RESEARCH ARTICLE

DETERMINANTS OF EFFECTIVE HOUSEHOLD SOLID WASTE MANAGEMENT PRACTICES IN JIMMA TOWN, ETHIOPIA.

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Manuscript Info

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Abstract

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The study aimed to investigate the determinant factors that can influence effective household solid waste management practices in Jimma town, Ethiopia. To realize this, explanatory research design was applied. The primary data collected from 200 sample household heads randomly selected from seventeen administrative units. Data collection tools like questionnaires, interview and focus group discussions were arranged for households, head of municipality and private waste collectors respectively. To analyze data both descriptive and inferential statistics such as mean, standard deviation, Chi-square and two sample T-tests were utilized. Finding revealed that sex, educational level, years of stay, location, willingness to pay, awareness level, law enforcement and access to private waste collectors significantly influence effective household solid waste management practices in the study town. Similarly, human power, budget, facilities and equipments were also recognized as factors affecting effective solid waste management. It's also found that unlike the other demographic factors, age and income of household head have almost no influences over the effectiveness of household solid waste management in the study area. Therefore, the study recommended that municipal administration has to encourage the residents on effective ways to solid waste disposal practice; extend households' awareness with provision of training, enact solid waste management laws with stiffer penalties on offenders, provide more solid waste evacuation facilities and equipment. As a result, solid waste management attitudes and perceptions of the households would be changed.

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Introduction:-

The rapid urbanization that has been taking place during the 20th century virtually renovated the world in to communities of cities and towns facing similar challenges on environmental issues in which most of them have to be addressed at international level (Smith, 2010). From those environmental issues solid waste management is a critical one because as far as people have been living in settled communities, solid waste generation has been an unavoidable and serious issue both in developed and developing nations.

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As a result, solid waste management became a worldwide agenda at united nation conference on environment and development in Riodejieneiro in 1992 with a great emphasis on reducing wastes and capitalize on environmentally sound waste reuse and recycling at first step in waste management(Zerbock, 2003). Recently the rapid growth of economic activities and population in the world particularly in developing countries has caused an increased consumption of natural resources that has led to much waste generation in most areas. About 20 to 80 percent of the solid waste in African cities is disposed in open spaces, water bodies, and gutter as a result of inadequate infrastructures and awareness among the society(Zerbock, 2003). Solid waste management is defined as the collection, transportation, processing, recycling, and disposal of solid waste materials so as to reduce their effect on health, environment and aesthetics(Proclamation, 2007). Dealing with the environmental costs in rapidly growing economic development, urbanization and improving living standards in cities have led to an increase in the quantity and complexity of generated wastes representing a serious problem in developing countries like Ethiopia(UNDP, 2004). One of the proven ways of obtaining efficiency and effectiveness gain in solid waste management is through the involvement of the private sectors(Johnson Cointreau, 2002). The private sector plays other important roles by mobilizing needed investment funds and providing new ideas, technologies and skills. Solid waste management is a growing public concern in Ethiopia. In many cities of the country, waste management is poor and solid wastes are dumped along roadsides and into open areas, endangering health and attracting vermin(Shen et al., 2006).

Moreover, Jimma is one of the towns of Ethiopia where proper solid waste management practice is still unsatisfactory and incomplete. In Jimma town, illegal dumping of waste on open areas, in gullies, river courses is considered as routine task of residents. The efforts made by the municipality to change the situation are also insufficient as compare to the degree of the problem. In addition to this, the number of population in the town became increasing at alarming rate. This could sees in the report of CSA (1994 and 2007) that Jimma town had about 88,667 and 159,009 number of populations respectively. Likewise, the volume of solid waste generation at household level becomes increasing with the increasing number of the residents in Jimma town. Hence, according to research conducted by Melaku (2008), household solid waste has remained a major challenge to the municipal government of Jimma town. This leads to the problem of environmental image or soundness. Thus, to reduce this problem and achieve effective house hold solid waste management practice of the town, detail study to the main determinants of effective house hold solid waste management practice is found crucial.

Statement of the problem:-
According to the RIO Declaration (1992), it has been emphasized that all countries around the world must seek and invest in environmental beautification and safe waste management practices. This means that clean and health living conditions in cities and towns cannot be achieved without reliable and regular waste collection and adequate disposal systems. In developing countries including Ethiopia, existing facts indicated that the provision of solid waste management services remains unsatisfactory and erratic with extensive use of unclean and unsafe waste disposal practices(Lal, 2004). Moreover, around 30-50% of residents in most cities in developing countries including Ethiopia do not get proper solid waste management services. This inadequacy is endorsed partially to weak institutional structure and insufficient municipal resources(Altaf & Deshazo, 1996).

In lower-income countries like Ethiopia, as well as poorer parts of middle-income nations, an estimated of 30 to 50% solid waste produced in urban areas is left uncollected. Some viral and other infectious diseases are associated with waste and also serve as habitat formation for breeding insects and mosquitoes(Lang et al., 2006). It implies that uncollected solid waste blocks drainage channels and increases the health problems related to pool stagnant water. In addition, accumulated wastes provide the ever-present hazard of physical injury to people coming into its close proximity, particularly children. According to (Balaban, 2012) in large number of Ethiopian urban areas, solid waste management services are either absent or insufficient. In fact, solid waste management in Ethiopia is generally in a poor state especially in Jimma town. In general, unauthorized and most of the authorized dump sites are poorly managed causing significant environmental impacts.

As mentioned earlier, Jimma town is characterized by rapid population growth caused by natural increase and migration. According to 1994 national census report, the town had 88, 667 total populations where as by 2007 national census reached 159, 009 with growth rate of 4.9%/annum. Such rapid increase in population together with rapid development of the town has produced increasing volume of solid waste and in turn it induced greater infrastructural demand, institutional setup and community participation for its management. But, the town municipality which runs the solid waste management activities of the town could not fulfill the required approach to

ensure effective solid waste management. The residents are expected to store domestic wastes using sack, plastic bags or other temporary storages inside the home and hand over to private waste collectors.

