Solid Waste Management Practice and Factors Influencing its Effectiveness: The Case of Selected Private Waste Collecting Companies in Addis Ababa

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Abstract

Solid waste, which is a consequence of day -to- day activity of human kinds, needs to be managed properly. Addis Ababa faces problems associated with a poorly managed solid waste system. A rational behind for the study was the poor status of solid waste management in Addis Ababa and this created the need to study the current solid waste management practice and factors influencing its effectiveness: the case of private companies in Addis Ababa. Solid waste management practice effectiveness was described in collection, disposal and transportation while factors influencing solid waste management practice effectiveness were described in financial, technical, institutional, social and political aspects. This employed mixed research approach. Collected data has been analyzed by descriptive and correlation statistical tools and the data collection instruments were questionnaires, interviews, observations, and secondary sources. A survey was conducted in three selected private solid waste managing companies and the survey questionnaire data was collected from 108 respondents and interview was conducted for three key informants from solid waste management agencies. Different sampling methods like purposive sampling, stratified sampling, and simple random sampling were employed to select the study units. The validity of research instruments was established by consulting the supervisor. The researcher employed the test and retest method to establish the reliability of the research instruments .The researcher used statistical packages for Social Science department to analyze the data. The study found out that the current waste service delivering practice is ineffective due to the financial constraints, technical problems, social influences and institutional aspect problems as major influencing factors. However, the political influence was moderate. Indeed, these influencing factors possessed association with solid waste management (collection, transportation, and disposal) separately except between political and disposal. This indicates that the higher the influences, the lower the effectiveness of solid waste management practices. Based on the findings of this study , it is recommended strict enforcement of -by law and policy, more budget allocation ,technical support by the government, development of solid waste management through waste reduction, reuse, and recycling ,retain staff with good salary ,benefit, and training ,implement awareness raising program.

Key Words: **Effectiveness, Financial, Institutional, Technical, Political Aspects, Social aspect, SWM**

1. Background of the Study

Solid waste management is becoming a big concern for cities administration task in developing countries. This is mainly due to the magnitude of rapid urbanization and increasing population growth; which in turn has greatly accelerated municipal solid waste generation rate in the urban environment. (Hayal Desta, 2014). According to World Bank (2012), every year developing nations spend nearly $46 billion on managing their municipal solid waste. These investments could exceed $150 billion per year by 2025. Solid waste management (SWM) in Africa is often weak due to lack of appropriate planning, inadequate governance, poor technology, weak enforcement of existing legislation and lack of economic incentives (UNEP, 2005). This impacts environment and public health.

Different approaches are used by countries to manage solid waste in order to prevent its impacts on the environment and health. Until recently, solid waste management (SWM) services in Ethiopia were mainly the responsibilities of municipalities, which results in inadequate service provision reflected by lack of proper collection, poor sanitary facilities, improper planning and co-ordination (Tadesse Kuma, 2004 ; Edmealem Bewuket, 2013).

1.1 Statement of Problem

One of the most daunting challenges of urban centers in developing countries like Ethiopia is proper waste management challenge (Nigatu Regassa, Rajan Sundarra and Bizunesh Bogale, 2011).

Currently in Addis Ababa, solid waste is increasing beyond the management capacity of the municipal governors, the volume of waste totals more than three million cubic meters per year with the prospect of increase by a constant rate of 2.1 cubic meters per person annually (Misrak Workneh, 2016). However, the (2010) estimate of UN shows that only 65 percent of the waste generated in the city is collected, having the rest being disposed of in open sites, drainage channels, and rivers. This fact can be observed by strolling on the street of Addis Ababa city, where residents might not find it strange to see overflowing garbage skips often rendered for their putrid smell. The best remedies, individuals can do in such a scenario is to cover their nose or hold their breaths and walk (Misrak Workneh, (2016, March 27).

Due to the above paradox, the government had structured a process where SMEs and privately owned sanitation companies work with the government's sanitation entities in line with proclamation No.513/2007. Despite, government's procedural mechanisms put in place to cope with the above problem, the matter of solid waste disposal seems far from being resolved due to the lack of technology, technical knowhow, financial capacity, institutional structure and understanding of the community required to properly manage solid wastes by the service providers (Tesema, 2010).

Past studies are few and not evident. The basic factors which have hindered the management of solid waste in Addis Ababa consequently escalated to an inefficient and ineffective means of SWM capacity. This gap directed the researcher to examine about the current solid waste management practice and influencing factors at private collector's level.

1.2 Research Questions

General: What is the status of current solid management practice and which factors are influencing its effectiveness?

Specific

- ✓ What is the current solid waste service delivering practice?
- ✓ Which factors influence the effectiveness of solid waste management practice in Addis Ababa?
- ✓ What is the association between the influencing factors of SWM and effective solid waste management practice?

1.3 Significance and Limitation of the Study

To give clear understanding for private companies and the municipality on how financial, technical, social, institutional and political aspects influence solid waste management effectiveness (collection, disposal and transportation) and as such can use recommendation for the problem remedial and researchers can conduct further research on it.

The study limitations were time and cost constraint, the researcher surveyed three private solid waste managing companies for their convince to collect data and the researcher was coerced to translate the questionnaire from English to Amharic.

2. The Research Methodology

To obtain the information properly, the study has adopted a descriptive research design with mixed research approaches. Data were also collected from both primary and secondary source. The primary data were collected from formal and informal survey.

2.1. Population and Sampling Technique

This study used two sampling stages. The first one is to sample out the Private waste managing companies and secondly the number of respondents within the company. According to waste management agency, there are 27 private companies engaged on waste management from Institutions and Commercial companies in Addis Ababa. From the existing 27 companies three were selected for their convenience to collect data about the effectiveness current SWM practice and its influencing factors.

