International Journal of Innovative Research and Advanced Studies (IJIRAS)
Volume 9 Issue 7, July 2022

ISSN: 2394-4404

An Assessment Of The Solid Waste Management System Of Gulshan E Ravi And Evaluation Of Waste Generation Rate

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Abstract: ***One of the major issues that need to be addressed for the protection of human beings and environment in a sustainable manner is solid waste management. This study focuses on the solid waste management system of Gulshan e Ravi and identifies the weaknesses in the system. The main weakness is that the current solid waste management practice is insufficient and also the collection and transportation of waste is improper. The area of Gulshan e Ravi that is UC (union council) 89 is a residential area and for the purpose of research it is divided in to three socio economic levels low income area, middle income area and high income area. The main objective of the study is to find the waste generation rate and the recycling behaviors in household. Questionnaire survey was conducted to find out the recycling behaviors in household. 10 kg of sample was collected from these areas for the chemical analysis and for the physical analysis 7 days sampling of waste was done. The main components found in the residential waste includes Organic waste, Textile, Paper, Plastic, Metal, Glass, Tetra packs, Cardboard and other inorganic waste. The waste generation rate from all three areas of Gulshan e Ravi was also calculated, which is 0.26 kg/cap/day. The survey results shows that in low and middle income areas many people sell recyclables to the hawkers whereas in high income area the recyclables are usually given to maids or servants so that they can earn some money by selling them.***

I. INTRODUCTION

Municipal solid waste management is often ignored in most underdeveloped nations. Solid trash is the most visible threat to the environment in many metropolitan settings. Pakistan has a total population of 160 million people, with 35 percent of them residing in urban areas, according to JICA. In metropolitan Pakistan, solid trash creation exceeds 55,000 tons per day, with waste collection accounting for just 50% of solid wastes. Lahore, Pakistan's largest metropolis, with an approximate total of 8 million people. The city of Lahore produces 5000 tons of solid waste generated trash every day [1, 2].

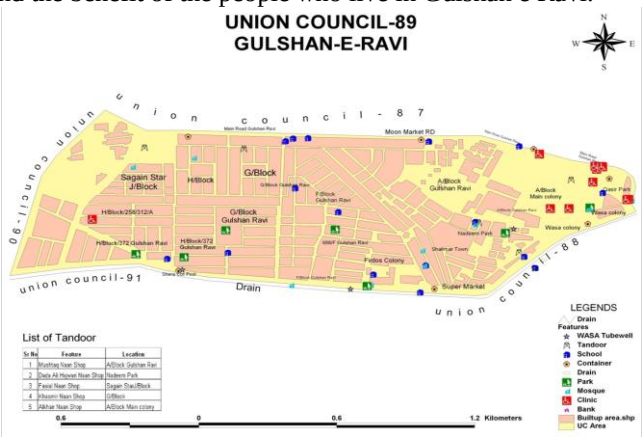
Waste management can be defined as such process in accordance with the regulation of generated waste, handling, repository, transmit and transfer, collection, restoration, and decommissioning in conformity with the requirements models of ethical safety, economics, technology, preservation of natural resources, visual appeal, and other emission reduction, as well as being responsive to consumer opinion. In Nations in the region, the usual wastewater treatment plant comprises features such as roadway cleaning, collection, treatment, transmission, and delivery, as well as trash reduction measures. Management of waste in India, Pakistan, and several other emerging economies often consists of primary gathering, intermediate collection, and indiscriminate disposal of further than 90% of the waste to be disposed [3, 4, 5].

Generation of waste, management of waste and classification, collection and storage at the source, pickup, transportation and transport, separation, and disposal are the six functional parts of solid waste management [6].

ISSN: 2394-4404

Municipal solid trash includes home rubbish, nonhazardous solid waste from industrial, commercial, and institutional enterprises (including hospitals), market waste, yard waste, and street sweepings. Its functions include municipal solid waste collection, transfer, treatment, recycling, resource recovery, and disposal. Vegetable/putrescible waste, textile waste, paper and plastic, glass and ceramics, various polymers and polymers, wood and bones, metals, and miscellaneous substances make up the majority of municipal garbage. Municipal solid waste is the most diversified type of garbage, encompassing waste created by residential, industrial, commercial, governmental, construction, deconstruction, process, and municipal services [7, 8].