However, there are wastes which are dumped on open areas, road sides and river courses, gullies, burning inside the villages and throwing in sewerages by the households.

As a result, household solid waste management has not been carried out in a sufficient and proper manner. The environmental and sanitary conditions of the town have become more serious from time to time, and people are suffering from living in such conditions. Detail study of the overall condition of household solid waste management practice should be the first move required for reducing this gap. Therefore, this study aims to identify the major determinants of effective household solid waste management practice of the town and forward possible recommendations to crack the problems.

Research questions:-
Based on the above problems, the major research question of the study conveyed that what are the determinant factors that can influence effective household solid waste management practice in Jimma town? Hence, the following specific research questions were addressed.
1. To what extent the demographic factor able to influence household solid waste management in Jimma town?
2. How the socio-cultural factor determines the effective household solid waste disposal practices in the study area?
3. To what degree the institutional factor affects the effective household solid waste management?
4. What the performance of private waste collectors looks like in study town?

Objectives of the study:-
General objective:-
The study aimed at analyzing the determinants of effective household solid waste management practices in Jimma town.

Specific objectives:-
1. To analyze the extent to which demographic factors influence effective household solid waste management in Jimma town.
2. To portray how the socio-cultural factor determines the effective household solid waste disposal practices in the study area.
3. To explain to what degree the institutional factor affects the effective household solid waste management.
4. To describe the ongoing performance of private solid waste collectors in the study town.

Literature review:-
Sources and types of solid waste:-
In order to categorize solid waste, there have been various approaches of categorization based on numerous classification criteria. Some of those criteria are source from which solid waste emanates, and nature of solid waste components. On the basis of the nature of items, solid wastes can be classified into organic or inorganic, combustible or non-combustible(Edelman, Mandle, Kazer, & Fulmer, 1997; Lang et al., 2006). In addition, based on its risk potential, it can also be categorized in to hazardous and nonhazardous wastes(Adams et al., 2003). According to (Eisenhardt & Martin, 2000)solid wastes are classified based on its sources as household (domestic) wastes, institutional wastes, street sweepings, commercial wastes, and construction and demolition debris. Moreover, some of the typical solid wastes of those sources are described by (Mgawe, 2014)as follows:

Domestic solid wastes:-
Are wastes generated from household activities such as food preparation, cleaning, fuel burning, old clothes, furniture, obsolete utensils and equipment, packaging, newsprint, and garden wastes. In developing countries particularly in Ethiopia, food wastes and ashes dominate households' solid wastes.

Commercial wastes:-
It is a kind of waste from shops, offices, hotels, restaurants, etc which typically consisting of packaging materials, office supplies and food wastes. In low income countries food markets contribute the largest proportion of commercial waste.

Institutional wastes:-
It includes wastes from schools, government offices, military bases, hospital and clinical wastes including potentially infectious and hazardous materials.

Industrial wastes:-
It refers to a composition of manufacturing wastes from different industries consists of food waste from kitchens and cafeterias, packaging materials, plastics, papers, metal items, etc.

Street sweepings:-
It is a variety of wastes which are found on the streets such as dust, soil, leaf, paper, used fruits, vegetables, etc. Moreover, in developing countries including Ethiopia, street sweeping also consists of fruit and vegetable residues thrown by scavengers, household wastes dumped along roads, drain cleanings, animal manure or dung and plant remains.

Construction and demolition wastes:-
It's a waste composition depends on the type of construction materials used which includes soil, brick, stone, metals, concrete, ceramic materials, wood, packaging materials and the like. Moreover, wood and metal scraps found at construction sites and building areas are a kind of construction wastes.

Basic aspects of solid waste management system:-
Solid waste storage facilities:-
Solid waste storage facilities may be classified as primary or individual and secondary or communal storage facilities. As far as possible, the storage facilities must be animal proof, insect-proof, washable and robust enough to meet the exigencies of normal use(Ramachandra, Rajinikanth, & Ranjini, 2005). The storage volume required for household wastes is a function of the number of premises served, rate of waste generation, family size and frequency of collection(Ramachandra et al., 2005).

Primary solid waste storage facilities:-
A variety of facilities are used for primary storage of solid wastes. Temporary containers, such as cardboard boxes and plastic bags, are used in poorly serviced areas. Standardized use of plastic bags is often inappropriate for developing countries as they require careful organization to distribute and their attractiveness for alternative uses and susceptibility for tearing. According to(Krylova, 2004), many of the primary storage waste facilities commonly used do not protect against breeding of flies, and the use of container lids is essential to protect and interrupt the breeding process. He also noted that plastic and galvanized-iron bins with lids are commonly used in middle income and high income areas, but they are relatively valuable and, hence, susceptible to theft.

Containers made from used car and truck tires, with capacities ranging from 30 to 80 liters, when fitted with a suitable lid, offer a useful fly-proof, washable, robust and low cost alternative. Depending on the method of waste collection, the standardization of primary-storage facilities could maximize labor and transport productivity. This is especially true for waste collection methods that rely on the direct handling of primary waste-storage equipments by municipal workers. No such advantage is derived in the case where municipal workers only handle secondary-storage facilities, such as communal bins(Olivier, 2011).

Secondary solid waste storage facilities:-
According to (Zelalem, 2011), secondary waste storage facilities may be either stationary or portable units. The stationary units are commonly uncovered, and the waste is often scattered around the facility where insects, rodents and animals are attracted to it. Wastes from stationary units have to be removed by raking out on to the ground and collecting in baskets before being carried to the vehicle. This is often demeaning, unhealthy and time consuming task which limits productivity of both labor and vehicles. In portable storage facilities, the vehicle deposits an empty container and collects a full one.

