ANNALS OF EDUCATION

Vol. 3(1), March 2017: 53-64
Journal's URL: http://www.crsdindia.com/aoe.html
Email: crsdindia@gmail.com
Published By: Council of Research & Sustainable Development

e-ISSN: 2455-6726

Journal Impact Factor (ISRA): 0.211

RESEARCH PAPER

Solid Waste Management is a challenge for Municipalities-A case of Pakistani Cities

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Received: 16th January 2017, Revised: 21st February 2017, Accepted: 24th February 2017

ABSTRACT

Management of the Solid Waste is growing as an important challenge for the municipalities of the developing countries especially due to increasing waste generation, the heavy burden on financial exchequer of the municipal bodies. In this regard, the major issues are; inefficient human resource management, insufficient machinery deployment and scarcity of technical resource. The main objective of this study is to present a fair understanding for the stakeholders regarding the challenges faced by municipalities related to management of the solid waste. In this study, the author also focused on quantitative technique to take an analytic view of the various aspects putting adverse or positive impacts towards managing the issue. Questionnaires were filled from the field formations where actually this issue is being faced or addressed and to beef up the conclusion appropriate statistical methods were used. The results of this study shows that effective planning and management of the financial, Personnel & technical aspects leave strong impact on efficient solid waste management. Moreover, in the context of Punjab province of Pakistan, political leadership should intervene in a sensitized manner to improve solid waste management at grass root level.

Key words: *Solid Waste Management (SWM), Financial Factors (FF), Personnel Issues (PI), Technical Issues (TI)*

INTRODUCTION

Rapidly growing solid waste is an emerging issue and has transformed into a great challenge for the urban localities of the Punjab province of Pakistan. Naturally, human lives on earth consume products for its existence and produces waste. The vital need of modern days is that to manage waste generated by human creatures in an effective and efficient manner. The question is that how the waste management practice be done so efficiently in a society in a deliberate manner that it does not pose any threat and create nuisance for the public. Population growth in a steady manner, rapid urbanization and frequent industrialization has made waste management more challenging, exigent and even more difficult. People in a specific geographic area produce bigger volumes of wastes and ill managed wastes practices are professed a big hazard towards environment, atmosphere and green canvas (Alam, 2008).

The solid waste management in developing countries creates many social and environmental challenges (Daskalopolous, 1998). For example the major waste problems are poverty, rapid increase in population, massive urbanization and infrastructure (Walling, 2004). The question is that how to cope with the waste? how the heaps of garbage, piles of litter and volumes of wastes be managed? and how the composting, recycling, and disposition made in a proficient and sustainable manner. Waste should be disposed of in a safe and healthy way considering its importance and cognizance of health of an environment and of public, guaranteeing non injurious effects on future generations.

In developing countries the most challenging issue of solid waste management is due to lack of inefficiencies/incomplete institutional and inappropriate management of solid waste management, developing countries are facing severe pollution problems caused by increasing solid waste quantities and putting gave impacts on water, soil and atmosphere, human health and climate change. In contrast, developed countries and the modern part of the world, sustainability encompasses that future generation is not decremented by environmental choices made today. On contrary to that, in most developing countries, attention rather paid on what can be currently achieved from such choices, especially from the socio- economic perspective (Khatib, 2011)

In Pakistan the collection of waste is irregular and the disposal services are poor. Regardless of the fact that solid waste services having enormous financial burden on municipalities, less than 50 percent of the waste generated is disposed and dumped inadequately in the open plots along

roadsides. Hence, Solid Waste Management has been documented as an important environmental problem due to this rapid urbanization. The solid waste in Pakistan mostly contains bags made of plastic, stuff made of rubber & metals, cooking waste, animal waste, glass, construction material and stuff of drains. Households, commercial centers, business organizations and industries are the prime basis of solid waste generation in Pakistan. Solid waste in Pakistan has presently not been properly adhered to in an effective way. Collection, transportation, disposal and dumping of wastes are creating many hazardous problems in cities. Environmental and sanitary conditions have become worse and jeopardizing the whole echoing system. The living conditions of people are becoming critical and alarming day by day. The problems related to solid waste are very huge, need consideration and management be properly addressed. The reasons behind this mismanagement include rate of urbanization, expansion in urban areas, thick population, fast pace industrialization, piles of wastes, dearth of recycling mechanism, scavenging, separation, reduced capacities, lack of competencies and limitations of municipalities to handle solid waste i.e. storage, collection, transportation and disposal (Shafiul, 2006).