Gulshan e Ravi was chosen as the location for the research. It is a residential neighborhood with a population of around 65000 people. The total garbage created in Gulshan e Ravi every day is 32 tons. In this location, rubbish is collected using eight containers. Gulshan e Ravi has 6 5 cubic meter containers and 2 10 cubic meter containers for solid waste collection. The neighborhood includes a mix of upper-class, middle-class, and lower-class households. The majority of the residences in the area's g block are 10 marlas in size, with a one-marla garden. Homes in a block d, a block a, and other blocks range in size from 3 to 8 marlas. Solid trash is collected by auto rickshaws and donkey carts. The quantity of solid waste storage containers is limited, and they are overflowing due to an excess of municipal solid trash. They are not meeting the demand. As a result, there is a need for a modern and appropriate solid waste management system for the area and the benefit of the people who live in Gulshan e Ravi.



Source: Urban Unit

Figure 1: Map of union council 89 Gulshan e Ravi

II. RATIONALE

In all regions of Lahore, solid waste management is a serious environmental challenge. Gulshan e Ravi has been chosen as the research location. It is a residential neighborhood with a population of around 65000 people. The solid waste management system is inadequate. The quantity of solid waste storage containers is limited, and they are overflowing due to an excess of municipal solid trash. They are insufficient to meet the demand. Open dumping and rubbish burning are major issues in Gulshan e Ravi, leading in the development of flies and vermin, which causes considerable health concerns and the spread of various water-borne illnesses (typhoid, cholera, dengue, malaria etc.). There is a high concentration of recyclables in municipal solid trash, including glass, paper, metal, and plastic.

III. AIMS & OBJECTIVES

The aims and objectives of the study area are to:

- ✓ Assess the percentage composition of solid waste.
- ✓ Evaluate the waste generation rate of the study area.
- ✓ Determine the economic potentials of the recyclables.

IV. LITERATURE REVIEW

Unnecessary stuff squandered for disposal is known as solid waste. Solid waste is generated by animals and humans activities that are generally solid and are thrown as worthless or undesirable. Municipal solid waste encompasses garbage created by the household, industrial, manufacturing, academic, renovation, removal, and local services industries. Open dumping of solid trash is extremely apparent in the area in which we live, and so has a significant potential for negatively impacting public health as well as environmental quality. Common problems associated with improper solid waste management include contamination of surface and groundwater sources through leachate, soil contamination via direct waste contact, and air pollution caused by waste burning, disease transmission via direct vectors such as birds, insects, and voles, and aesthetic annoyance [7, 9, 10, 11].

Conventional solid waste management techniques are changing due to a paucity of urban space for solid waste disposal and increased public pressure to increase solid waste recycling. These developments have resulted in new managerial and governance issues. One institutional replacement that may be justified in some instances is the deployment of a distinct regional agency to administer a local solid waste program. Nonetheless, the combined powers agency provides a flexible method of regional direction. Because it provides for the considerable political representation necessary to cope with issues such as site alterations, trash transit across jurisdictional lines, and altering waste management priorities. The issue of proper waste management in big metropolitan areas outlines different approaches that aid in the mitigation of the negative effects of solid waste. These negative effects are damaging the attractiveness of the metropolitan center and have an influence

ISSN: 2394-4404

on the sanitation system. They provide methods that aid in the alleviation, reduction, minimization, and avoidance of solid waste incursions into city streets and roadways, particularly in places where the populace is uncontrolled [12, 13].

The comparison of the composition of household waste in industrialized and developing economies explains the treatment methods for household waste in Stuttgart, and the use of collection and disposal at source would be taken into account in Kumasi to make the treatment process more efficient, as this process is already practiced in the advanced world Stuttgart. The domestic garbage found in Kumasi comprises a considerable percentage of organic waste, which aids in the production of compost, a better choice for waste management because incineration is costly. Only 5% of the land is taken up by metal, wood, glass, fabric, and other components [14].

