2018).

Similarly, 107(56.61%) of HHs and 10(19.23%) of CIs respondents were 'slightly satisfied' and 75(39.68%) of HHs and 38(73.08%) of CIs were 'not at all satisfied' with MSE solid waste collection service (Table 4). Absence of collection container, improper collection, poor coordination, low service quality, poor legal enforcement, poor commitment, and inadequate service providing materials were the possible reasons for the low satisfaction level of Metu town clients with municipal solid waste management service.

As the respondents explained that the waste management problems were at the town level and this has now become a problem of CIs since sometimes if the waste is not collected for weeks by municipality and MSE.

Table 4. Solid waste management service in Metu town, Southwest Ethiopia

Variables	Households		Commercials & Institutions	
	Frequency	%	Frequency	%
Access to solid waste collection service				
From town municipality	204	80.95	41	63.08
From micro & small scale enterprise	189	75.00	52	80.00
From informal sectors (daily laborers)	118	46.83	41	63.08
SWM Service delivery interval by micro & small scale enterprise				
1-3 days	0	0.0	0	0.0
4-7 days	3	1.59	0	0
8-15 days	7	3.70	4	7.69
16-30 days'	0	0.00	0	0.00
above 30 days	105	55.56	8	15.38
as service available	74	39.15	40	76.92
Micro & small-scale enterprise SWM Service delivery satisfaction				
Completely satisfied	0	0.0	0	0.0
Very satisfied	3	1.59	1	1.92
Moderately satisfied	4	2.12	3	5.77
Slightly satisfied	107	56.61	10	19.23
Not at all satisfied	75	39.68	38	73.08
MSWM Service delivery interval				
1-3 days	0	0 .0	0	0.0
4-7 days	0	0.0	0	0
8-15 days	5	2.5	2	7.14
16-30 days'	3	1.5	0	0.00
above 30 days	54	26.5	6	21.43
as service available	142	69.6	20	71.43
MSWM Service delivery satisfaction level				
Completely satisfied	0	0.0	0	0.0
Very satisfied	0	0.0	2	4.88
Moderately satisfied	8	3.9	4	9.76
Slightly satisfied	132	64.7	28	68.29
Not at all satisfied	64	31.4	7	17.07

Regarding service delivery interval CIs get the service as the service available (71.43%) and above 30 days intervals (21.43%) from the municipality. Similarly, the service delivery intervals from MSE were also 76.92% as the service available and 15.38% above 30 days intervals (Table 4).

In order to overcome the constraints and improve the service majority of the study participants (communities, municipality workers & MSE workers) suggest that the municipality should develop well planned and organized solid waste management system by creating awareness about the town's municipal solid waste management problems and solutions, actively participating and sharing responsibility with the community. In addition, to improve the satisfaction of clients and to improve service delivery system provision of waste collection containers is very important.

The public participation is a wholly accepted crucial element for the success of any waste management program. Generally, the majority of participants proposed that the municipality should actively participate in CIs, create awareness, plan, control, and monitor MSE, other service providers, and any illegal dumping activities in the town.

3.5. Other means frequently of solid waste disposal practiced by communities in Metu town

Even though Metu town municipality is planned to provide solid waste management services for communities once per week in a regular way by MSE workers and municipal solid waste collection truck, 105(55.56%) of the sample households and 8(15.38%) of CIs waited for MSE for above 30 days to receive solid waste collection services. Surprisingly, more than 20% of sample communities never received any solid waste collection services from MSE and town municipality. As a result, those

communities are forced to use other means of solid waste disposal options which has a harmful effect on human health and the surrounding environment. Based on the survey results a significant number of respondents 49(64.5%) reflected that they frequently used other ways of waste disposal system which is under the category of illegal practice besides municipal and micro-enterprises services. This data is confirmed by the response from head of the sanitation and beautification department. Among respondents 20.24% of HHs and 12.31% of CIs dumping their solid waste in open disposal pits located in their compound; about (16.92%) of CIs and (4.76%) of HHs reported practicing "dumped in riverside & gullies", and only 18(7.1%) of HHs and 5(7.7%) of CIs reported simply dispose of in their compound.

However, the majority of respondents 44.62% of CIs and 58.73% of HHs reported often practicing open burning as a means of solid waste disposal apart from the above methods (Fig. 3). These disposal methods are most commonly recognized methods that most people in developing countries exercised as solid wastes disposal options (Fetene, 2018).