The criteria used for selection were Service year and coverage (size). The larger the service year and size of coverage assumed the more the variety of the challenges. The names of the private companies under waste management practice are Rose private limited company, Dynamic private limited company and Yes private limited company. It was convenient for the researcher to gather reliable and sufficient data from these companies. In regard to a number of respondents, there were a total of 176 populations (employees) on the surveyed companies. From this total population, 121 employees were selected at 5% margin of error by setting response distribution 50% with 95% confidence level. Setting the response distribution to 50% is the most conservative assumption which gives largest sample size. (Bartlett, Kotrik, and Higgins, 2001). Then proportion number of employees was selected using stratified sampling by dividing in to two strata. The first strata contain waste collectors and drivers and the second strata contain administrative workers.

From each stratum employees were selected using simple random sampling. This often improves the representativeness of the sample by reducing sampling error (Bartlett et al., 2010). In this manner (57%) of the employees were selected from Rose Private limited company, (34%) from Dynamic Private Limited company and (9%) from Yes Private Limited Company . At this stage respondents were selected randomly because of their similar nature. Furthermore, Interview was conducted with (2) key informants from each companies and (3) from waste management agency. The criteria used to select the interviewee were based on their length of exposure on the solid waste management work.

Table 2.1 Summary of Sampling Population

Company name	Unit of Analysis (Population Group	Population size	Sampling size	Sampling methods
Rose Private limited company	Administrative(management) staff	15	10	Simple random
	Collectors and drivers	85	59	Simple random
Dynamic private limited company	Administrative(management) staff	7	5	Simple random
	Collectors and drivers	53	36	Simple random
Yes private limited company	Administrative(management) staff	3	2	Simple random
	Collectors and drivers	13	9	Simple random
		176	121	

3.   Research Findings and Discussions

Survey questionnaires collected from over 108 respondents have been summarized in tabulation form.

3.1. Socio- Demographic Characteristics of Respondents

In terms of sex statistics that only 14.8% of the respondents were females while the male respondents were 85.2%. This is an indication that we have more male participating in the study.

In terms of age characteristics, 47.2% of the respondents were between the ages of 18 to 25; 41.17% of them are between 26 to 35years; 8.3% are between 36 to 45 years; and 2.8% were above 45.

The other influentially relevant demographic characteristics is education, because a level of education tends to influence the performance of employees in all fields, and could much significantly influence the performance of SWM sector in the research area.

Statistics from own survey shows the distribution of respondents by their level of education. It shows that majority (50%) of the respondents had completed secondary education; while 18.5% had primary education; the other 11.1% of the respondents had diploma; 7.4 % of the employees had BA degree education and 0.9% of the respondent had Masters Education. On the other hand 6.5% of the respondents were illiterates. This shows that most of the respondents have secondary education background. Therefore, this educational distribution of employees leads us to the realistic conclusion that it has been carrying out the operation in the capacities of management and technical work required in SWM of the city sufficiently.

The distribution of respondents according to the position they hold in the job shows that majorities (57.4%) of the respondents were waste collectors; 19.4% were drivers, 14.8 administrators and the remaining 8.3% were assigned in other auxiliary works. Therefore, great numbers of employees need to engage to the duty of garbage collection, since SWM is more of a menial job and does not require many highly skilled persons.

3. 2. Existing solid Waste Management Practice

One of the parameters used in assessing a performance of a waste service delivery is its effectiveness. Effectiveness of a firms waste service delivery practice can be assessed using indicators such as waste reliable collection, transportation and disposal. The present study employs these indicators to assess effectiveness of waste service delivery by selected private firms in Addis Ababa.

3.2.1 Waste Collection

A given waste management practice is considered to be effective when a waste collection goals are achieved. An effective waste collection can be recorded when companies are able to facilitate enough collection points near to all beneficiaries, increase a frequency of waste pick up, avoid waste spill over and when waste personnel is fully and frequently trained

Table 3.1 Solid waste Collection Practices

N=108

Indicators	Mean	S.D	SA	A	U	D	SD
Frequency of waste pick-up are strictly followed by our company	3.26	1.179	14(13%)	45(41.7%)	9(8.3%)	35(32.4%)	5(4.6%)
There is full and continuous training on solid waste collection in our company	2.74	1.155	11(10.2%)	17(15.7%)	24(22.2%)	45(41.7%)	11(10.2%)
Our company have facilitated enough number of collection points near to all beneficiaries	3.04	1.067	11(10.2%)	25(23.1%)	34(31.5%)	33(30.6%)	5(4.6)
The waste spillover our Company maintains to the ground is cleaned at collection	2.25	1.208	8(7.4%)	14(13%)	5(4.6%)	51(47.2%	30(27.2%)

Own survey, 2016

SA: Strongly Agree, A: Agree, U: undecided, D: Disagree, SD: Strongly Disagree

The Municipality has responsibility and it spends large proportion of its budget on collection, transportation, and disposal of solid waste services.

In general, respondent's information on the effectiveness of waste collection indicators from the survey, interview result with key informants and observation by the researcher support this ineffectiveness current solid waste collection.

Accordingly, above 50 percent of the respondent's opinion reveal that there is a lack of training for solid waste collecting staff. A significant portion (74%) said there is waste spillover on the road and the ground which indicate a deficiency of current waste collection that needs improvements. Finally, respondents were unclear with a median distribution of 3.04 whether enough collection point is facilitated for beneficiaries or not). In summary, the entire mean figure on the indicators of current solid waste collection practice (2.82) below mean figure 3 , observation made by the researcher and interview conducted with the agency and managers of private waste collectors indicated that status of current solid waste management practice is at poor level and this has negative impact on the health and environment.