To deal with escalating and ever increasing crisis, the municipalities in Pakistan have shortage of resources like financial, human, technological, and skill development. Many countries have considered the dearth and realized that much attention be provided to handle the solid waste management issues to satisfy the objectives of sustainable development (Abu Qdais, 2007). This has aroused the importance that how to provide efficient quality service having constraints in financial and skill development of public sector (Mansoor, 2006).

BACKGROUND OF THE RESEARCH PROBLEM

Infrastructure &Services (I&S) section of the TMA is accountable to manage Solid waste collection/ disposal. Tehsil Municipal officer, Tehsil Officer (I&S) and Chief Officer (HQ) is the supervisory officer and has overseen the operations performed at field level by field staff. It is analyzed that cities' requirement are not being addressed so far and waste collection and disposal services are very poor and sluggish in the sampled TMAs. The information gathered from sampled TMAs also revealed the fact mentioned above, as an averagely 45% (approximately) of spawned solid waste are being disposed of in the cities populace from 97,000 to 1, 08,000.

PROBLEM STATEMENT

Urbanization means to make a gathering of the people, to use staff efficiently and to grow further to develop larger cities with the ability to provide better civic amenities and to make an access to better health care system, modern education, and employment to excel. But with the expansion of population and rapid urbanization is the source of an increasing waste. With the high migration rate of the people towards urban localities from the rural areas, the per capita level of the waste associated with them is also increasing, which is directly correlated with the higher– consumption living patterns belonging to cities. So this is quiet challenging to manage the subject faced by the municipal bodies of the urban localities (Bhada, 2016). The study will investigate: Factors affecting Cities' Municipalities in provision of quality solid waste collection / disposal services (solid waste management) to the public residing in the cities of the Punjab, Province of Pakistan.

LITERATURE REVIEW

In Pakistani lifestyle change has been observed, waste generation has increased in Pakistan due to consumption driven population and changing consumption patterns. Households, commercial centers, business organizations and industries are the prime basis of solid waste generation in Pakistan. Some amount of solid waste is also generated by health care institutions such as; hospitals, private clinics, dispensaries etc. Estimates of WWF in 2001 revealed that nearing 250,000 tons of hospital waste is generated by the hospitals in Pakistan per annum. Likewise in Pakistan waste generation is 0.6 to 0.8 kg/person/day, which is growing @ 2.5% yearly. (Khattak, 2009).

In this universe, every living thing "humans or animals" use natural means to live life and to dispose of wastes. In ancient times, due to availability of huge land, meager resources, less population and low density of waste generation, disposal of wastes was not considered as a major

threat and problem. The solid waste is usually a mixture of useless, unwanted or undesirable stuff. The waste is a mixture generated from the urbanized community as well as from similar addition of agricultural, commercialized activities such as industrial and mining wastes. The majorly, solid waste is a mixture generated from various business activities such as; industry, farming and mining remaining quantity is municipal waste (Kaushika, 2016).

Sustainable municipal solid waste management needs an efficient method of public awareness, finances, infrastructure development, proficiency and severe implementation of waste related legislatures by the government. NGO's and other interested parties can contribute much in achieving measureable results in attaining long term sustainability. The challenges need to be addressed for efficient solid waste management systems and to attain the major target of a hygienic, healthy and pollution free environment for all(Badgie, 2016).

The study revealed that there are four critical strategies may be adopted such as; inhabitants' awareness regarding recycling needs to be promoted, recycling approach / system should be insured, make ensure the producers/manufactures' accountability, and encouraging keen insight research for treatment of the waste are required to design and sustain the household solid waste recycling schemes. This may also be a ready reference for other developing economies as well (Zheng, 2016)

Variety of political, social and economic factors has effect on the benefit and margins of different stockholders dealing in waste trading system. Informal waste recycling is not only a waste reduction approach but also produces ample opportunities for urban poor people as their day to day earnings Thus this technique / approach may be encouraged as viable methodology by formulating a community based solid waste management package for emerging cities in comparatively low level economies (Suthar, 2016).