If you walk in from any corner of Ethiopian cities all public spaces like roadsides, drainage lines, street sides, besides individual houses, market areas and open spaces attest eye-catching piles of garbage, flying objects, rubbish. Which spoils the beauty of the town and it affects the health of inhabitants and deprive citizens a good quality of life as it affects their health and consequently, affect productivity and economic development (Fetene, 2018).

According to Scarlet et al.(2015), from the total solid waste generated in developing countries about 40 to 70% the municipal solid wastes was collected and the rest is either indiscriminately thrown away at various dumping sites on the periphery of urban centers, or at a number of so-called temporary sites (Endalew and Tassie, 2018; Scarlat et al., 2015).
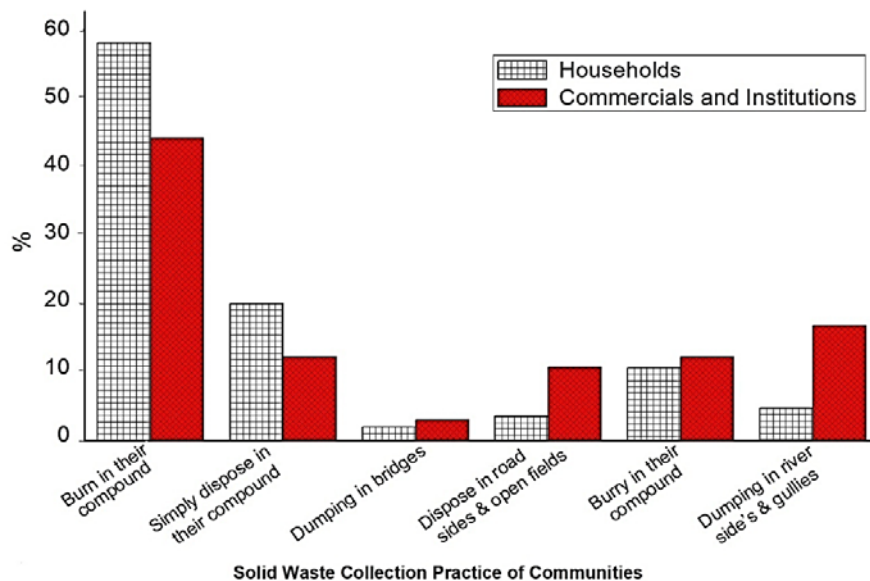

Fig. 3. Solid waste disposal practice apart from door-to-door waste collection in Metu town

The HHs open burning practice in the present study are nearly 22 times more than that in Debre-Berhan town (2.7% of HHs) (Tyagi et al., 2014). Uncontrolled burning of waste is expected to contribute to urban air pollution. These problems, among others, are expected to hold back the effective performance of solid waste management services in Metu town. On the other hand, workers in the sanitation and beautification department revealed that improper institutional set up/arrangement for solid waste management service and existing waste management practices have been a serious problem in the town and the efforts made by the town municipality to change the situation in the town are also insufficient as it compared to the extent of the problem. Therefore, in order to reduce this situation and achieve efficient solid waste management system of the town, alternative ways of solid waste management service is required.

About 126(50%) of HHs and 59(90.77%) of CI were revealed that they did not know even whether the waste-related laws and regulations are available in the town. Further, asked whether they have seen sanitation agents making supervision/control on illegal dumping of solid waste in the town. Only 152(60.3%) of HHs and 19(29.2%) of CIs stated that they have seen sanitation agents making supervision/control on illegal dumping of solid waste (data not shown). Out of the total respondents, 203(80.6%) of HHs and 49(75.4%) of CI reported that they were obtained training, education or information about solid waste management and 248(98.4%) of HH and 64(98.5%) of CI respondents were interested to learn more about solid waste management using their favored method of door to door education (29.0%; 9.2%), open seminar (25.8%; 58.5%), radio and television (18.3%; 0%), brochures distributed (11.1%; 27.7%), solid waste management campaign (7.1%; 3.1%), respectively (data not shown).