They stated that vehicle productivity in general is maximized in portable units since time taken to set down an empty container and load a full one is very small, and with appropriate tipping gear fitted to the vehicle, the tipping operation also requires minimal time to complete. Hence, the overall round-trip time is essentially composed of travel time for shuttling back and forth to the disposal site. The requirement of labor is also minimal as compared to the stationery containers.

Methods of solid waste collection:-
Communal collection:-
Under the communal collection system, householders discharge their wastes at predetermined locations having some form of communal storage facility, and collection vehicles collect the wastes at frequent intervals.

The frequency with which communal storage facilities should be distributed is often depending on the extent to which a community is willing to cooperate in its proper use. Accordingly, the containers should be spaced so that the distance between any two containers does not exceed 200 meters(Altaf & Deshazo, 1996; Zurbrugg, 2003).

Block collection:-
As stated by(Zurbrugg, 2003), under block collection system, a collection vehicle travels a predetermined route at intervals that suit the capacity and schedules of the municipality, usually every two to three days, and stops at selected locations. Consequently, the householders bring their wastes using containers upon hearing the bell, and hand them over to the sanitation crew.

Kerbside (entrance) collection:-
Under this system, the crew collects containers of waste which are deposited at the Kerbside at fixed intervals, usually on two specific days in the week. In effect, this system requires a very regular and well organized collection service, so that householders know when to leave out their wastes. Kerbside collection could be mainly applicable in high-income areas of the developing world as it incurs a relatively high collection cost(Miles & Paddison, 2005).

Door -to -door collection:-
In door-to-door collection system, the waste collectors enters each premise, takes out the container and sets it back after emptying the waste into collection vehicles. Lack of householder involvement in the collection process is, however, offset by increased labor costs in entering all premises. The door-to-door collection method only proves productive when collection is infrequent, typically once a week(Abebaw & Virchow, 2003).

Transport condition:-
According to UNCHS, many sources of waste might only be reached by roads or alleys which may be inaccessible to certain methods of transport because of their width, slope, congestion or surface. This is especially critical in unplanned settlements such as slums or low income areas and thus largely affects the selection of equipment. Road conditions, traffic density, and overall haul distance will have a determining influence on vehicle choice. Besides to motorized vehicles, non-motorized vehicles should be considered which are mainly used to transfer wastes to communal containers or to disposal sites (in small towns) that are found near the towns. It stated that non-motorized vehicles are also recommendable in narrow and filthy roads, dense settlement areas and in inaccessible parts of large towns. In large towns or cities, the non-motorized vehicles should be used only to transfer wastes to communal containers.

Other aspect of consideration:-
Institutional arrangement:-
According to MUDC (2012), institutional aspects of MSWM concern the institutional structures and arrangements for solid waste management as well as organizational procedures and the capacity of responsible institutions. An institutional issue including the current and intended legislation and the extent to which it is enforced, and also affects the solid waste management system. The policy environment pertaining to the involvement of the private sector including the micro and small scale enterprises also affects the system.

Besides, the capacity of the institution that handles the overall solid waste management system has an impact in the overall efficiency of the solid waste management system. Towns should have an appropriate institutional arrangement that handles solid waste management in accordance with the amount of generated solid wastes and other related factors(Eça, 1996).

Awareness and attitudes:-
Public awareness and attitudes to waste can affect the whole solid waste management system. The components of the solid waste management in one way or another depend on public awareness and participation. Hence, public awareness and attitude is one of the crucial issues which determine the success or failure of solid waste management

system(Witte et al., 2009). In order to change solid waste management significantly, the behavior and attitudes of individuals and groups in the society would have to change.

Research design:-
An explanatory research design used to portray the existing condition through acquisition of the opinion, attitudes and perceptions of the people and official's response about solid waste disposal practices.

Accordingly, the method applied to explain and test the trends and determinant factors influencing the effectiveness of household solid waste management practice in the study town.

Source of data:-
All required data for the study collected from both primary and secondary sources. The primary data collected from sampled household respondents and key informants by using different instruments of data collection. Similarly, secondary data extracted from published and unpublished materials like journal articles, internet resources, proclamation, books and other documents of the town administration office.

Target population:-
Jimma town is one of the reformed towns in Oromia region in terms of administrative structures. It has city administration and seventeen independent kebeles. Permanent residents who are member of the town and legally licensed were considered as the population of the study area. Thus, the total number of household units was 31, 060 in the study town.

Sample size and sampling technique:-
The researcher received a total sample size of 200 households from the selected kebeles. In this study, multi-stage sampling was adopted to select the sample respondents from the given population. Given this, the researcher has clustered a number of administrative units in to seven manageable groups using their population density, economic status and geographical location as the defining variables. Then, a random sampling method was employed to select one administrative unit from each cluster. Accordingly, seven kebeles namely Bosa Kito, Hermata Mentina, Jiren, Mendara Kochi, Bacho Bore, Hermata and Ginjo Guduru were selected as the sample units. Finally, 200 sample respondents were drawn from selected kebeles using purposive sampling method looking at the residential areas where mostly illegal solid waste disposal practices takes place. The number of households drawn from each kebele was proportionally determined based on its population density.

Methods of data collection:-
Self-administered questionnaires (close and open ended) prepared for the selected household heads to share information about their socio-economic status, methods of solid waste handling and disposal practices.

Moreover, data was also gathered from head of municipality using structured interview. Lastly, some data were gathered from the members of private waste collectors through focus group discussion.

Data analysis:-
In this study, both descriptive and inferential statistics were used to analyze the obtained data. This section employed the inferential statistics like T-test and chi-square to test the relationship between variables. Moreover, descriptive statistics like: frequency, percentage, mean and standard deviation were applied using table, bar graph and pi-chart to describe the present progress of household solid waste management practices in the study town. Thus, SPSS version 16 software was used to compute the descriptive and inferential statistics. Qualitative data also analyzed through narration and detail description.