According to the primary literature improper waste system cause the ineffectiveness of the waste collection and reuse (Hazra, 2009). The poor quality of organizational structure as lack of vehicles, condition of roads and other factors affect the waste management system. According to (Sharholy, 2008) Private and Micro level enterprises can be a useful and affordable source of waste collection. Shortage of skilled and unskilled manpower both has impact on efficient management waste management in Ibadan metropolis. The scarcity of staff makes it difficult to deal with the municipal matters. It is required to educate and train the staff and impose enforcement laws on people (Kayode, 2011)

Municipalities need strong financial support to provide services to the citizens because a huge expenditure is needed for this purpose (Hoque, 2008). The improper use of finances, lack of instruments and unwillingness of users, scarcity of finances cause the deficiency of waste services. Solid waste management is not single but has multi dimensions issues, it not only relates to technological but also issues directly linked to environment, legal, capacity, institutional development, cultural and economic viability (Gupta, 2007).

To address the growing problem of solid waste management, private sector work in tough circumstances due to less amount in terms of recovery/receipt, old and frustrated use of low quality machinery/equipment for wastes collection and transportation, ill managed programming, less time duration contract, inefficient way of fee collection, poor road infrastructure and execution of weak municipal laws/by-laws, rules and policies. Moreover, it was also observed that the system will succeed with the municipal authorities' accountability. Willingness to pay against tariff may be increased or encouraged by the enhanced awareness of the communities and illegal waste dumping should be discouraged, municipal by-laws enforcement, effective arrangement and such activities in this regard should be promoted which are environment friendly(Kirama, 2016).

Human resources for waste management are insufficient or in some of the cases it is entirely negligible. Without imparting professional training and technical assistant in solid waste management sector, officials are deputed to handle complex situations and problematic issues. They are assigned the tasks about which they are completely negligent. Lacking in capacity, technical expertise and insufficient human resources to deal and manage with solid waste is also a reason for absence of comprehensive waste management planning in developing countries (Shafiul Azam Ahmeda, 2004). In developing countries, modality can be adopted with joint amalgamation of public and private sectors that these two entities may actively been engaged in management of

solid waste. The focus is to encourage private sector to enter into solid waste management practices and to make connections with public sector in its operations to strategize the policies and effective plans (David, 2006). Lack of awareness and politics are the major hurdle in the way of effective solid waste management system. It is not possible that the little segment of society with less interest and negligible resources can play a significant role to improve municipal solid waste management in Mumbai. In this regard, result oriented approach and coordination is required to attain sustainable long term practical solution (Joelsson, 2016).

METHODOLOY

For this study, we have taken ten medium sized cites of the Punjab to access the impact of various factors on solid waste management. These cities have almost same population size and facing the same challenges in terms of solid waste management sector. The quality sanitation services are affected from various factors such as; Financial Factors (FF), Personnel Issues (PIs), Technical Issues (TIs) and Political Factors (PFs).

SOURCES OF DATA

Solid waste section of TMAs is working under the direct supervision of TO (I&S) and CO (Head Quarter) and implementation is being done through Sanitary Inspectors and Sanitary Workers. In this study, we examined the major factors affecting solid waste management the prime responsibility of municipalities. Therefore, the major sources of data are both primary and secondary data collected through TMA offices and surveyed conducted for TMA functionaries respectively. Mostly the secondary data collected through TMAs was used for justifying the context of the study. As the researcher is working to address the municipalities' issues, it looks mandatory to encircle the study within same size/scope/characteristics. For the purpose, secondary data was collected from a certain population group of municipalities such as; it was gathered through data provided by sampled TMAs ranging from 97,000 to 108,000 and averagely 45% (appox.) of solid waste generated are being disposed off by these TMAs. As these municipalities are providing the same kind of services in terms of solid waste collection / disposal to the citizens, having almost same population size to cater and same challenges are being faced by these cities municipalities.

SAMPLING

For this study, we will take ten cites' municipalities of the Punjab to access the impact of various factors on solid waste management. These cities have almost same population size ranged from 97,000 to 108,000 and facing the same challenges in terms of solid waste management sector as detailed through following table. Towns' average disposal efficiency is 45% and these towns are expended a lot per household causing extreme burden on Govt. financial exchequer against poor service delivery in terms of solid waste management. We named these TMAs as: Town 1, Town 2, Town 3, Town 4, Town 5, Town 6, Town 7, Town 8, Town 9, Town 10.