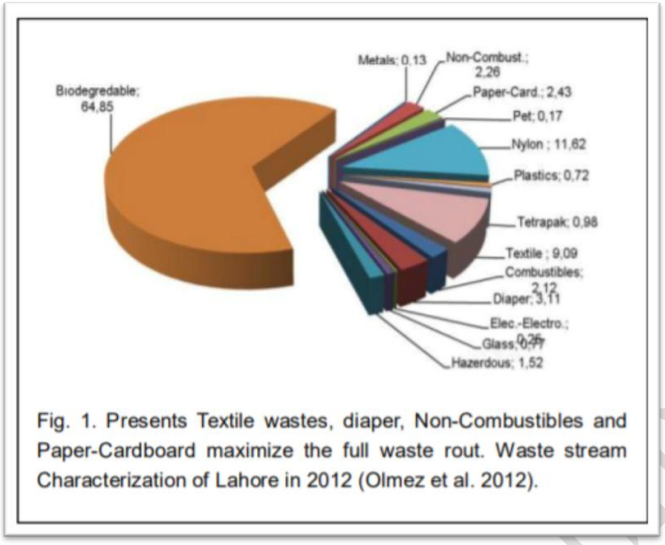


Fig. 1. Presents Textile wastes, diaper, Non-Combustibles and Paper-Cardboard maximize the full waste rout. Waste stream Characterization of Lahore in 2012 (Olmez et al. 2012).

Trash generated from distinct places is normally treated separately in industrialized nations, but separate management of waste produced from different regions is usually not anticipated in underdeveloped countries. The inappropriate processing and disposal of solid waste has a multifaceted influence on human and physical well-being. Inadequate dumping can pollute the air, soil, and water, contaminate land and soil water supplies, clog drains, create stagnant water for bug breeding, cause floods in the lowlands, and cause landslides in mountainous places during rainy seasons. In his work, the author also demonstrates how incorrect garbage burning and incineration may lead to pollutant emissions, greenhouse gas emissions from landfills, and untreated leachate [11, 15].

Various studies show that a lack of funding and infrastructure has a wide range of negative environmental consequences. These consequences are especially visible in the case of trash disposal. In most underdeveloped nations, open dumping is the primary method of solid waste disposal. In these poor countries, the dumping sites are relatively close to human settlements. The disposal of hazardous, biomedical, or abattoir waste is seldom regulated. Illegal trash dumping in water bodies is a prevalent activity that not only causes poisons to be disseminated in the environment but also ends up harming the ecosystem of the region and coagulating the water bodies. Numerous studies have been undertaken to compare the content of garbage generated in industrialized and developing countries. The garbage created in affluent nations is mainly inorganic in character, however in underdeveloped countries, a major amount of waste is made from organic contents. In underdeveloped nations, the proportion of organic material in garbage is about three times higher than in developed countries. When compared to wealthy nations, the volume of garbage created in developing countries is substantially smaller, and the type of waste is mixed and has a very high moisture content. It is heavily influenced by the population's income and lifestyle [9, 11, 16, 17, 18].

The concerns and problems in diverse waste disposal are quite complicated in developing countries. Top-down solutions and management practices are clearly no longer effective. To ensure long-term sustainability, the waste treatment system will require a far larger and more integrated set of technologies. In industrialized countries, integrated wastewater treatment is the most ecologically friendly development strategy. The services given for solid waste management are sparse, resulting in the degradation of the urban environment by creating water, air, and land pollution, which has an impact not only on human health but also on the ecosystem. The growing population is also causing a vicious cycle of pollution. More population leads to increased infrastructural amenities, which leads to pollution and rubbish. As dirt is collected, the quality of services supplied by towns deteriorates more, and a smaller percentage of households accept to pay for retrieval services [9, 16, 17, 19].