Result and Discussion:-
Determinant factors of effective household solid waste management:-
Demographic factors:-
Demographic factors include sex, age, educational level, family size, years of stay and monthly income of households'. As mentioned, these major factors were tested with Chi-square and T-tests to find out its' association with effectiveness of household solid waste management. Hence, simple descriptive statistics such as mean and standard deviation also applied to describe explanatory variables (see table 4.1 below).

Table 4.1:-Descriptive statistics for demographic characteristics of households

Variables	N	Mean	Std. Deviation	Minimum	Maximum
Sex of the HH	200	.52	.501	0	1
Age of the HH	200	1.82	.562	1	3
Educational level of HH	200	3.26	1.524	1	7
Family size of HH	200	2.53	1.421	1	6
Years of stay of HH	200	2.76	.947	1	4
Average monthly income of HH	200	3.97	.977	1	5

Source: Survey result, 2014

The explanatory variables such as sex, educational level, distance from the main road, access to private waste collectors, willingness to pay, awareness level, law enforcement are verified by Chi-square (X^2) test as per the following table.

Table 4.2:-Summary of descriptive statistics -Chi-square (X^2) test result

Variables		Effective SWM		Ineffective SWM		X^2- test	Sig.
		Frequency	Percent	Frequency	Percent		
Sex of HH	Male	40	44.44	64	58.18	3.743*	.036
	Female	50	55.56	46	41.82		
Edu of HH	Primary education	10	11.1	20	18.18	21.745*	.035
	Secondary education	15	16.67	20	18.18		
	Certificate	17	18.89	34	30.91		
	Diploma	20	22.22	19	17.27		
	First degree	23	25.56	10	9.1		
	Second degree & above	5	5.56	1	0.9		
	No formal education	0	0	6	5.46		
DMR	<100m	23	25.55	19	17.27	33.391*	.000
	100- 400m	60	66.67	42	38.18		
	>400m	7	7.78	49	44.55		
AccePWCs	Yes	90	100	50	45.45	70.130*	.000
	No	0	0	60	54.55		
Willpay	yes	90	100	98	89.09	10.445*	.001
	No	0	0	12	10.91		
Awarlevel	yes	90	100	70	63.64	40.909*	.000
	No	0	0	40	36.36		
Lawenfmt	Strong	0	0	0	0	17.454*	.000
	Very strong	0	0	0	0		
	Fair	8	17.02	0	0		
	Weak	38	80.85	64	85.33		
	Very weak	1	2.13	11	14.67		

Source: Survey result, 2014 **NB**: Significant at 5% level

Sex of the Household:-
As of the above survey result indicates, 52% of the sample households are male whereas the remained 48% of them are female headed households. Even though the number of male headed households is large in the sample units, the result of chi-square test indicates that significant percentage of the female headed households effectively manage its solid wastes as compared to male. This means that 55.56% and 44.44% of the female headed households and male headed households are managing its solid wastes in a proper way respectively. However, majority of the male headed households (58.18%) are ineffectively managing its solid wastes whereas 41.82% of female headed households are ineffective (see table 4.2).

Moreover, sex has significant relationship with the effectiveness of solid waste management practices at household level. It implies that females are feeling more responsibility to keep their homes or compounds clean and health by disposing solid wastes in a proper ways as compared to males. This is related with what is found by(Abebaw, 2008). He stated that female headed households are more likely to perform legal disposal practices. From this finding, one

can understand that most of the households who are effectively managing its wastes are female headed households in Jimma town.

Educational Level of Household:-
As seen in the above table 4.1, the average mean of the households' educational level is 3.26. This indicates that most of the educational levels of sample households head are found between certificate and diploma levels. Furthermore, Chi-square test also proved effective group of households' heads' educational level is found between diploma and master's degree and above levels. In contrast, educational level of ineffective groups of households' heads is found between informal education and certificate levels (see table 4.2). This implies that there is a positive relationship between household heads' educational level and effective household solid waste management practices at 5% significance level in the study town. Moreover, as the level of households' education increased, effective solid waste management also increased at same time and vice versa.

Table 4.3:-Summary of Descriptive Statistics- Two sample T-test result

Variables	Total Samples		Effective SWM		Ineffective SWM		T- test	Sig.
	Mean	Std. dev	Mean	Std. dev	Mean	Std. dev		
Age of HH	1.82	.562	1.82	.510	1.83	.604	.063	.950
Fsize	2.53	1.421	2.21	1.362	2.79	1.421	2.925*	.004
AMI	3.97	.977	3.99	.918	3.95	1.026	-.247	.805
YS	2.76	.947	3.00	.899	2.56	.944	-3.323*	.001

Source: Survey result, 2014NB: significant at 5% level

Age of the Household:-
As seen in table 4.1 above, the average mean of the household heads' age is 44.83 years. In relation to this, both groups of the household heads age are the same as the average means of the total household heads age. This means that the average mean of the effective and ineffective groups of households head age is similarly 44.83 years. This indicates that there is no gap between both effective and ineffective groups of households head age rather they are found in the same age interval. Moreover, the result of T-test shows that no significant relationship between household head age and effectiveness of household solid waste management at 5% level of significance. This means that age of the household head has no effect over solid waste management (see table 4.3). This finding claimed(Habtamu, Desta, Tesfaye, Ashenafi, & Abunna, 2011; McDonald et al., 2011)that he found household head age is negatively related with effective solid waste management practices at household level in a particular area.

Family size of the Households:-
According to the household survey result in table 4.1 above, the average mean of the households' family size is 4.38. Based on the result obtained from T-test, there is a significant gap between family size of effective and ineffective groups of households in the study area. This means that the average mean of family size of households who are managing its solid wastes in effective way is 3.83. But the average mean of households' member who ineffectively managing its solid wastes is 5. In other words, households whose family size is large are disposing its solid wastes improperly as compared to small family size. Moreover, there is significant negative relationship between family size and effective solid waste disposal practices at household level (see table 4.3).