3.2.2 Solid Waste Transportation Practices

Under the framework of effective solid waste management, safe and reliable transportation was considered as one of the key measurement for effective SWM (Hufane, 2015). Subsequently, effective solid transportation can be achieved by companies with sufficient manpower and modern vehicle, nature of available roads, traffic condition and traveling Schedule (Shubeler, 1996)

Table 3.2 Solid Waste Transportation

N=108

Indicators	Mean	St.D	SA	A	U	D	SD
Our company have sufficient manpower and vehicle to transport solid waste	2.66	1.087	6(5.6%)	26(24.1%)	8(7.4%)	61(56.5%)	7(6.5%)
Nature of traffic condition along collection route has created jamming	2.74	1.370	18(16.7%)	18(16.7%)	8(7.4%)	46(42.6%)	18(16.7%)
Our company supervises the daily number of trips, tonnage of waste and route plan to drivers	3.94	.863	26(24.1%)	61(56.5%)	10(9.3%)	11(10.2%)	0
Our company use covered vehicles and there is no spillover of solid waste upon transport	2.54	1.256	8(7.4%)	26(24.5%)	3(2.8%)	50(46.3%	21(19.4%)
The existence of inadequate internal roads (alternative roads has created challenges on solid waste transportation.	2.42	1.224	10(9.3%)	16(14.8%)	4(3.7%)	57(52.8%)	21(19.4%)

Own survey, 2016

SA: Strongly Agree, A: Agree, U: undecided, D: Disagree, SD: Strongly Disagree

Transportation of waste is carried out by City Administration and private sector vehicles. The existing reality in Addis Ababa where waste transporting tracks are not available to the level demanded and even some of the available trucks don't all fully perform.

In summary, the entire mean result of 2.86 below the likert mean of 3 indicated respondent's opinion on the current ineffective solid waste transportation practice. The indicator whether (company has sufficient manpower and vehicle to transport solid waste), was scored disagreed with significant number of respondents (63%), It provided an indication that the important indicators for effective solid waste transportation (manpower and vehicles) are the main deficiency to transport waste in their respective companies. This finding is in line with the theory of (Schubeler, 1996), which states the lack of skilled and adequate manpower and vehicles were the hindering factors to transport solid waste. Hence, current solid waste transportation is less effective.

3.2.3 Solid Waste Disposal

Waste management is also dependent on safe and reliable disposal system. This system can be effectively achieved when disposal site is on accessible landfill near to collection points, closed and protected from animals and which has no bad smell to the community.

Table 3.3 Solid Waste Disposal Practice

N=108

Indicators	Mean	S.D	SA	A	U	D	SD
The existing disposal site is far-away from our collection point	2.36	.952	2(1.9%)	16(14.8%)	15(13.9%)	61(56.5%)	14(13%)
Municipality did not provide designated and accessible land fill site	2.34	1.112	3(2.8%)	14(13%)	31(28.7%)	29(26.9%)	31(28.7%)
The existing disposal site is open and it has irritant(bad smell)to the community	2.77	1.425	17(15.7%)	26(24.1%)	2(1.9%)	41(38%)	22(20.4%)
Our company disposes waste at designated land fill by law and it is environmentally safe	3.23	.882	2(1.9%)	48(44.4%)	34(31.5%)	21(19.4%)	3(2.8%)
Presence of animal on the existing disposal site is common.	3.2	.935	8(7.4%)	25(23.1%)	54(50%)	17(15.7%)	4(3.7%)

Own survey, 2016

SA: Strongly Agree, A: Agree, U: undecided, D: Disagree, SD: Strongly Disagree

According to UN-Habitat (2010), a final waste disposal site should be properly selected and fenced so as to protect the entrance of stray animals and to reduce the impact of waste on surrounding environments as a whole.

In Addis Ababa city, there was one open dumpsite where all collected waste is disposed off. It has been established 47 years ago. The site is known as "Reppi" or "Koshe" which is to the South West part of the city, located 13 km away from the city center. The method of disposal was crude open dumping: hauling the wastes by truck, spreading and leveling by bulldozer and compacting by compactor or bulldozer. The disposal site was one of the identified challenges to the system. This problem has forced the agency to introduce new dumping site at 'Sendafa' which is much further away than the old one at Reppi. This new dumpsite also creates major clash between the agency, waste collectors and the surrounding community due to low compensation or no compensation for land owners, or negative externalities to community and additional distance to waste collectors as said by one of the key informants. The survey result from respondents also confirmed this fact. When we sum up the current disposal practice indicators, 75 percent of the respondent says the existing disposal site is far- away from the collection point. This indicates a deficiency on the indicator (the agency did not provide designated and accessible landfill site). The respondents view, interview and observation conclude that the current disposal site shows poor status.

3.3 Study Variables

3.3.1. Financial constraint and Solid Waste Management
Financial resources were conceptualized in terms of four dimensions: financial cost, operating cost, cost recovery and capital for investment. Respondents were asked to rate, using a five point likert scale, several statements related to these indicators were delivered with the view to assessing the financial conditions of the firms.