Uncollected solid waste is generating major health concerns and is causing numerous infectious illnesses, particularly water-borne diseases such as cholera and dysentery. In poor developing nations, such illness outbreaks place an additional strain on already overburdened health-care systems. Many insect and rodent vectors are drawn to garbage, which contributes to the uncontrolled fermentation of wastes, resulting in the establishment of circumstances conducive for the growth and maintenance of rodents and insects that operate as disease vectors. The environmental effect of solid waste is enormous, including the release of damaging greenhouse gases (GHGs) that contaminate ground water. The most important environmental hazard associated with solid waste is GHG emissions. The waste management industry accounts for 4% of total anthropogenic GHG emissions, and landfills are the greatest anthropogenic source of methane, accounting for 90% of total GHGs generated from the waste sector in the United States. Methane is a key component of landfill gas. It is produced naturally as a result of decomposing organic matter, such as food and paper, disposed of in landfills, and it is composed of around 35-50 percent methane (CH4) and 35-50 percent carbon dioxide (CO2), with a trace quantity of non-methane organic molecules [20, 21].

Reusing is described as the recovery of objects for future use. It guarantees that raw material consumption is reduced, which saves energy and water, lowers pollution, and eliminates waste formation. Reusing materials and goods is more attractive in the public eye than recycling the same items. This practice of recycling materials not only saves money, but it may also be profitable for the businesses and households that apply it. Public policies that encourage businesses and individuals to participate in reuse programs

may have a huge and positive economic and environmental impact. According to the survey, individuals in underdeveloped nations reuse far more than people in rich ones [16, 17, 22].

V. MATERIALS AND METHODS

MATERIALS

Shopping bags for the sample collection, Gloves, Mask, Top load balance, Spring balance, Electrical balance, Grinder, Oven, ,Muffle furnace, , Crucible and Lid, Plastic Bottles, Sieve, Camera and Tongs

METHODOLOGY

SELECTION OF AREA

The location of Gulshan e Ravi was chosen for the investigation. People from diverse socioeconomic backgrounds live in the neighborhood. As a result, the research region is separated into three economic levels: high, middle, and low income.

DATA COLLECTION

There were two sorts of data collected: main data and secondary data. Primary data was gathered using a questionnaire survey, while secondary data was gathered through the current waste management department and approved digital libraries. The statistics cover solid waste management system information as well as all aspects of municipality and combined solid waste management systems.

SURVEY THROUGH QUESTIONNAIRES

For the primary collection of data the questionnaire survey was conducted from all three economic levels. Fifty questionnaires were filled from each economic level.

SAMPLING OF WASTE

Seven days of garbage from all three sites were sampled for the physical analysis, which included the percentage content of each component. And for the chemical analysis, which included the proximate analysis, three samples of roughly 10kg garbage were gathered from low, middle, and high income areas. For garbage storage, large empty shopping bags were employed.

ANALYSIS OF WASTE

The following analyses were carried out for the research work

- ✓ Physical Analysis
- ✓ Chemical Analysis

SAMPLING AND WEIGHING

Waste samples of different houses from each economic level were collected. Weight of the total waste samples was determined with the help of spring balance.

SEGREGATION AND WEIGHING

The garbage was separated after sampling and weighing. Various waste components were separated during segregation. Paper, organic waste, plastic, cloth, glass, and metal, for example. The top load balance was used to weigh each component of the waste sample.