Households' years of stay:-
It would believe that the number of years the resident stayed in a particular destination impacts the effectiveness of solid waste management practices. As indicated in the above table 4.1, the average mean of the year that household heads stayed in the study area is 11.88 years. Moreover, the average year that effective and ineffective groups of households stayed in the particular residential area is 14.83 and 11.75 years respectively. In addition, the result of T-test revealed there is positive and statistically significant relationship between the years that households stayed in a study area and effective solid waste management (see table 4.3). This finding implies that as compared to long-existing dwellers, new dwellers are more likely to practice illegal solid waste disposal practices in Jimma town. Unlike the new comer, the long stayed residents mostly feeling responsibility to care for their environment disposing its wastes at regulated sites.

Average monthly income of household:-
According to the survey result of the above table 4.1, the average mean of households' monthly income is 1667.33 birr. The average means of effective and ineffective households' is similarly 1667.33 birr. This implies that there is

no mean difference of monthly income of the two groups of the households (effective and ineffective groups). It would assumed that households' income has positive impact over the effective solid waste management but as the result of two samples T-test indicates, households' income and effective solid waste management has no relationship in the town understudy (see table 4.3). This means that both household groups earn the same level of income.

Socio-cultural factors:-
This part is intended to analyze and describe the awareness and perceptions of individual households towards the importance and other related issues of solid waste management along with the location of the residential houses and willingness of the households to pay for solid waste collection services.
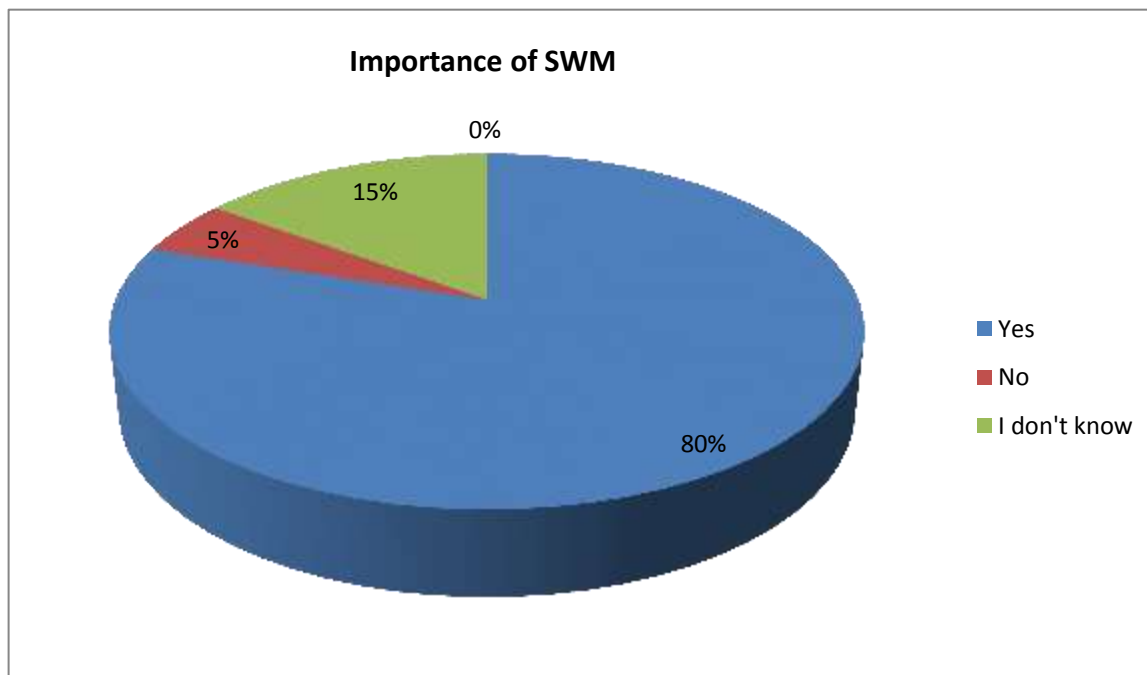
Distance from the main road:-
A comparison is made between the location of households living area and effective solid waste management. As clearly indicated in the above table 4.2, significant numbers of households (66.66%) who are effectively managing its solid wastes are living at the centre or near to the main road. But 44.55% of the ineffective group of households is found at the distant of greater than 400m far from the main road.

Similarly, 17.27% and 7.78% of the ineffective and effective groups of households are residing at a distant of greater than 400m and less than 100m from the centre respectively. The result of Chi-square test also depicted there is negatively significant relationship between the residential location of the household and effective solid waste management practices at 5% level of significance. This implies that as households residential village far away from the centre where there are public waste containers in place and access to the private waste collectors, they exposed to throw domestic solid wastes to the open spaces, river side, & other illegal places.

Awareness of households towards SWM;-
Attitude and perception of the households towards solid waste management is the expected determinant factor that can influence effective solid waste management. Due to this fact, the sample respondents were enquired that they thought solid waste management as important (see figure 4.1 below).