Table 1: Percentage of Solid Waste Disposed of Per Month

Sr.#	Tehsil	Population (2016)	Percentage of Solid Waste Disposed of Per Month
1	Town 1	103654	45
2	Town 2	106482	49
3	Town 3	105142	48
4	Town 4	104408	20
5	Town 5	107839	61
6	Town 6	102503	48
7	Town 7	106257	45
8	Town 8	106435	46
9	Town 9	100575	38
10	Town 10	97502	47

Source: Forecasted population on the basis of district census report – 1998 & Punjab Municipal Development Fund Company Data)

As it is necessary to collect the data from decision making machinery and the field staff both for fulfilling the requirement of the study. Sanitary workers who are the lowest tiers in this regard, and are mostly uneducated and have not enough capacity, the purposive / convenient sampling was used and the questionnaire for gathering primary data / information was controlled in a manner that the various segments of the sample population i.e. educated/skilled/field employees (TMO, TO (I&S), ATO (I&S), Sub Engineers, TO (F), Accountants, TO (P&C), TO(R), CO (HQ,) Sanitary Inspector, Sanitary Supervisor and Complaints Cell In charge) and sanitary workers as well are encompassed.

Table 2: Sampling size and Sampling Method Table

Unit of Analysis (Population Group)	Population Size	Sample Size
Decision Making/ Management/Skilled/ Field Staff	1260	300

QUESTIONNAIRE

As already discussed, the sources of data under this study were both primary and secondary. The source of secondary data was TMAs official record. On the other hand, the primary source which was firsthand information collected from the TMAs functionaries in the month of June 2016. Keeping in view of the scope of the study, employees' survey was conducted for the TMAs' educated/ skilled, field employees as well. For the purpose, an established questionnaire comprising close ended questions was used with required modifications to take into account the key variables to determine the factors affecting solid waste management services being provided by TMAs. The researcher has picked the established questionnaire used under such kind of study titled as "Assessing the Challenges Affecting Solid Waste Management System in the Kumasi Metropolis" (Otchere, 2014) with Likert Scale Technique. It is comprised of various questions dealt with solid waste management practices prevailed in Tehsil Municipal Administrations. The questionnaire was discussed with experts before conducted actual employees' survey for rational and valuable data collection leading towards efficient analysis and interpretation resulting in meaningful discussions.

HYPOTHESIS

1. **H1:** Financial factors are positively associated with solid waste management.
2. **H2:** Personnel issues are positively associated with solid waste management.
3. **H3:** Technical issues are positively associated with solid waste management.
4. **H4:** Political factors moderate the relationship between financial factors and solid waste management positively
5. **H5:** Political factors moderate the relationship between personnel issues and solid waste management positively
6. **H6:** Political factors moderate the relationship between technical issues and solid waste management positively

VARIABLES

Dependent Variable (effect): The variable which will be effect of some cause. In this research, solid waste management is being considered as dependent variable. Currently, Punjab province of Pakistan is facing adverse challenges in managing the solid waste. Transportation, collection and disposal of waste need to be managed optimally keeping in view of the existing resources and accordingly potential resources needs to be explored. Under the scenario it is critical to establish some model to exercises best practices in terms of effective solid waste management.

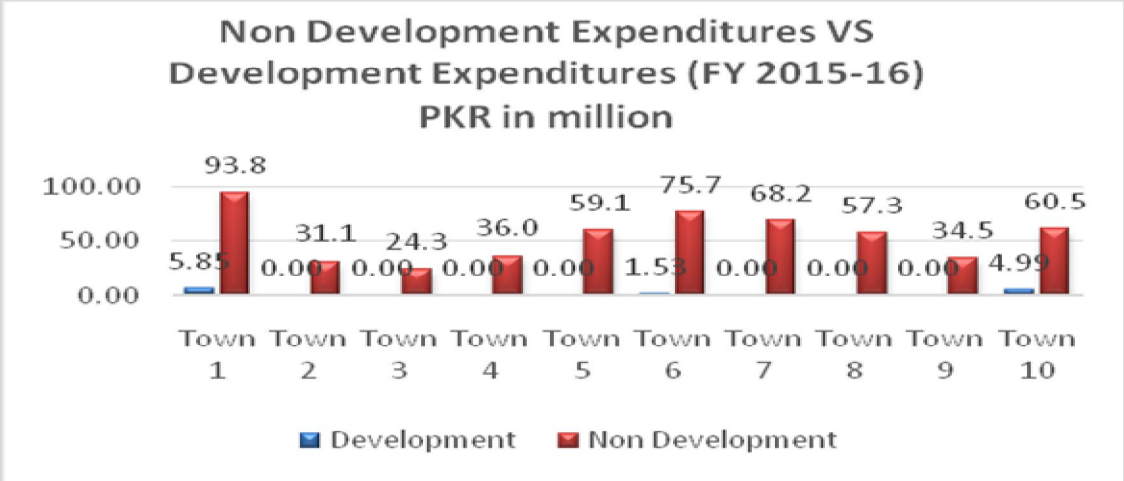
Independent Variable (Cause): These are the variables create causes of some effect to be happened. In this study, three independent variables named as; Financial Factors (FF), Personnel Issues (PIs), Technical Issues (TIs) are being taken to evaluate the cause.