VI. RESULTS

HIGH INCOME AREA

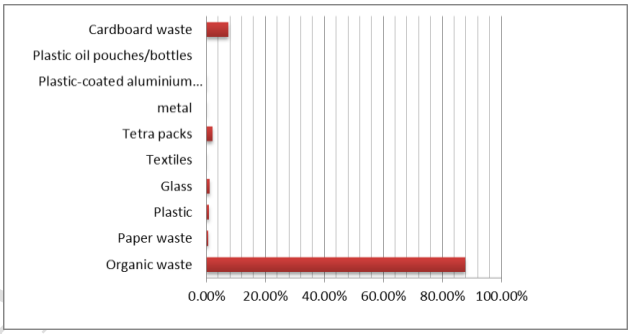


Figure 2: Composition of waste in high income area

MIDDLE INCOME AREA

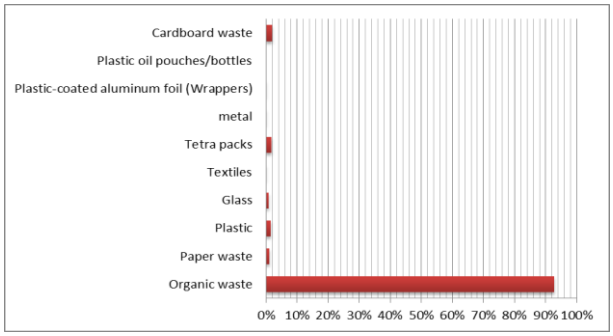


Figure 3: Composition of waste in middle income area

LOW INCOME AREA

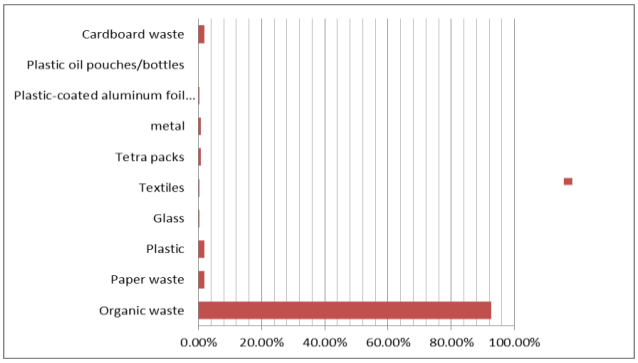


Figure 4: Composition of waste in low income area

ISSN: 2394-4404

CHEMICAL ANALYSIS RESULTS OF PROXIMATE ANALYSIS

Proximate analysis				
Components	Moisture Content %	Volatile Organic Compounds (VOC) %	Fixed Carbon %	Ash Content %
Organic Waste	55.42	179.45	28.7	43.51
Paper	8.4	80.6	10.99	0
Cardboard	9.33	89.33	100.8	11.24
Textiles	22.4	71.39	6.2	0
Metal	1.05	-	-	-
Glass	0.028	-	-	-
Plastic	1.5	94.56	3.9	0
Tetra packs	13.29	87.41	100.79	13.83

Table 1: Chemical analysis showing results of proximate analysis

STATISTICS OF USAGE OF HAZARDOUS WASTE LOW INCOME

Statistics							
		Usage of oil bottles of cars per month	Usage of sharps per month	Usage of battery cells per month	Usage of pesticides bottles per month	Usage of expired medicines per month	Usage of syringes per month
N	Valid	0	33	16	37	11	0
	Missing	50	17	34	13	39	50
Minimum			1.00	1.00	1.00	1.00	
Maximum			3.00	3.00	2.00	4.00	
Sum			48.00	22.00	43.00	28.00	

Table 2: Statistics of usage of hazardous waste in low income area

MIDDLE INCOME

Statistics							
		Usage of oil bottles of cars per month	Usage of sharps per month	Usage of battery cells per month	Usage of pesticides bottles per month	Usage of expired medicines per month	Usage of syringes per month
N	Valid	3	42	45	49	22	2
	Missing	47	8	5	1	28	48
Minimum		1.00	1.00	1.00	1.00	1.00	4.00
Maximum		2.00	9.00	3.00	3.00	10.00	12.00
Sum		4.00	99.00	63.00	67.00	75.00	16.00

Table 3: Statistics of usage of hazardous waste in middle income

HIGH INCOME

Statistics							
		Usage of oil bottles of cars per month	Usage of sharps per month	Usage of battery cells per month	Usage of pesticides bottles per month	Usage of expired medicines per month	Usage of syringes per month
N	Valid	8	44	47	50	30	3
	Missing	42	6	3	0	20	47
Minimum		1.00	1.00	1.00	1.00	1.00	2.00
Maximum		3.00	25.00	3.00	3.00	12.00	10.00
Sum		13.00	140.00	92.00	95.00	101.00	16.00

Table 4: Statistics of usage of hazardous waste in high income

VII. DISCUSSIONS

EXISTING SOLID WASTE MANAGEMENT PRACTICE IN GULSHAN E RAVI

The Lahore Waste Management Company is responsible for the solid waste management in Gulshan e Ravi.