Table 3.4 Financial conditions of SWM

N=108

Indicators	Mean	S.D	SA	A	U	D	SD
There is adequate revenue generation, for provision of effective solid waste management within our company.	2.36	.952	2(1.9%)	16(14.8%)	15(13.9%)	61(56.5%)	14(13%)
Our vehicles always have fuel and ready for use all the time.	2.44	1.079	3(2.8%)	14(13%)	36(33.3%)	29(26.9%)	26(24.1%)
Working on the solid waste collection and transportation business service is attractive.	3.14	1.027	15(13.9%)	18(16.7%)	44(40.7%)	29(26.9%)	2(1.9%)
Our company receives (collecting) fair fee for its solid waste management service.	2.31	.971	3(2.8%)	16(14.8%)	6(5.6%)	69(63.9%)	14(13%)
There is sufficient money for the promotion of waste reduction, recycling and recovery programs	2.25	1.208	3(2.8%)	16(14.8%)	6(5.6%)	69(63.9%)	14(13%)

Own survey, 2016

SA: Strongly Agree, A: Agree, U: undecided, D: Disagree, SD: Strongly Disagree

The survey result indicated in Table 3.4 implies the indicators financial resource as deficiencies with grand mean of 2.5. First of all, the involvement in SWM is not generating adequate revenue. 56.5 percent of the respondents supported this financial indicator showing constraint. Secondly, the indicator ('vehicle have fuel always and ready for use), was scored as disagree with mean value 2.44. This was also confirmed in percentiles that 51 % were recorded as disagreed; which show the poor condition of the financial resource. In addition, the statistical response on the indicator (adequacy of receiving a fair fee for its solid waste management), respondents rated 76.9% as disagreed .This was also supported by the respondent's opinion that the companies lack financial resource to plan for the promotion of waste reduction, recycling and recovery programs.

An interview conducted with the private waste service delivering company representative's response, related to indicators of financial condition as well indicate poor condition. Particularly interviewees' claimed; the existing payment as unfair. They furthermore added their complaint on the waste management agency. According to the interviewees', the agency has changed the existing measurement from meter cube to kilogram and it introduced the far sanitary site without clearly communicating the surrounding community. As a result of this change their income has decreased dramatically and a significant number of companies cut their employees and many of them have stopped their job.

The combined statistical evidence and interview about the condition of financial indicators from the surveyed firms indicated that financial resource is the main constraint on the waste service delivery practice in the research area. Hence, financial constraint is one of the major factors negatively influencing the effectiveness of solid waste management practice. The most enhanced financial position in this sector shall be correlated with the improved solid waste management (collection, transportation, and disposal).Edmealem Bewket (2013) identified the status of financial aspect as a hindering factor which determines the sustainability of effective SWM in Bahirdar city. This finding is also in line with the literature (Shubeler, 1996; Coffey and Coad, 2012)

3.4. Technical Constraints and Solid Waste Management

The researcher developed criteria/indicators to assess the status of technical condition of private waste collectors. These are adequate and modern waste management equipments, environmentally adaptable and maintainable equipments with sufficient spare parts, good infrastructure to collect and transport with skilled personnel.

Table 3.5 Technical Conditions of SWM firms

Indicators	Mean	St.D	SA	A	U	D	SD
Our company has adequate and modern waste management. equipment	2.27	.963	3(2.8%)	15(13.9%)	5(4.6%)	70(64.8%)	15(13.9%)
Our company usually uses environmentally adaptable and maintainable equipments.	2.33	.947	2(1.9%)	13(12%)	21(19.4%)	55(50.9%)	17(15.8%)
Addis Ababa city is well planned with appropriate infrastructure to collect and transport waste.	2.31	.912	1(.9%)	19(17.6%)	3(2.8%)	74(68.5%)	11(10.2%)
Waste personnel in our company are regularly getting training.	2.06	1.126	3(2.8%)	16(14.8%)	5(4.6%)	44(40.7%)	40(37%)
There are accessible spare parts when vehicles and equipment s are breakdown.	2.32	1.031	7(6.5%)	9(8.3%)	11(10.2%)	66(61.1%	15(13.9%)

Own survey, 2016
SA: Strongly Agree, A: Agree, U: undecided, D: Disagree, SD: Strongly Disagree

Technical Conditions and Effective Solid Waste Management Practice.

Technical condition was measured with the indicators like adequate and modern waste management equipment with enough spare parts, skilled personnel and adequate infrastructure as table 3.6 shows. In summary, the respondent's mark all (sub) indicators, that make technical indicator with disagreed as the entire or grand mean value of all these indicators are turned out to be 2.25.

In consequence, it is evident that technical aspects pose serious influence on solid waste management practice in Addis Ababa. Lack of adequate modern waste disposal equipment, none frequent use of environmentally adaptable and maintainable equipment, the city of Addis Ababa not being well planned with the appropriate infrastructures suitable for waste collection and transportation, and most of the companies falling to give regular training to their employees, inaccessibility of spare parts for damaged and broken vehicles and equipments are more or less the influencing factors for none effective waste management practice coming from the technical aspects.

The combined result from quantitative and qualitative analysis indicates that technical conditions were at poor level. Hence, poor level of technical condition is one of the negatively influencing factors of effective solid waste management. This finding is consistent with the literature (Shubler ,1996, Coffey and Coad,2012 ; Fianko, 2014 ; Edmealem Bewuket ,2015 ;Un-Habitat ,2013)

3.5 Social Factors and Solid Waste Management

Social conditions were constructed from 4 indicators: the condition of workers (fair remuneration and workers protection at work), the attitude of beneficiaries about waste disposal workers and awareness raising programs.

