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Cost Analysis of Municipal Solid Waste Management

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ABSTRACT

Cost Analysis is that it provides accurate and complete information on the real costs of managing solid waste. It uncovers hidden and overlooked costs and allocates all costs to the specific program for which they are incurred. As a result, managers are able to compare current and proposed services accurately, predict future costs reliably, and evaluate privatization options thoroughly. In short, full-cost analysis allows elected officials and solid waste managers to make informed decisions regarding the types and levels of solid waste services. In addition to the general advantages that come with understanding program costs.

Keywords: SWM, MSW, Cost Analysis, MCC, FCA, MSWM

I. INTRODUCTION

1. General

One of the very important factors in keeping the environment clean and aesthetic is the efficient Solid Waste Management (SWM). The proper disposal of Municipal Solid Waste (MSW) becomes more acute as the population of the cities becomes larger and larger.

The improper disposal of the solid waste causes pollution to the environment. In the absence of efficient collection of MSW, it will be dumped randomly in open spaces, streets, valleys and water bodies. The unsupervised process of dumping solid waste becomes a source of diseases, leachate from the decomposition which infiltrates into the soil and percolates into the aquifers. In addition, the improper management of MSW causes harmful effects to the public health and environment. SWM involves activities associated with generation, storage,collection, transfer and transport, processing and disposal of solid waste which are environmentally compatible, adopting principles of economy,aesthetics, and energy and conservation. It encompasses planning, organization, administration, financial, legal and engineering aspects involving an interdisciplinary relationship , estimated that solid waste related processes consume about 20% to 40% of municipal revenues in developing countries.

Pune is the 8th largest city in India and the 2nd largest in the state of Maharashtra.
Population ; about 4 million,
Households ; nearly 1 million,
Area of city is 244 sq. kms.,

4 Zones ; 15 Administrative Ward Offices ; 76 Prabhags

- Pune generates 1500 to 1600 tons of solid waste per day.
- 122 trucks collect waste door-to-door, collecting an average of 137 organic tons per day.
- 56% of households have door-to-door coverage.
- 44% of households provide segregated waste.
- 125 tpd Hotel waste collected by 23 Hotel Trucks.
- 936 containers and 412 compactor buckets dispersed around Pune.
- SWaCH Cooperative, which is wholly owned by waste pickers, also provides services.
- Ward wise average- 350 to 750 gms per capita per day

1.1 Need for the study

Now a day's solid waste management is becoming huge problem for human beings as well as environment. So it is necessary to adopt scientific method in municipal solid waste management. This requires financial budgets

to require manage all expenses incurred to complete solid waste management process. So that, this study contributes financial and cost analysis related information to upgrade the pune City Corporation have a valuable planning tool preparing budgets and determining a program's direction explore the incorporation of financial incentives into solid waste management programs.

The public can also benefit from cost analysis information. cost results can be presented to the public through the newspaper, tax forms, or other avenues to make solid waste cost and fees more transparent. With such information, citizens can better evaluate their own actions and the choices of their publics.

1.2 Objectives of the Study

The objectives of the study are as follows

1. To highlight the significances and scope of the municipal solid waste system in pune management
2. To Critical examine the infrastructure and improvement cost required for the development of municipal solid waste management
3. To estimation of primary and secondary collection costs incurred to manage municipal solid waste management
4. To assess the transportation cost required to manage municipal solid waste management
5. To analyze the recycle and disposal cost required to manage municipal solid waste management

1.3 Scope of the Study:

The present study is conducted to examine the solid waste management on the basis of public private partnership in pune City Corporation,. The analysis includes the private sector participation in solid waste management commercial and residential wastes generated in municipal or notified areas The scope of this report is confined to municipal solid waste management over all cost analysis incurred is carried out, with due consideration for implicit or hidden costs and benefits. Total cost incurred on quantity of MSW transported to disposal sites, municipal solid waste management services provided scientifically method as to followed through trash haulers, transfer stations, recycling facilities, trash-to-energy facilities on land filling merge functioning of public and private partnership.