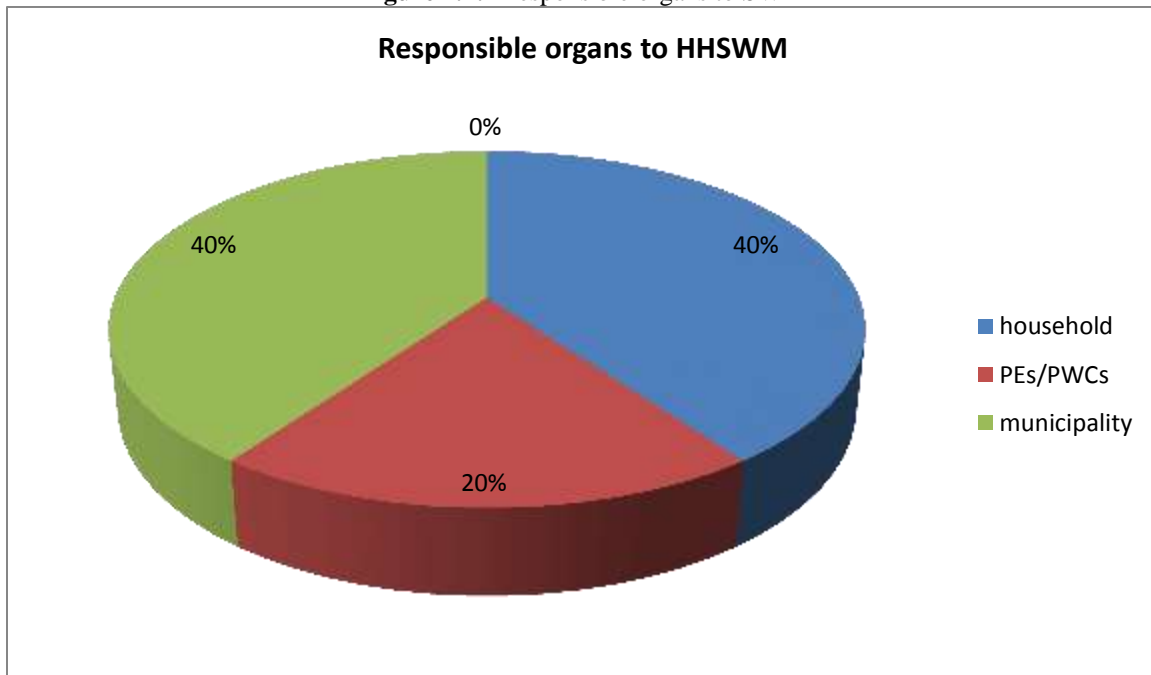**Figure 4.1:-** Importance of solid waste management

Source: Survey result 2014

As shown on the above figure 4.1, large number of the respondents revealed that they thought solid waste management is important. Unlike, a few number of the respondents (20%) had not aware about the importance of

solid waste management as a whole. That means 15% of them did not know whether solid waste management is significant or not whereas 5% of the respondents believed that solid waste management is not vital rather it's a mere issue. This implies most of the residents of Jimma town understood the effects of improper solid waste disposal practices in relation with human and environmental healthy. This finding is further verified by the result of Chi-square test that indicates all the effective group of households confirmed solid waste management is important. Therefore, it's clear that awareness level of the households and effective solid waste management have positive significant relationship (See table 4.2).This is corresponding with what is assured by(Rejter, 2011), the need for further education and awareness creation is clearly evident by observing the perceptions of people, level of litter and illegal dumping in many urban areas.

In fact, commitment and responsibility are required to ensure effective solid waste management in a given town. To this end, sample households were required to give their perception on the responsible organ (s) to SWM (see figure 4.2 below).

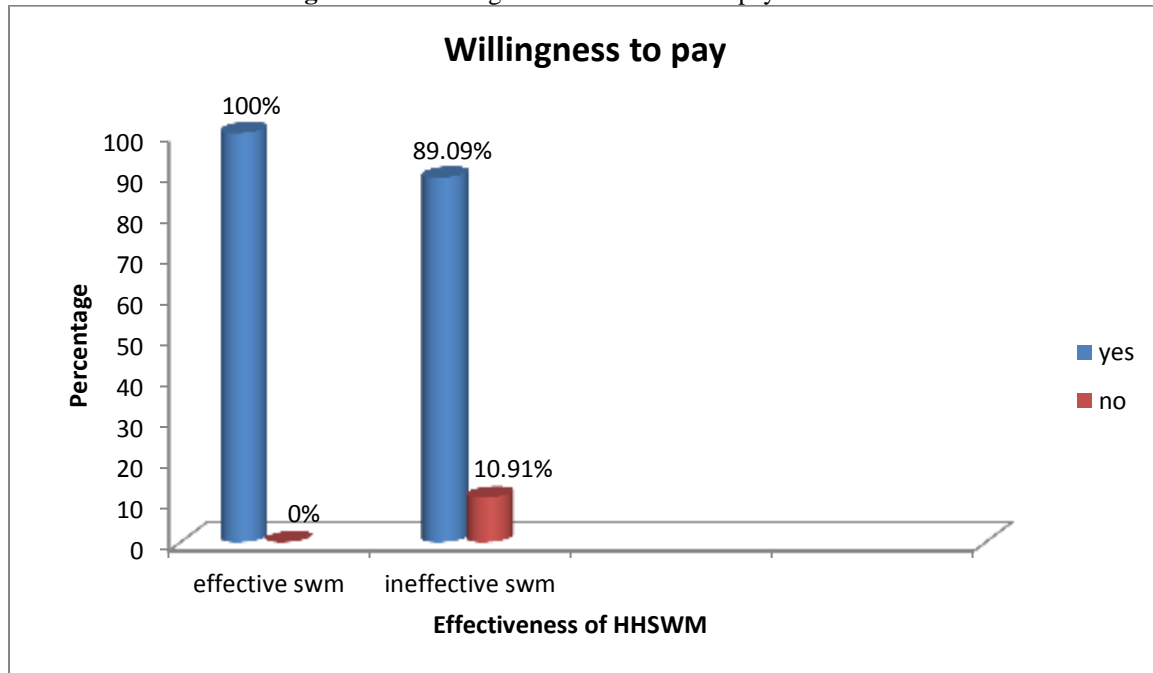**Figure 4.2:-** Responsible organs to SWM

Source: Survey result, 2014

According to the survey result on the above figure, household and municipality are highly responsible to solid waste management (both are equivalent i.e 40%). Similarly, 20% of the respondents believed that PWCs are responsible to manage solid waste. The above figure clearly showed that significant number of the respondents preferred that household and municipality are basically responsible to handle the solid wastes in general. Even though the level of percentages the respondents indicates on the responsibility of the three organs to SWM is various, all organs are primarily in charge to manage the solid wastes generated at residential areas so as to protect their environment.