Table 3.6 Social condition of SWM firms

Indicators	Mean	St.Dv	SA	A	U	D	SD
I am paid adequate salary and sufficient additional benefits for my work at our company.	2.42	1.185	5(4.6%)	13(12%)	11(10.2%)	66(61.1%)	13(12%)
Waste workers always wear safe and protective gloves and clothes during their work hours at our company.	3.31	.990	25(23.1%)	47(43.5%)	5(4.6%)	27(25%)	4(3.7%)
Beneficiaries have good attitude for waste collecting workers.	2.31	1.404	8(7.4%)	26(24.1%)	1(.9%)	30(27.8%)	42(38.9%)
Our company carries out awareness raising programs on general public health and management of waste.	3.01	1.201	13(12%)	26(24.1%)	27(25%)	33(30.6%)	9(8.3%)

Own Survey, 2016
SA: Strongly Agree, A: Agree, U: undecided, D: Disagree, SD: Strongly Disagree; St D: Standard deviation

Social condition was constructed as the condition of workers, the attitude of beneficiaries about waste collecting workers and awareness raising programs. Respondents were asked to react to several statements on these indicators intended to weigh the status of indicators. The response was scored as described in table 3.7

To sum up, regarding social aspects, respondents said they do not agree with their payment and additional work benefits being reasonable in their respective companies. On the other hand, they (employees) believed that they always wear safe and protective gloves and clothes during their work. When strongly disagreed is summed up with it (disagreed), the category will constitute 67% of the total respondents, which means they do not think beneficiaries have good attitude toward them.

Rathana (2009) stated the fact that a lack of public awareness and co-operation are root causes of solid waste service delivery practices. Likewise in Addis Ababa, one of the problems is lack of awareness in communities, private sectors, and decision makers.

In this regard, almost an equal number of respondents have divergent view that (36%) and (39%) said they agreed and disagreed with their respective companies carrying out awareness raising programs on general public health and management of waste, respectively. This survey finding using statistical value, interview and observation was further supported by literature (Shubeler, 1996; Coffey and Coad, 2012; Fianko, 2014 and Edmealem Bewuket, 2013)

3.6. Institutional Weakness and Solid Waste Management Practice

Institutional strength indicators were proper organizational set ups for responsibility, integrated participation between private and public agencies, sufficient and consistent contract between service providers, beneficiaries and the authority, and waste managing companies that are responsible to service reliability (UN-Habitat,2013)

Table 3.7 Institutional Condition of SWM firms

Indicators	Mean	S.D	SA	A	U	D	SD
There is no proper institutional set-up for solid waste management service	2.16	1.201	6(5.6%)	12(11.1%)	15(13.9%)	35(32.4%)	40(37%)
Several institutions or agencies are not involved in SWM	2.54	.961	1(.9%)	26(24.1%)	10(9.3%)	64(59.3%)	7(6.5%)
We have sufficient and consistent waste management contract period with the municipality	2.25	1.208	8(7.4%)	14(13%)	5(4.6%)	51(47.2)	30(27.8%)
There is integrated solid waste management practice between private and public agencies	2.54	1.321	11(10.2%)	16(14.8%)	24(22.2%)	26(24.1%)	31(28.7)
Our company has faced frequent customer complaint about solid waste management on its assigned jurisdictions	3.26	1.179	14(13%)	45(41.7%)	9(8.3%)	35(32.4%)	5(4.6%)

Own Survey, 2016
SA: Strongly Agree, A: Agree, U: undecided, D: Disagree, SD: Strongly Disagree

Institutional condition was conceptualized as proper organizational set up for responsibility, integrated participation between private and public agencies, sufficient and consistent contract between the service provider, beneficiaries and the authority and waste managing companies that are responsible for service reliability.

All negatively recorded indicators were recorded as a positive response. From table 3.7 respondents opinion on the statement of indicators under institutional condition has an entire mean value 2.55. Except for indicator (company has faced frequent customer complaint about solid waste management on its assigned jurisdictions); all reveals the adverse effect on the solid waste management. Meaning, responses of the respondent were positioned as (50%) above and below disagreed. In percentile terms, (69.4%) of the respondent agreed as there was no proper institutional set-up for SWM. Similarly, (65.8%) of the respondent said there is no involvement of several institutions in SWM.

According to Contreau-Levine and Coad (2000), the contractual periods should enable economic depreciation of assets and repayment of loans, developing systems and facility sizes to make financially feasible. Nevertheless, most of the respondents (81%) disagreed on the existence of consistent and sufficient waste management contract with the cleaning agency.

Using interview, the researcher confirmed that the duration of a contract agreement between the cleaning agency and private solid waste managing firms is for three months and contract agreement is renewed every three months, which is too short. Besides, according to the manager of 'Yes' private solid waste collector, the agreement does not allow to work in a flexible manner. For example, the waste management agency changed its policy many times without our participation and consent.

Finally, 59% of the respondents expressed their opinion as there were no frequent customer complaints on their respective companies. But the interview made with the agency indicates that private waste collecting firms sometimes complained. The combined information from survey, interview and observation indicates weak institutional capacity on the waste management that would negatively influence the service delivery practice. Therefore, the city of Addis Ababa needs to encourage both individuals and private institutions to provide proper SWM along with upgrading the required equipment to strengthen the service delivering system. Yet again this finding is consistent with the literature (Hayal Desta., 2014) that reveals the lack of effective public participation and inadequate governance in the waste management system which is an

institutional aspect of weakness. It is also in line with the literature of Shubler, 1996; Coffey and Coad, 2012 and Fianko, 2014.