Moderating Variable: Political Factors

RATIONALITY BEHIND THE SELECTION OF VARIABLES

Financial Factors:

These factors influenced a lot in terms of solid waste management in municipalities. Infect, this is the service, local governments are providing without charging even a single penny. However, it will cause huge burden on their financial exchequer. Moreover, taking analytic view of the allocation / expenditures in different heads of solid waste management such as; Development vs. Non Development and Non Development break ups, it seems quite irrational. Within our sampled municipalities, its ratio is different from city to city but no city municipality has development expenditures more than of its non – development expenditures. The same phenomena can easily be analyzed through below delineated graph.

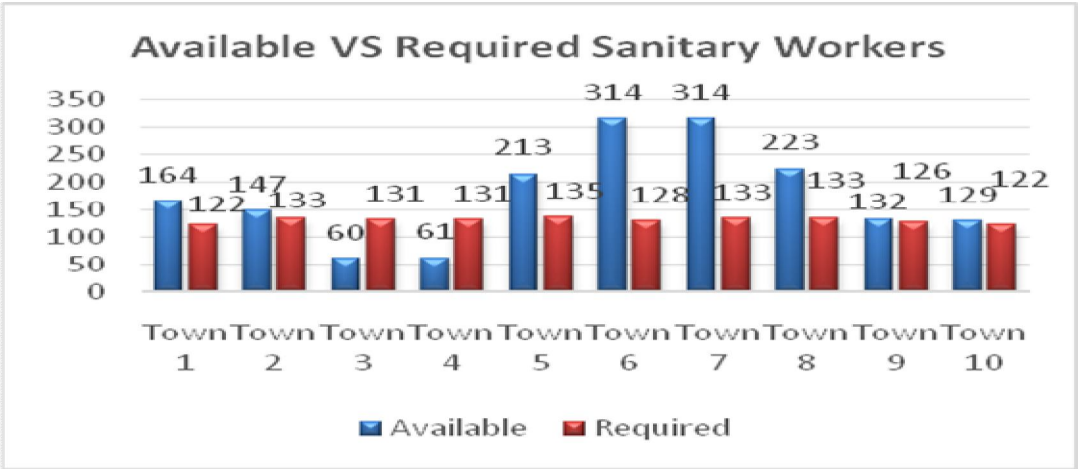


Source: Punjab Municipal Development Fund Company – Performance Management System (PMS)

In view of the above mentioned facts, it is observed that financial issues need to be optimally addressed.

Personal Issues:

Personnel management is the key factor in addressing the management issues. Solid waste management is labour intensive and field / operational activities are dependent upon the way how efficiently this resource has been used. The international criteria narrates 800:1 – population vs. sanitary workers. Our sampled municipalities' don't fulfil the criteria. Sometimes, staff is excessive and sometimes it is short of requirement as depicting through delineated graph. Under the scenario, staffing issues need to be rationalized.



Source: 01 sanitary worker for 800 consumers (outsourcing of Solid Waste Management in Sialkot City – The Urban Unit and TMA record)

Technical Issues:
Here, researcher has taken technical issues with an interpretation of availability of adequate sophisticated waste management equipment, working condition and appropriate infrastructure etc. This is the factor which is more critically to be evaluated as a soldier without weapon can't perform efficiently. In our sampled TMAs, We are assessing that how much these factors have contributed in terms of solid waste management.