Willingness to pay:-
It is hypothesized that households' willingness to pay for the solid waste collection service is one of the influential factors of the effective solid waste management practices. Due to this, households were asked the question that whether they are willingness to pay for door to door solid waste collection services or not (see figure 4.3 below).

Figure 4.3:- Willingness of households to pay for PWCs

Source: Survey result, 2014

As the above survey result shows, all of the householders who effectively managing its solid wastes were interested to pay waste collection service whereas, 89.09% of the ineffective group of the households were willing to pay for the solid waste collection service. But 9.09% of the ineffective group of the householders was not willing to pay for solid waste collection service. Moreover, the effective groups are better of managing its solid wastes having interest to pay for the service delivery in relation to ineffective group. Those who are not willing to charge for the service might be consider their economic status or may take solid waste management is mainly the responsibility of the municipal administration. Furthermore, Pearson Chi-square test also indicated there is positive relationship between households' willingness to pay for proper solid waste disposal and effective household solid waste management at 5% level of significance (see table 4.2).

Institutional factors:-
Institutional aspects considered as other factors that can highly influence the effectiveness of household solid waste management. These include access of private waste collectors, law enforcement, facilities and equipment, human power and budget.

Access to private waste collectors (PWCs):-
According to the interview made with head of municipality, currently the labor force for waste management in Jimma town is inadequate – street sweepers, service men in the collection and transportation department as well as those involved in landfill operations is inadequate, and this has rendered the waste management system ineffective. Furthermore, the result Chi-square test revealed access to PWCs and effective solid waste management have significant positive relationship (see table 4.2).This implies that all the households who manage its solid wastes in effective manner have access to private solid waste collectors whereas, 45.45% of the ineffective households have access to private waste collectors. But more than average percentage (54.55%) of the ineffective group of households have no access to solid waste collection service in Jimma town (see table 4.2). Thus, households who have access to PWCs but ineffective might illegally dispose its wastes during the service interruption due to different factors such as truck breakdown or adjournment of service provider.

Law enforcement:-
National Hygiene and Environmental health regulation has a mandate to prepare solid waste management law or rules and regulations. These rules and regulations are largely emphasized on solid waste handling responsibilities and obligations of individuals (households), establishments, and institutions. Accordingly, the sample householders

were asked that whether they thought the existence of rules and regulations of SWM in Jimman town (see table 4.4 below).

Table 4.4:- Rules and regulations of SWM practices

Do you think that there are rules & regulations of SWM in Jimma town	How do you rate the extent of the enforcement of rules and regulations					Total
	Strong	Very strong	Fair	Weak	very weak	
Yes	-	-	8(6.56%)	102(83.6%)	12(9.84%)	122 (61%)
No						26(13%)
I don't know						52(26%)
Total	**-**	**-**	**8(6.56%)**	**102(83.6%)**	**12(9.84%)**	**200(100%)**

Source: Survey result, 2014

According to the above table, significant number (122(61%)) of the households assured the existence of solid waste management rules and regulations in Jimma town. This implies massive households aware about the existence of rules and regulations of solid waste management practices in the study area. But average number of the households (52(26%)) of the households did not know the existence of law whereas 26(13%) of them believed that no rules and regulations of solid waste management in Jimma town.

Apart from this those households who believed the existence of rules and regulations also asked to evaluate the degree of enforcement of rules and regulations of solid waste management in the town. As depicted in the above table, 102 (83.6%) of the respondents reflected that the enforcement of rules and regulations is weak whereas 8(6.56%) of the respondents replied that the enforcement of rules and regulations is fair. This finding implies municipality gave low consideration to the law enforcement towards solid waste disposal practices in Jimma town. Moreover, the Chi-square test also confirmed there is a significant positive relationship between law enforcement and effective solid waste management practices (see table 4.2).

Human power:-
The most important factors that have influenced level and quality of operation of solid waste management services related with manpower are size and qualification of staff, adequacy of waste management training and technical assistances. In addition, the result of interview made with head of municipality confirmed that municipality is not equipped with required human power technically and professionally that can handle waste disposal activities. According to the work process manual of the municipality, 14 workers are involved in provision of solid waste management within Green and Sanitation department. From this one can understand that the department has very low manpower and this condition can be considered as a major problem for the existing SWM activity of the town. Thus, one can understand access of skilled human power can positively affect the effectiveness of solid waste management in a particular town.

Access to finance and facilities:-
Finance is a very decisive factor for any public service delivery in any town or country. According to the interview made with the head of municipality, at present, the budget of Green and Sanitation department of Jimma town released together with other service sectors of municipality from state finance and economic development office. In addition to this, municipality also collect its own revenue from various sources such as fees collects from different services and taxes. In doing so, municipality prepares a budget to all the services given to the public, Green and Sanitation department also share the budget from this revenues. As a result, the town faced weak financial performance of solid waste management service since municipality cannot collect adequate annual revenue to run all work processes. The head also stated that in this year the total budget allocated for Green and Sanitation department was about 175,230 ETB.

But the required budget to carry out the service provision is about 275, 877 ETB. From this situation, one can understand that the Jimma town municipal budget allocation to this sector has not been carried out based on the requirement of fund for service provision. This implies that there is a positive relationship between budget and effective household solid waste management in a particular area.