3.6. Institutional arrangement and capacity of municipal solid waste management service of Metu town.

The town municipality needs to have well structured management that functions within the institutional arrangement, capable manpower and economic resources, appropriate rule and regulation, and good collaboration with different stakeholders that bring together a sufficient and suitable level of municipal solid waste management service (Gedefaw, 2015; Solomon and Yirgalem, 2011; Thyberg and Tonjes, 2015). So, institutional arrangement and municipal solid waste management service capacity of Metu town were assessed using a questionnaire prepared for the sanitation and beautification department head, and workers and secondary data were reviewed from the department. According to the head of sanitation and beautification, in Metu town solid waste management is mainly undertaken by inadequate manpower, insufficient funding, and inefficient equipment and technologies. The reason behind these were lack of budget, the very weak financial performance of solid waste management service of the town and inadequate economic development, and low attention given by the department as well as higher officials to this service.

Currently, the town runs this service by supplying only two solid waste collection and transportation dumping trucks, which are open types. This data supported by the workers of sanitation and beautification department, the trucks which are used for solid waste collection and disposal is not always giving service due to spare part problems and most of the time it enters in a garage for maintenance. Obviously, these amounts of equipment are not sufficient to perform the service due to the increasing waste generation rate and expanded urbanization of the town.

Besides this, the town has one disposal site which is five kilo-meter far from the town center. This is an agricultural area where no extra preparation has been done to make it proper disposal site and its management was inadequate and below the standard. It was inveterate by sanitation and beautification department, they believed that the absence of responsible body to monitor and manage the final disposal site and inappropriate waste disposal place worth the system in the town. Through observation, it is also confirmed that the disposal site does not have any boundaries to protect entrance of animals and human and waste are indiscriminately disposed which affects the surrounding community by runoff and wind blow. Such very poor disposal management of Metu town disposal site is prone to pollute and negatively affects the nearby environment, peoples living near disposal area, agricultural area (Fetene et al., 2018; Olukanni et al., 2013; Solomon, 2018; Tassie and Endalew, 2018). Therefore, the existing disposal site is not an appropriate place and should be changed and well managed.

According to the head of sanitation and beautification department, the only source of income for solid waste management activity was the municipality capital budget, which was assigned by government higher officials. Apart from this, the municipality did not have other sources of income which can support the improvement of the solid waste management service. And the employee in the department confirmed that either the HHs or CIs did not pay specifically for solid waste collection activities.

Further, the sanitation and beautification department employees said that there was no specifically assigned budget to solid waste management to run the service in a proper manner like other cities in the country. According to the mayor of the town, the municipality budget was assigned from internal income; from this budget, only some portion was given to solid waste-related purpose; rather the rest were assigned to other city's basic development. Concerning this, his reply goes as follows "that is why

the department has not been provided containers at least in some parts of the town, which solve waste collection problems and other necessary facilities". From this finding one could be understood that the financial source of the department was only a small part of the municipal budget, which is really critical. Due to this, the department faced a lack of capacity to purchase and provide the necessary facility in order to confirm effective solid waste management in the town. They found that because of lack of financial resources to handle with the increasing quantity of produced waste generated by the rapid growing towns and insufficient funds from a central municipal budget cannot finance adequate levels of service; again municipal solid waste collection scheme of towns in the developing world generally serve only a limited part of the urban population (Endalew and Tassie, 2018; Yoadaet al., 2014).

4. Conclusions

Cognitive domains of communities on solid waste management of Metu town were assessed and the findings of the study indicate that 73.83% of HHs and 5.36% of CIs were separately stored solid wastes which are sold and exchanged. But, 72.02% HHs and all of CIs did not practice solid waste composting due to lack of spaces and time, incapability to afford separate bins, and lack of ready market for recyclable materials.

Furthermore, municipal solid waste collection and transportation activity of the town is carried out by the door to door solid waste collection provided by the municipality, MSE, and informal sectors. It is largely implemented for the collection of solid waste from residential, commercials and institutional areas to disposal sites. But, the status and spatial coverage of this service are very unsatisfactory, only 3(1.2%) of HHs and 2(3.1%) of CIs respondents are 'satisfied' with the services of the town municipality.

Therefore, the town administration/municipality must work hard to make solid waste management system more efficient to improve the services, raise public awareness on waste handling, segregation, recycling, reusing and disposal to increase their participation in practices, increase stakeholders' involvement and enforce solid waste management regulations, laws etc.

Moreover, there is a need to have well-structured management that functions within the institutional arrangement, capable manpower and economic resources, appropriate rule and regulation, and good collaboration with different stakeholders.

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