Political Factors:
Moreover, in this study we used Political Factors (PFs) as *moderating variable* to evaluate the impact on three independent variables. As the municipalities are the institutions which are suffered a lot from the dilemma of politicization in Punjab province of Pakistan. This factor has an influenced role in managing and making decisions sometimes within the stream or vice versa. Here, researcher is evaluating the impact of this factor on the independent variables; Financial Factors, Personnel Issues and Technical Issues whether it is positive or negative. Like this it is critical to consider this variable as moderating variable to assess the actuality of the other factors or influenced by this factor. According to the scope of research, we used quantitative case study approach and gathered both primary and secondary information and to analyze the data, we executed multiple regression line.

CONCEPTUAL FRAMEWORK

To determine the impact of different factors on solid waste collection and disposal services, in our framework Solid Waste Management (SWM) is dependent variable and the factors such as : Financial Factors (FF), Personnel Issues (PI), Technical Issues (TI), are independent variables. Whereas, Political Factors will act as moderating variable.

Y: Solid Waste Management : Dependent Variable
X_1: Financial Factors (FF) : Independent Variable
X_2: Personnel Issues (PI) : Independent Variable
X_3: Technical Issues (TI) : Independent Variable
X_4: Political Factors (PF) : Moderating Variable

FINDINGS/RESULTS AND DISCUSSIONS

Researcher used SPSS to evaluate / analyze the data and to conduct multiple regression & correlation analysis due to its recognition in terms of authenticity and accuracy of results.Regression results are quite interesting and demonstrating that financial factors, personnel issues, and technical issues leave impact on solid waste management. Interestingly, political factors which are being considered as moderating variables enhance the adverse effect of all above mentioned three independent variables on dependent variable (solid waste management). Now we discuss the impact of each variable separately:

1. **Model 1**
   Dependent Variable: Solid Waste Management
   Independent Variable: Financial Factors (FF)
   Moderating Variable: Political Factors

Table 3: Model Summary[c]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin - Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.476[a]	.227	.224	.57466	.227	87.288	1	298	.000	
2	.476[b]	.227	.222	.57545	.000	.184	1	297	.668	2.017

Durbin-Watson value is near to 2, which show no +ve or –ve auto correlation exists in the data.

Table 4: ANOVA[c]

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	28.826	1	28.826	87.288	.000[a]
	Residual	98.411	298	.330		
	Total	127.237	299			
2	Regression	28.887	2	14.443	43.616	.000[b]
	Residual	98.350	297	.331		
	Total	127.237	299			

a. Predictors: (Constant), FF_AVG
b. Predictors: (Constant), FF_AVG, FF_PF
c. Dependent Variable: Solid Waste Management

F-Values are greater than 5, which shows goodness of the model and significance level is also less than 0.05.

Table 5: Coeffeceints

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.532	.345		1.541	.124
	FF_AVG	.745	.080	.476	9.343	.000
2	(Constant)	.533	.346		1.541	.124
	FF_AVG	.757	.085	.484	8.905	.000
	FF_PF	-.008	.018	-.023	-.429	.668

a. Dependent Variable: Solid Waste Management

Beta value shows that for each one unit change in financial factors, it will cause 0.48 units change in SWM. Its impact shows considerable change in SWM and its significance level is less than 0.05 (accordingly H1 is accepted) which shows positive impact of good / viable financing planning on solid waste management. t-value is also greater than 1.96 which shows efficacy of this variable on solid waste management. It means if positive financial planning occurs in municipality, it will cause better results in SWM. Moreover, when politics is considered as moderating variable, almost same % change occurs i.e against one unit change in financial factors (with politics as moderating variable) will make 0.48 units change in SWM. This shows weak moderation impact of politics. In other words, the phenomenon can also be described in a manner that this is not a lime light sector in the intermediate and small cities, political leadership does not consider this sector as cash cow to gain political mileage. Its significance level is less than 0.05 (accordingly H4 is accepted). Durbin-Watson value is near to 2, which shows no +ve or –ve auto correlation exists in the data.

2. Model 2

Dependent Variable: Solid Waste Management
Independent Variable: Personnel Issues (PI)
Moderating Variable: Political Factors

Table 6: Model Summary[c]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.661[a]	.437	.435	.49015	.437	231.605	1	298	.000	
2	.662[b]	.438	.434	.49064	.001	.407	1	297	.524	1.947

a. Predictors: (Constant), PI_AVG
b. Predictors: (Constant), PI_AVG, PI_PF
c. Dependent Variable: Solid Waste Management

Durbin-Watson value is near to 2, which show no +ve or –ve auto correlation exists in the data.