II. LITERATURE REVIEW

This chapter confers the review of literature regarding the issue of risk management in construction of the past researches and studies. The most noteworthy of them which are relevant to the thesis are being reviewed.

2.1 Financial sustainability in municipal solid waste management – Costs and revenues in Bahir Dar, Ethiopia Christian Riuji Lohri , Ephraim Joseph Camenzind , Christian Zurbrügg

Providing good solid waste management (SWM) services while also ensuring financial sustainability of the system continues to be a major challenge in cities of developing countries. Bahir Dar in northwestern Ethiopia outsourced municipal waste services to a private waste company in 2008. While this institutional change has led to substantial improvement in the cleanliness of the city, its financial sustainability remains unclear. Is the private company able to generate sufficient revenues from their activities to offset the costs and generate some profit?

This paper presents a cost-revenue analysis, based on data from July 2009 to June 2011. The analysis reveals that overall costs in Bahir Dar's SWM system increased significantly during this period, mainly due to rising costs related to waste transportation. On the other hand, there is only one major revenue stream in place: the waste collection fee from households, commercial enterprises and institutions. As the efficiency of fee collection from households is only around 50%, the total amount of revenues are not sufficient to cover the running costs. This results in a substantial yearly deficit. The results of the research therefore show that a more detailed cost structure and cost-revenue analysis of this waste management service is important with appropriate measures, either by the privates sector itself or with the support of the local authorities, in order to enhance cost efficiency and balance the cost-revenues towards cost recovery. Delays in mitigating the evident financial deficit could else endanger the public-private partnership (PPP) and lead to failure of this setup in the medium to

long term, thus also endangering the now existing improved and currently reliable service.

Following are the major findings through the literature review:

1. Improved fee collection efficiency by linking the fees of solid waste collection to water supply
2. Increasing the value chain by sales of organic waste recycling products
3. Diversifying revenue streams and financing mechanisms (polluter-pays-, cross- subsidy- and business-principles)
4. Cost reduction and improved cost-effectiveness.

2.2Analysis of the Full Costs of Solid Waste Management for North Carolina Local Governments NC Department of Environment, Health, and Natural Resources *James B. Hunt Jr., Governor Jonathan B. Howes, Secretary, DEHNR*
***Gary E. Hunt, Director, DPPEA* February 1997**

North Carolina local governments are required by law to determine the full cost of solid waste management. In 1996, the North Carolina General Assembly reaffirmed this statutory requirement with the view that an understanding of full cost is a fundamental component of sound public solid waste management. The process of full cost analysis' (FCA) helps local governments understand expenditures associated with collection, disposal, and recycling so that the true costs and benefits of each service are understood. Through FCA, recycling costs can be directly and fairly compared to solid waste collection and disposal. This approach helps local governments identify all current costs associated with solid waste management as well as account for past and future expenses for which benefits are realized in the current budget year.Only through an understanding of the full costs of their programs can local governments make the best possible decisions regarding solid waste management. For this reason, the North Carolina Division of Pollution Prevention and Environmental Assistance (DPPEA) developed a worksheet to help local governments perform full cost analyses.' In a pilot use of the work sheet, 15 North Carolina local governments completed full cost analyses of their solid waste management budgets. Although the main purpose of the pilot project was to promote the use of FCA by local governments, the scant research on solid waste management costs completed to date underscored the need to provide local governments with benchmark data on costs for solid waste collection,disposal, and recycling.This study presents and analyzes the quantitative data from the completed full cost analysis work sheets.

Following are the major findings through the literature review:

1. Full cost analysis provides a foundation for budgetary decisions.
2. Recycling can cost as little or less than solid waste collection and disposal.
3. Local governments that achieve high recycling rates are more likely to operate recycling programs that are less expensive per ton than solid waste collection and disposal.