The interview result also shows recently the Green and Sanitation department of the town runs this service with supplying only two dumping trucks and 52 storage containers. Besides this, the municipality has two regulated disposal sites located at Seka around Jimma airport and Marawa (at side of bada buna) which are 5and 7 kms far away from the centre of the town. Obviously, these amounts of equipment or facilities are not sufficient to convey the service when we compared with the rapid expansion of the town and the increasing waste generation rate in the town. Moreover, the limited containers are placed on specific places by far which is more deteriorated. According to the interview made with the head of municipality, one container provides a service to greater than 2000 people. Based on this, a few households are within the service area of the container. From the personal observation, some of the households are far away (more than 2km) from any nearby container. In addition, some Kebeles also do not have containers at all. As a result; most of the households who live these areas are forced to dumping its solid wastes to illegal locations such as at road side, open spaces, near the river, in the drainage, etc. This exposed the environment of Jimma town to unhygienic and unhealthy environment.

MSSEs/PWCs and its performance in Jimma town:-
Micro and small scale enterprise is one of the development actors that involves in various activities particularly waste management under the regulation of the government in a certain country. Obviously, solid waste management function is commonly the prominent task of the private sectors in Ethiopia.

According to the result of interview made with head of municipality, currently there are nineteen (19) MSSEs engaging themselves in solid waste collection service throughout the town. From these private enterprises, some of them are individually organized whereas majority of them are organized with the support of municipality in to micro level. According to the focus group discussion made with private waste collectors, these enterprises are at the infant stage which needs to be going further and equipped with enough facilities and equipment to provide wide coverage of solid waste collection services in the town. For those who are interested to use the PWCs, the service is delivering with affordable prices by taking the economic status of the households in to consideration.

Each households charge for the service 10 to 20 birr depends on the volume of waste, and hotels and commercial sectors paid up to 100 birr per a month. Apart from this, there are also many households who are living at periphery where there is no access of PWCs because of inadequate road infrastructure which limits the service provider to serve these people. The worst thing in relation to waste disposal is most of the time dumping starting from 500 meters out of the town along the road without even reaching disposal site. These can be clearly seen by any traveler along the road to Seka.

Conclusions and Recommendations:-
Conclusions:-
Waste management in urban centers of Ethiopia such as Jimma, still remains one of the largest challenges that public administrators face because of the increasing quantities of different material streams and consumable products which become more and more complex and diverse as demographic and economic growth rise. It is extremely recognized that the existing solid waste management practice in Jimma town is ineffective both in terms of coverage and sanitary treatment of the waste. The solid waste collection service is very low, that means the major part of the solid waste generated in the city is uncontrolled and illegally disposed that results unhealthy and unsafe environment to live and work in it. The statistical tests revealed that most of the determinant factors have significant relationship with the effective household solid waste management practice in the study area. From demographic factors sex, educational level and years of stay, and family size of the household heads have significant positive and negative relationship with the effective household solid waste management at 5% significant level respectively. In contrary to this, age and average monthly income of the household heads have insignificant relationship with effective HHSWM. It means that there is no significant difference between two groups of households (effective and ineffective groups).

According to the result; among the socio-cultural factors, distance of the householders' house from the main road, awareness level and willingness of the household heads to pay for the service delivery have significant negative and positive relationship with effective solid waste management in Jimma town respectively. Similarly, the result of Chi-square test shows law enforcement is positively affect effective solid waste management. Moreover, finding revealed from the institutional factors access to PWCs, human power, budget and access to equipments and facilities are the other leading factors that determine the effectiveness of HHSWM in Jimma town. Micro and small scale enterprise is one of the development actors engaged in different activities particularly solid waste collection in

Jimma town. However, they are not equipped with the necessary facilities. This has aggravated the solid waste management problems and challenges to public health, aesthetic and ecological concerns. Thus, it's inferred that solid waste management is not considered as essential development segment to meet the goals set in the national and regional policies and strategies for sustainable development.

Recommendations:-
As finding indicated the current situation of solid waste management in Jimma town is worse because of various illegal and unregulated solid waste disposal practices of the households in their villages. Households have lack of awareness to manage its solid wastes at source using temporary storage facilities rather than they throw out its solid wastes everywhere else like in the gutter, at road side, open spaces, etc.

Thus, it's highly advisable for the households to handle its solid wastes at source using temporary storage facilities and even building cooperation among the neighborhoods to make regular and consistent follow up and expose illegal disposal practitioners to the government body in their village. Similarly, it's better for the government to develop community-based solid waste management as a control mechanism of illegal SW disposal practices and create massive awareness campaign regarding the adverse impact of ineffective solid waste management to the environment and human life using different means such as open meeting, media and workshops. According to the survey result, significant number of effective group is female headed households as compared to the male.

Therefore, the government particularly municipality is expected to eliminate this gap between both sex within the broad range of awareness creation through training and education program that any individual are equally responsible to manage solid wastes and even protect its surrounding environment. Incentives for recycling initiatives could be made because this would serve as a motivation and get the community more committed to the course. The rules and regulations governing solid waste management should be strengthened and fully expressed to the community by municipality of the town.

Similarly, weak enforcement of rules and regulations is a critical problem in the study area. To solve this, municipality has to give enormous attention to the enforcement of solid waste management laws by assigning skilled, commit and honest personnel and make a regular follow up to the progress of household solid waste disposal practices by visiting the residential areas and take various measures over those violated the SWM rules starting from oral warning to strong punishment. Finding revealed PWCs in Jimma town are on the infant stage and they are not equipped with necessary equipments made them fail to do so. Moreover, recognition of and support for small-scale and waste-related enterprises is a significant element of sound practice especially in developing countries. Therefore, municipality has to create enabling conditions and provide PWCs with the necessary materials and facilities which help them to do so. On the top of this, adequate planning of solid waste management is essential if communities and municipality are to successfully address the challenge of a sustainable development including resource conservation, climate protection, and pollution prevention. Thus, the need to upgrade current solid waste management practices at household level is very vital due to its effect on human health and environment.

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