3.7 Political Condition and Solid Waste Management

Political situation can be evaluated using the indicators of existing relationship between local and central governments (the effective degree of decentralization, for example), the form and adequacy of law and policy making and priorities given about environment by politicians and administration all affect the character of management, governance and the type of SWM system which is possible and appropriate (Schubeler, 1996)

Table 3.8 Political Condition of SWM firms

Indicators	Mean	St.D	SA	A	U	D	SD
There is adequate policies , laws that promote for effective SWM	3.76	.916	19(17.6%)	58(53.7%)	19(17.6%)	10(9.3%)	2(1.9%)
The assembly enforces to implement the existing solid waste management	2.19	.716	0	5(4.6%)	25(23.1%)	64(59.3%)	14(13%)
The assembly is independent when it monitors solid waste management companies	2.64	.942	3(2.8%)	9(8.3%)	59(54.6%)	20(18.5%)	17(15.7%)
The government gives high priority to solid waste management	2.78	1.026	7(6.5%)	23(21.3%)	20(18.5%)	55(50.9%)	3(2.8%)

Own survey, 2016

SA: Strongly Agree, A: Agree, U: undecided, D: Disagree, SD: Strongly Disagree

From table 3.8, the indicator (there are adequate policies and laws that promote for effective SWM), was recorded as agreed by the respondents with the highest mean value 3.76. This can be supported in percentile terms (71.3%) strongly agreed and agreed; whereas (11.2%) strongly disagreed and disagreed and the remaining (17.6%) remain neutral. This reflection has supported with the existing waste management policies and proclamations No.513/2007

On the other hand, the second indicator (the government gives high priority to solid waste management) was scored as disagreed by the respondents with mean value = 2.76. In percentiles (53.7%) of the respondents strongly agreed, and agreed. But, (27.8%) strongly disagreed and disagreed and the remaining (18.5%) remain neutral. In addition to this respondents stated their opinion with a mean value = 2.19 on the indicator (The assembly enforcers to implement the existing solid waste management law). In percentiles, (72.3%) expressed their opinion strongly disagreed and disagreed. However, (28.1%) agreed and remained neutral. But, no respondent was rated as strongly agreed. The indicator (policies and laws are enforced independently by the waste management agency), was pointed with mean value of 2.64. Which means respondents were feeling as these policies and laws are not enforced?

 The entire arguments about the condition of the political aspect of solid waste service delivering practice show a high negative influence with grand mean vale of 2.84.

3.8 Relationships between the Influencing Factors and SWM

3.8.1 Correlation Analysis

Correlation measures relationships existing between indicators, and does not necessarily show causal connections. Spearman's correlation was used to analyze relationships between each set of several

indicator attributes of SWM firms, taken together as influencing aspects: financial, technical, social, institutional and political factors or conditions and measures of solid waste management effectiveness. As indicators were measured in ordinal scale, a non-parametric correlation (Spearman's Vs Pearson's) was preferred (Corder and Foreman, 2009).

In addition to this, the sign of correlation coefficient determines whether the correlation is positive or negative. The magnitude of the correlation coefficient determines the degree of strength of the association. Though there is no commonly accepted standard for range of Correlation coefficients. Tukey, (2014) stated coefficient of correlation standards as:

Weak correlation $\qquad$ $0 < |r| < .30$

Moderate correlation $\qquad$ $.30 < |r| < .70$

Strong correlation $\qquad$ $|r| > .70$

Table 3.9   Correlations between SW Collection and Influencing Factors

(N=108)	Collection	Financial condition	Technical condition	Social condition	Institutional condition	Political condition
Spearman's Collection Correlation Coefficient	1.000	.296	.348	.323	.337	.036
P. Value		0.002	0.000	0.001	0.000	.712

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

As shown in table 3.9 above, there exists positive correlation between collection and all the influencing indicators, separately. That means when each of the variables increase effective SW collection also increases with the coefficient magnitude, but it did not indicate causal relationships. More precisely, except financial condition indicator variable, which has relatively significant positive but weaker association with SW collection, the other indicators have significant moderate positive relation almost equal in magnitude, that is, around 0.3 on average.

Separately, a moderate significant positive correlation is exhibited between SW collection and technical condition (with 0.348 correlation coefficient) indicating that ineffective solid waste collection has positive moderate association with firms' technical advancement problems. The moderate positive correlation (with 0.337correlation coefficient) between collection and institutional condition comes second. This indicated that ineffective solid waste management has relation with weak institutional set-up, meaning that when the institutional setup is better, then there is a chance for effective SW collection to exist. More, positive correlation between collection and social condition indicates that the ineffective solid waste collection is related to low level of social conditions.

Also the significant positive correlation between financial condition and solid waste collection revealed that minimum volume cube meter of solid waste collection associated with the city allocated sufficient budget for firms. This association of ineffective solid waste collection and varies indicators influencing indicators as a challenge or the high the constraint the high ineffective SWM was in line with the finding by Williams and Fianko (2014).

In general, correlation measurement indicated that constraints of technical, institutional, social and financial aspects have significant positive correlation associated with ineffective solid waste collection. Indeed, the high the constraints or influences associated with high the ineffective.

Table 3.10 Correlations between SW transportation and influencing factors

N=108

	Transportation	Financial condition	Technical condition	Social condition	Institutional condition	Political condition
Spearman rho Transportation Correlation Coefficient	1.000	.510**	.307**	.429**	.401**	.131
P-Value		0.000	0.001	0.000	0.000	.178

 ** Correlation is significant at the 0.01 level (2-tailed).
 * Correlation is significant at the 0.05 level (2-tailed).

Table 3.11 indicated that positive correlation between transportation and indicators, effective solid waste collection associated to the sets of indicators as influencing factors of effective SWM.