WASTE GENERATION

The total population of Gulshan e Ravi is approximately 65000. The total waste generated in Gulshan e Ravi is 32 tons per day. There are 8 containers used for the collection of waste in this area. 6 containers of 5 cubic meter and 2 containers of 10 cubic meters are placed in Gulshan e Ravi for the collection of solid waste.

WASTE COLLECTION

The existing waste collection and transportation system is not based on modern and efficient method instead they are still using the old traditional methods of donkey carts which need to be replaced to improve the collection and transportation system. In G block of Gulshan e Ravi the auto rickshaws are used for the collection of solid waste but the capacity of waste storage in auto rickshaw is 400 kg. These rickshaws collect waste from house to house with the help of waste bags which are provided by the Lahore waste management company. Also the existing system is very unsustainable and the responsible authorities are not focusing on treatment, resource recovery, and scientific disposal of solid waste.

DISCUSSION OF PHYSICAL ANALYSIS, CHEMICAL ANALYSIS, WASTE GENERATION RATE AND QUESTIONNAIRE RESULTS

The physical analysis includes the % composition of each component. The results indicated that approximately 88 % of waste is organic in nature and 7% of waste includes the cardboards the remaining waste includes tetra packs, glass, plastic and paper waste. In this area the organic waste comprising of 93% of total waste whereas the figure 4.3 is

showing the % composition of waste in low income area. The organic waste in this area is also 93% approximately. The results of % composition shows that in all the three areas of Gulshan e Ravi the large amount of waste is organic the reason behind it is that the people in these areas are not using the packaged food instead they prefer to buy fresh vegetables and fruits and their peels make a large amount of organic waste. The questionnaire survey was conducted in the low income, middle income and high income areas of Gulshan e Ravi to know the socio economic status of households. The results indicated that the minimum monthly income in low income areas was 6000 and maximum monthly income was 15000 whereas mostly people in the low income area did matriculation and only 2% people were highly educated in low income area

VIII. CONCLUSION

As a result of detailed field studies and questionnaire surveys, a description of the solid waste management system and recycling behaviors of households of Gulshan e Ravi is presented. Gulshan e Ravi is the residential area of Lahore with a population of 65000. The area is divided into three socio economic levels high, middle and low income. The research shows that the waste generation rate in low income area of Gulshan e Ravi is 0.23 kg/cap/day, in middle income area the waste generation rate is 0.31 kg/cap/day and the waste generation rate of high income area is 0.24 /kg/cap/ day. The physical analysis involves the % composition of municipal solid waste. The main components of waste in all three areas are organic waste, paper, metal, glass, cardboard, tetra packs and plastic. The organic waste account for about 91% of the total waste generated.

IX. RECOMMENDATIONS

- ✓ Waste minimization strategy should be developed i.e. reusing the products that are not useless and recycling of products that are not in use.
- ✓ Door to door collection of the household waste should be introduced.
- ✓ Targets and goals should be set to promote the reduction, reuse and recycling of the solid waste.
- ✓ Mechanical sweeping of the main roads can save time and increase cleanliness.
- ✓ Containers should be placed on points, easily accessible by community
- ✓ Awareness should be developed about the waste management among community at every level.
- ✓ Health risks and hazards associated with waste can be conveyed to people through print and electronic media.
- ✓ Waste bags provided to the house holders should be collected on time.
- ✓ Recycling should be promoted to generate revenue and help reduce the waste.
- ✓ Improve the working conditions of the scavengers on transfer stations and disposal sites.
- ✓ Waste should be properly disposed off i.e. sanitary landfill should be constructed and properly operated.
- ✓ Recycling as formal industry can generate revenue and help reduce the waste.