Table 7: ANOVA[c]

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	55.643	1	55.643	231.605	.000[a]
	Residual	71.594	298	.240		
	Total	127.237	299			
2	Regression	55.741	2	27.870	115.775	.000[b]
	Residual	71.496	297	.241		
	Total	127.237	299			

a. Predictors: (Constant), PI_AVG
b. Predictors: (Constant), PI_AVG, PI_PF
c. Dependent Variable: Solid Waste Management

F-Values are greater than 5, which shows goodness of the model and significance level is also less than 0.05.

Table 8: Coeffients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.030	.246		.122	.903
	PI_AVG	1.020	.067	.661	15.219	.000
2	(Constant)	.034	.246		.137	.891
	PI_AVG	1.038	.073	.673	14.296	.000
	PI_PF	-.011	.017	-.030	-.638	.524

a. Dependent Variable: Solid Waste Management

Beta value shows that for each one unit change in personnel issues, it will cause 0.66 units change in SWM. Its impact shows considerable high change in SWM due to this variable and its significance level is less than 0.05 (accordingly H2 is accepted) which shows encouraging and positive impact of good / viable personnel planning on solid waste management. t-value is also greater than 1.96 which shows efficacy of this variable on solid waste management. It means if positive human resource management occurs in municipality, it will cause better results in SWM. Moreover, when politics intervenesas moderating variable, almost same % change occurs i.e against one unit change in personnel issues (with politics as moderating variable) will make 0.67 units change in SWM.This shows weak moderation impact of politics. Its significance level is less than 0.05 (accordingly H5 is accepted). Durbin-Watson value is near to 2, which shows no +ve or –ve auto correlation exists in the data.

3. Model 3

Dependent Variable: Solid Waste Management
Independent Variable: Technical Issues (TI)
Moderating Variable: Political Factors

Table 9: Model Summary[c]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df 1	df 2	Sig. F Change	
1	.528[a]	.278	.276	.55510	.278	114.931	1	298	.000	
2	.531[b]	.282	.277	.55481	.003	1.311	1	297	.253	1.681

a. Predictors: (Constant), TI_AVG
b. Predictors: (Constant), TI_AVG, TI_PF
c. Dependent Variable: Solid Waste Management

Durbin-Watson value is near to 2, which show no +ve or –ve auto correlation exists in the data.

Table 10: ANOVA[c]

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	35.414	1	35.414	114.931	.000[a]
	Residual	91.823	298	.308		
	Total	127.237	299			
2	Regression	35.817	2	17.909	58.181	.000[b]
	Residual	91.419	297	.308		
	Total	127.237	299			

a. Predictors: (Constant), TI_AVG
b. Predictors: (Constant), TI_AVG, TI_PF
c. Dependent Variable: Solid Waste Management

F-Values are greater than 5, which shows goodness of the model and significance level is also less than 0.05.

Table 10: Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.329	.227		5.843	.000
	TI_AVG	.681	.064	.528	10.721	.000
2	(Constant)	1.326	.227		5.831	.000
	TI_AVG	.721	.073	.559	9.931	.000
	TI_PF	-.023	.020	-.064	-1.145	.253

a. Dependent Variable: Solid Waste Management

Beta value shows that for each one unit change in technical issues, it will cause 0.53 units change in SWM., Its impact shows considerable high change in SWM and its significance level is less than 0.05 (accordingly H3 is accepted) which shows encouraging and positive impact of good / viable technical resource planning & management on solid waste management. t-value is also greater than 1.96 which shows efficacy of this variable on solid waste management. It means if positive technical resource planning & management occurs in municipality, it will cause better results in SWM. Moreover, when politics intervenes as moderating variable, than against one unit change in technical issues (with politics as moderating variable) will make 0.56 units change in SWM. This scenario also shows weak moderation impact. Its significance level is less than 0.05 (accordingly H6 is accepted). Durbin-Watson value is near to 2, which shows no +ve or –ve auto correlation exists in the data.