2.3 Cost Analysis of Solid Waste Management for the City of Qalqilia An-Najah National University Faculty of Graduate Studies By:Ibrahem Mohammad Nimer Hinde

Cost analysis is an important tool in decision making. The idea is to evaluate all the costs of a proposed policy or action, in order to determine the least cost option. The net benefits can also be determined by subtracting the total costs from the total benefits. The basic goal of this process is to determine which decision maximizes the possible benefits of a policy or action (Jackson and Strauss, 2007). Conducting a cost analysis has many elements such as calculating the operating costs of all options. However, it also contains elements that are harder to quantify such as the environmental effects. These effects, which are not directly imposed on the operators, are considered external factors. External factors (that is, externalities) can either be negative or positive. When attempting to conduct a cost analysis externalities must be included, since someone in the community does eventually bear the external costs and benefits of them. The analysis also should consider the various external costs associated with each option. The negative externalities associated with landfills include environmental effects to the
surrounding area. The environmental effects arise from the greenhouse gasses (such as methane) emitted from landfills when waste decomposes, the potential

groundwater pollution through toxic seepage, and air pollution from the transportation of waste. The local externalities include decreased 55 property values in the areas surrounding landfills, increased traffic, and increased traffic accidents (Jackson and Strauss, 2007).

Following are the major findings through the literature review:

1. Maintaining the existing situation (The do-nothing option). In this option, the Municipality collects the municipal and construction solid wastes and all the collected waste is sent to the existing landfill to be disposed of there.
2. Constructing a transfer station and transport the MSW to Zahrat Al-Finjan Sanitary Landfill in Jenin District which is the only sanitary landfill in the north of the West Bank.
3. Constructing a sanitary landfill for Qalqilia City operated by the Municipality.
4. Making partial recycling to separate the recyclable materials and partial compost generation and then transfer the remaining part of the solid waste to Zahrat Al- Finjan Sanitary Landfill.

2.4 Comparative cost analysis of waste recycling for best energy alternative

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The main purpose of this study is to demonstrate that the conversion of solid/green waste into renewable energy is not only environmentally beneficial, but also financially rewarding. Such advantages are validated by exploring the energy potential from market waste management and conducting a benefit-cost analysis (BCA) under two scenarios. The compost and biogas potentials are estimated through a simple analysis and a best suitable option for the green market of Thailand is suggested. The study area is, Talaad Thai, the largest agriculture market of Thailand. Furthermore, a benefit-cost analysis is conducted to propose a best suitable solution for managing organic waste in the market. The overall results show that biogas is the best suitable option for the green market and is not only environmentally sustainable, but financially sound as well. The policy makers of the market should ponder low cost and profitable policies in order to manage solid waste on a sustainable basis.

Following are the major findings through the literature review:

1. A benefit-cost analysis is conducted to propose a best suitable solution for managing organic waste in the market.
2. The overall results show that biogas is the best suitable option for the green market and is not only environmentally sustainable, but financially sound as well.
3. It can be determined that biogas is the best renewable energy option for the market at this time.

2.5 Full Cost Analysis of Municipal Solid Waste Management: A Study with Reference to Mysore City Corporation on PPP Basis Dr. Veena K.P. Associate Professor, Dept. of Master of Business Administration (MBA), Visvesvaraya Technological University, Post Graduate Studies, Mysore Regional Centre, Mysore – 570029, Karnataka.

The concept of full cost analysis is a systematic approach for identifying and determining, all the cost of municipal solid waste management systems. It involves the identification and inclusion of all direct and indirect costs associated with providing a particular service or program. This paper includes the process of full cost analysis which helps Mysore City Corporation understand expenditures associated with collection, disposal, and recycling so that the true costs and reimbursement of each service are understood. This paper focused on the significances and scope of the municipal solid waste management on the basis of public private partnership and also to critical examination of the infrastructure and improvement cost required to development of municipal solid waste management system in Mysore City. The study further focuses on the estimation of primary collection cost and secondary collection cost incurred to manage municipal solid waste management. The study has been conducted through interview of Puvrakarmikas worked under the project of land filling it has been run under the public and private partnership Mysore City Corporation (MCC), Mysore. Finally the study concluded that this approach

helps local governments identify all current costs associated with solid waste management such as collection charges, transportation cost, process or recycle cost, and disposal charges are account for past and future expenses for which benefits are realized in the current budget year.