Correlation coefficient between transportation and financial, social, institutional, technical and political conditions exhibited .510, .429, .401, .307 and .131 respectively and has a positive significant moderate linear relationship with transpiration at p-vale below 5% significant level, whereas, political conditions and transportation system show insignificant (p>.05). This means there is no linear relationship between political condition and transportation.

Significant positive association at different level indicates that ineffective SWM practice has relation with influencing factors.

Table 3.11 Correlations between SW disposal and influencing factors of effective SWM
N=108

Spearman's rho	Disposal	Financial condition	Technical condition	Social Condition	Institutional condition	Political condition
Correlation Disposal Correlation Coefficient	1.000	.454**	.025	.314**	.046	-.039
P- Value		0.000	.795	0.001	.638	.685

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Table 3.11 also shows the correlation between disposal as set of indicators measurement and indicators defined as (financial, technical, social, institutional).

Correlation coefficient between disposal practice and financial and social conditions exhibited .454, and .314 respectively and have a significant moderate relationship with transportation at p-vale below 5% significant level, whereas technical, institutional and political conditions have no significant relationship with disposal even at 10% significant level.

Individually, the highest positive correlation ($r = 0.454$) recorded between effective solid waste disposal and financial conditions, show that effective solid waste disposal is associated with good financial resources.

4. Conclusion and Recommendations

4.1 Conclusion

The study has been conducted to address the current solid waste management practice and factors influencing its effectiveness in Addis Ababa. Based on the findings, the current solid waste service delivering practice of Addis Ababa is characterized by the huge generation of solid waste coupled with unbalanced solid waste management service. The study found that key element of effective SWM such as waste collection, transportation and disposal practiced by private firms in the city is ineffective. The result shows that the survey companies are unable to fulfill most of the indicators of effective SWM practices in the research area.

This ineffective SWM practice in the survey companies was associated with the following constraints:

Insufficient financial allocation by government for private solid waste management companies - like service recovery charge, budget allocation, and the municipality willingness to pay those involved in waste service delivering, insufficiency of funds for promoting waste reduction, and recycling were examined as influencing factor of effective solid waste management.

Next, technical skill problem like modern waste management vehicle and equipment with accessible spare parts, professional qualification of personnel, lack of infrastructures like accessible internal road were challenges in addressing effective solid waste management in Addis Ababa city. In addition, social influences such as city public awareness on solid waste management, the lack of adequate salary and benefits and low level of beneficiary's attitude for waste collecting workers were examined as influencing factor of effective solid waste management. Also, institutional factors like an improper institutional setup, lack of integrated solid waste management, and lack of involvement by many institutions in SWM, insufficient and consistent waste management contract period with the municipality, and no integrated solid waste management practice between private and public agencies were factors influencing effectives of SWM. Finally, political aspect influences were moderate except for enforcement problems and socially unaccepted disposal site.

Furthermore, Spearman's correlation measurement suggested that set of indicators as influencing factors (technical, institutional, social and financial conditions) ,were significantly and positively associated at different strength with sets of effective SWM practice measured with (collection, transportation and disposal). This indicates that the current ineffective SWM practice was associated with factors of financial constraint, technical problem, low social condition and weak institutional set-up. On the other hand, political factor showed insignificant correlation with collection, transportation and disposal.

4.2 Recommendations

The following recommendations were made in conclusion of the study;

Financially, the city government should allocate enough money for the provision of solid waste management. Improving the service payment rate of private collectors, providing incentives, designing revenue generation mechanisms and access to credit system are required. The newly introduced payment system for private collectors should be revised through detailed information about their cost of collecting and transporting.

Technically: For waste management to be effective there should be proper waste collection systems with qualified personnel, availability of modern vehicles and equipments so as to reduce environmental pollution and prevent health hazards.

The city government and private firms should ensure better waste management through waste reduction, reuse, and recycling of compost waste. The government should support business communities through pilot projects, funding training, and technical assistance information exchange follow up support and monitoring.

Institutionally: The agency should facilitate proper institutional structure and integrated waste management between stakeholders. It should elongate the duration of the contract agreement with private waste managing firms for potential cost recovery; besides, the contract agreement should be modified to allow the private firms work in a flexible manner. There should be continuous assessment of satisfaction about the service delivery and supervision function as well.

Socially: The cleaning agency and service delivering firms should provide awareness raising programs to inform the community about the danger and the consequences of waste, especially on illegal open dumping. Private waste managing firms also need to improve the status and conditions of workers by providing clothing adequate salary and benefits.

Politically: the research found out that there are policies and laws that promote about effective SWM but it lacks strict enforcement by-laws, by the waste cleaning agencies such that dumping of waste on open pits and drainages are common. This research recommends that existing by-laws should be strictly enforced in all areas of the city.

4.3. Further Suggestion for Future Research

This study has focused on the waste management practice which involves private limited companies only. In fact, the current service deliveries by private limited collectors were limited to collect solid waste only from institutional and commercial activities and the household waste is the responsibility of MSEs.
Therefore, it is imperative to suggest further research area as a comparative study between private limited companies and MSEs in Addis Ababa.

Finally, this study was also limited to assess the current SWM practice by considering five factors as influencing the effective SWM practice measured with (collection, transportation and disposal). But, further study can be conducted by assessing factors which were not included in this study.