REFERENCES

[1] Batool, S.A; Chauhdary, N, Solid Waste Management in Lahore City District, Pakistan, Waste Management, (2009).
[2] JICA (Japan International Cooperation Agency), Solid Waste Management Capacity Building, (2005).
[3] Hayat, S; Hayder, S, Solid Waste Management, Introduction, First edition, Empire Publishers AL- Fazal Market, Urdu Bazar, Lahore, 1 (2011).
[4] Ernst, B; Partners Ltd, the World Bank PPIAF – Punjab Solid Waste Management Reform Final Report, (2007).
[5] Tchobanoglous, G; Theisen, H; Eliassen, R, Solid Wastes Engineering Principles and Management Issues, Introduction, First edition, McGraw-Hill Book Company, USA, 15-38 (1977).
[6] Mckinney, M.L; Schoch, Robert, Environmental Science Systems and Solutions, Municipal Solid Waste and Hazardous Waste, Third edition, Jones and Bartlett Publishers Canada 2406 Nikanna Road Mississauga, ON L5C2W6 CANADA, 442-450 (2003).
[7] Ernst, B; Partners Ltd, The World Bank PPIAF – Punjab Solid Waste Management Reform Final Report, (2007).
[8] Schübeler, P; Wehrle, K; Christen, J, Conceptual Framework for Municipal Solid Waste Management in Low-Income Countries, SKAT (Swiss Centre for Development Cooperation in Technology and Management), (1996).
[9] Zurburgg, C, Solid Waste Management in Developing Countries, Solid Waste Introductory Text, (2003).
[10] Altaf, M.A; Deshazo, J.R, Household Demand for Improved Solid Waste Management: A Case Study of Gujranwala Pakistan, World Development, Vol 24(5) 857-868 (1996).
[11] Hoornweg, D; Giannelli, N, Managing Municipal Solid Waste in Latin America and the Caribbean. Integrating the Private Sector, Harnessing Incentives, Public-Private Infrastructure Advisory Facility (PPIAF), World Bank, December (2007).
[12] O'Neil, R.K; Locke, E.R, Institutional and Financial Consideration in Regional Solid Waste Management, Water, Air, and Soil Pollution 4, 227-236 (1975).
[13] Momodu, N; Dimuna, K; Dimuna, J, Mitigating the Impact of Solid Wastes in Urban Centers in Nigeria, J Hum Ecol, Vol 34(2) 125-133 (2011).
[14] Ketibuahi, E; Asase, M; Yusif, S; Mensah, M.Y; Fischer, K, Comparative Analysis of Household Waste in the Cities of Stuttgart and Kumasi Options for Waste Recycling and Treatment in Kumasi.
[15] Milindo, C; Sarkhel, P, Economics of Solid Waste Management: A Survey of Existing Literature, World Development, Vol (22) 953-969 (2003).

ISSN: 2394-4404

[16] Olar,Z , Solid Waste Management: Waste Reduction in Developing Nations, Waste Reduction and Incineration, (2003).
[17] Martin, M, Globalization, Development, and Municipal Solid Waste Management in Third World Cities, (2002).
[18] Bulent, I; Idris, A; Terazono, A; Sakai, S, Development of a database of landfills and dump sites in Asian countries, J Mater Cycles Waste Management, Vol (6) 97-103 (2004).
[19] Victoria, C; Sinclair, J, Measuring the Ecological Footprint of a Himalayan Tourist Center, Mountain Research and Development, Vol 22(2) 132-141 (2002).
[20] Sandhya, V, Ecological, Economic and Social Dimensions, Economic and Political Weekly, (1994).
[21] Susan A, T; Weitz, K; Nishtala, S; Yarkosky, S; Zannes, M, The Impact of Municipal Solid Waste Management on Greenhouse Gas Emissions in the United States, Journal of the Air & Waste Management Association, Vol (52) 1000-1011 (2002).
[22] Sudhir, V; Muraleedharan, V.R; Srinivasan, G, Integrated Solid Waste Management in Urban India: A Critical Operational Research Framework, Socio-economic Planning Science, Vol 30(3) 163-181 (1996).