CONCLUSION

In view of results and discussions, the study deduced that Solid Waste Management is a huge environmental hazard and health danger for urban areas in Pakistan. Rapid urbanization, commercialization and spread of business activities in large scale are the source of high magnitude of solid waste. In nutshell, human ways of life have exerted pressure on the surface, water, environment, natural resources and have caused imbalance in the systems by producing, consuming and wasting of resources. The country like Pakistan has evidently major effects on environment due to solid waste generation.

The main objective of this study is to present a fair understanding for the stakeholders regarding the factors affecting management of the solid waste. This study explored the importance of SWM for sustainable development and investigated the factors hampered in the way of solid waste management practices. In summary, the research findings revealed that there are significant issues with unauthorized waste disposal practices due to the lack of proper waste management processes, absence of financial support and integration of personnel, political and technical issues. The absence of practical usage of regulation and laws is identified as a barrier to residents engaging in proper waste management processes with recycling and waste separation because the tehsil municipalities and district administrations could not enforce these management practices. The reason to which is the lacks of knowledge, awareness and cooperation have been identified.

The characteristics of waste management in the municipality reflect the limited resources, ineffective management & planning that local governments have to handle waste issues to meet the residents' needs. The idea that waste management at municipality level can be handled more efficiently within existing resources if some of the key factors such as Personnel, Technical & Financial factors are managed effectively. Moreover, political leadership should also intervene in positive manners especially for managing these factors as is already evident through delineated analysis.

The empirical analysis clearly depicts that above mentioned three factors have strong impact on managing the solid waste effectively if be properly managed. Furthermore, the analysis also exhibited that currently in the Punjab, political leadership needs to think more positively and should take practical steps in this regard. Like this, approaches such as knowledge transfer, personnel development and capacity building activities, technical adherence and financial management have shown to be effective in encouraging the performance of TMA officials for better solid waste management. Eventually, this leads to sustainability in the system, humankind has established for living and the preservation of the environment in which it exists.

As we have observed that no tariff is already being collected from the public in terms of services provided against this sector. On the other hand, huge spending is being incurred and there is great burden on financial exchequer of the municipalities, which deteriorates the situation further. Moreover, most of the spending is towards non-development activities rather than development portfolio with respect to this sector. In this regard, no major development is being assessed across the Punjab since last years. Indirectly, this affects the health sector as well because the environment is going polluted gradually and causing various epidemics and other diseases in such localities. In this context, this is observed through literature review that citizens are willing to pay if they may be provided quality services against this sector.

Solid waste management sector is deprived and neglected segment of the municipality of the intermediate and small cities of the Punjab as political leadership is not considered this sector as a cash cow to gain political mileage.

RECOMMENDATIONS

In pursuance of the submissions / discussions / results, some recommendations are listed below:

1. Personnel, technical & financial factors needs to be properly planned at municipality level and political leadership should intervene in a sensitized manner to improve solid waste management at grass root level
2. At municipality level Technical Issues such as; make available the requisite equipment, practical O&M structure, optimal planning of the transportation route by using GIS technique and requisite official's trainings need to be guaranteed.
3. It is essential to utilize the POL & R&M funds efficiently. For the purpose, a practical and sustainable operation & maintenance framework is required to be implemented at municipality level.
4. The municipalities should look forward to levy a rationalized tariff against the services provided for this sector, which will lessen the financial burden of the municipal bodies. Moreover, these institutions should pay great attention towards providing the quality services to the public for convincing them to pay the imposed tariff.
5. TMAs should develop training calendar for efficient utilization of available stuff and induction of required skill should also be a part of human resource management plan for this sector
6. TMAs should introduce and implement an effective complaints registration and redressed system to restore the public satisfaction level.
7. A proper / effective monitoring system with certain key performance indicators need to be implemented at municipality level to make accountable the government functionaries as well as political figures as well.
8. Government is required to take practical steps to encourage general public participation towards solid waste management activities and launch effective awareness campaign.
9. Government should provide opportunity to civil societies for joint ventures in this sector to lessen the burden on government financial exchequer.

10. Adequate strategy is required to be adopted by municipal body to enforce that waste components are appropriately disposed.
11. Political leadership should perform their active and positive role to streamline the management in this sector.

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How to cite this article:
Iftikhar S. and Aziz B. (2017): Solid Waste Management is a challenge for Municipalities-A case of Pakistani Cities. Annals of Education, Vol. 3[1]: March, 2017: 53-64.