References

Books
Babbie, E.(1990). Survey research methods (2nd edn) Belmont, CA: Wadsworth. recommendations. Mandaluyong City : Asian Development Bank.
Cohen,L. M. (2000). Research methods Education,. 5th (edn) Routledge falamer group ,London. Cointreau, L. (1982). Environmental management of solid waste in developing countries .
Creswell , J. W. (2003). Research design: qualitative, quantitative and mixed methods. (3rd Ed). Thousand Oaks, CA: Sag
Creswell, J. W. (2009). Research Design: Qualitative, Quantitative, and Mixed Methods, 3rd ed) Los Angeles, CA: Sag
Journals
Ansari, M. (2012). Municipal solid waste management in kingdom of Baharain. International Journal of water resource and Enviromental Enginering.
Asia Development Bank (2016). Solid waste Management In Nepal, current status and policy recommendations. Mandaluyong City : Asian Development Bank.

Bartlett, .J.E, Kotrlik, J.; Higgins, C. (2001) .Organizational research: Determining appropriate sample size for survey research. Information Technology, Learning, and Performance Journal.

Bryman, A. (2004). Social Research Methods. Oxford: Oxford University Press.

Coder and Foreman, D. I. (2009). Nonparametric Statistics for Non-Statisticians.
Coffey, M. and. Coad . (2010). A collection of municipal solid waste in developing countries. Gutenberg Press .

Edmealem Bewuket (2013). Assessment of the sustainability of solid waste collection and transport service by MSEs case of Bahir Dar city, Urban Management: Rotterdam, The Netherlands .

Fianko, A. (2014). Assessing factor affecting solid waste management system in the Kumasi. Solid waste management Nairobi, Kenya

Hayal Desta, Hailu worku, and Aramde Fetene, (2014). Assessment of the Contemporary Municipal Solid Waste Management in Urban Environment :The case of Addis Ababa Ethiopia. Enviromental science and technology .

Kelvin and Jane. (2015) "Determinants of effective solid waste management in Kakamega county. Journale for Management science and Technology .

Misrak Workneh (2016). Cyclic disappointment: Fortune Vol. 16 No.830

Nigatu Regassa. Sundaraa, R. (2011) . Challenge and opportunity in municipal solid waste management the case of Addis Ababa city, Central Ethiopia : Institute of Environment, gender and Development, Hawasa university. Humanity and Ecology Vol 33(3): 179-190 .

Rode, P and Burdett ,R. (2011). Cities: Investing in Energey and Resource efficiency. In Towards a green economy : pathway to sustainable development and poverty eradication .United Nations Enviromental program .pp.453-492.

Schubeler, P. W. (1996). A conceptual framework for municipal solid waste management in low- income countries. Gallen; Switzerland: Swiss Centre for Development Cooperation (SKAT. 1-59.

Tchobanoglous, G. H. (, 1993). Integrated solid waste management; engineering principles and management issues, civil engineering series, McGraw-Hill International Editions, New York.

 UN- Habitat (2010). Solid waste management in the world cities; earth scan, Washington, DC

Un- Habitat (2013). Planning and Design for Sustainable Urban Mobility: Global Report on Human Settlements**,** earth scan Rutledge, New York

UNDP (2004). Urban Agriculture: Food, Jobs, and Sustainable Cities. New York: UNDP Urban Harvest Working Paper Series, Paper No. 1. .

UNDP (1996). Conceptual Framework for Municipal SolidWaste Management in Low-Income Countries.Nairobi:. Urban Management and Infrastructure.Working Paper No. 9.

UNEP (2004). The Use of Economic Instruments in Environmental Policy: Opportunities and Challenges, Geneva. United Nations Environmental Program. Health Impacts solid waste. Web page ": F: / Health percent 20 impacts percent20 of percent 20 solid.

UNEP (2009). Developing Integrated Solid Waste Management Plan: Training Manual for Assessment of Current Waste Management System and Gaps therein, Volume 2,

UNEP. (2005). Selection, Design and Implementation of Economic Instruments in the Solid Waste Management Sector in Kenya. Nairobi Kenya: United Nations Environment Programme.

United Nations 2010. Overview of Addis Ababa City Solid Waste Management System. New York:

WHO (1996). Guidance for Municipal Solid Waste Management in Pacific countries .Healthy Cities - Healthy Islands Document Series, No.6 .World health Organization Western pacific Region.

William, G. S., and Francis, M. (2004). Solid Waste Management in Kawempe division. Issues, Challenges and Emerging Options. http://www.scribd.com

World Bank (2004). Urban Solid Waste Management Glossary. Washington D C. USA

 World Bank (2011). Municipal Solid Waste Management in Small Towns. An economic analysis conducted in Yunnan, China. Available from: http://www-wds.worldbank.org

World Bank (2012). Annual report on Environmental Protection . Washington.DC: World Bank
Zerbock.O. (2003). Urban solid waste management, waste reduction in developing nations , Akra, Ghana

World Bank. A Project Guide. Urban Development Technical Paper; No. 5. Washington, DC: http://documents.worldbank.org/curated/en/1982/06/1096146

 Unpublished Sources

Aklilu Amiga (2002). House holds willingness to pay for improved solid waste : Masters Thesis submitted to Addis Ababa University , Addis Ababa ,Ethiopia

ENDA, (2006). The Cycle of Waste in Addis Ababa. A Research Component. Addis Ababa, Ethiopia.

Fikru Tesema (2010). Overview of Addis Ababa City Solid Waste Management. Workshop on Solid Waste Management in Addis Ababa, Ethiopia.

Federal Democratic Republic of Ethiopia, Ministry of Health 1998. Plan of Action for Health Sector Development Program. Addis Ababa, Ethiopia.

Hufane. (2015, March 26). http://amouduniversity.org/research/school-of-postgraduate-studies,. Retrieved January 2016

Tadesse Kuma (2004). Dry Waste Management in Addis Ababa City. Ecological and Environmental Economics Program Conference.