Following are the major findings through the literature review:

1. According to the annual budget report of MCC, the overall infrastructure and improvement cost was found to be 104, 34, 400.
2. The highest cost was incurred towards land rent and amount stood at 43,33,000, this was followed by office building rent and furniture, computer charges and their amount stood at 24,52,000 and 16,74,000 respectively.
3. In the year 2013-14 the highest total cost was incurred towards SWM and the amount stood at 24,75,200 and the lowest cost was incurred in the year 2008-09 and the amount is 16,13,000.

III. THEROTICAL FRAMEWORK

Cost Analysis of Solid Waste Management:

3.1 Introduction

Cost analysis is an important tool in decision making. The idea is to evaluate all the costs of a proposed policy or action, in order to determine the least cost option. The net benefits can also be determined by subtracting the total costs from the total benefits. The basic goal of this process is to determine which decision maximizes the possible benefits of a policy or action (Jackson and Strauss, 2007).Conducting a cost analysis has many elements such as calculating the operating costs of all options. However, it also contains elements that are harder to quantify such as the environmental effects. These effects,which are not directly imposed on the operators, are considered external factors. External factors (that is, externalities) can either be negative or positive. When attempting to conduct a cost analysis externalities must be included, since someone in the community does eventually bear the external costs and benefits of them. The analysis also should consider the various external costs associated with each option. The negative externalities associated with landfills include environmental effects to the surrounding area. The environmental effects arise from the greenhouse gasses (such as methane) emitted from landfills when waste decomposes, the potential groundwater pollution through toxic seepage, and air pollution from the transportation of waste. The local externalities include decreased property values in the areas surrounding landfills, increased traffic, and increased traffic accidents (Jackson and Strauss, 2007).The required information to carry out cost analysis includes details on landfills and waste management, such as listing and quantifying the private and social costs of waste.

Another important cost to consider is social cost of health risks caused by air and water pollution. Recycling costs and benefits, job creation and the resold of recyclables materials are also to be considered (Jackson and Strauss, 2007).The development of an effective solid waste management system in Qalqilia City needs a benefit cost analysis study which is to be the road map for enhancing and improving the quality of MSW collection and disposal services and reducing the annual cost of SWM system.

3.2 Cost Estimate Consideration:

For estimating the cost of MSW management system, the full cost accounting (FCA) procedure which is derived from the Municipal Solid Waste Management Full Cost Accounting Workbook for Local Governments in Florida 1997, is to be used. The FCA is a tool that helps to assess and report accurately and consistently the full costs of managing MSW. Because FCA offers a systematic approach for determining the full costs of MSW services, managers can identify accurately the cost of different MSW program options and contemplate adjustments to current levels of service FCA data can be used to help establish rates and user fees that are sufficient to recover the full costs of the MSW services provided.

FCA is a systematic method of identifying, summing, and reporting the costs incurred in providing solid waste management services to communities. In addition to the obvious and direct costs of MSW management, FCA includes both "overhead" and "hidden" costs incurred to provide necessary support services for solid waste

programs. Moreover, FCA considers the complete life cycle of MSW services from planning and administration (for example, permitting and construction of facilities) through proper closure and, if needed, long-term care of MSW facilities. In seeking to identify and include all direct and indirect costs associated with providing a particular service or program, FCA takes into account annual costs that are incurred during the operating life of a facility as a result of past and future outlays of funds. For example, the costs of capital assets may be depreciated over the expected useful life of those assets, while the future costs of closure and long-term care may be amortized evenly over the expected operating life of a MSW facility.

In implementing the FCA we focuse on all aspects of MSW management, identify all activities to be considered, clarify which costs are to be included, buildings, equipment, and properties used in MSW activities, identify human resources involved in the MSW management process, avoid double counting, include appropriate shares of indirect costs for activities that support MSW management and provides detailed cost information in a simple, concise format (FCA, 1997).

The following activities, in general, are considered in estimating the total cost for solid waste management options:

1. SW collection activities
2. Transporting activities
3. Indirect operating cost
4. Landfill activities
5. Recycling activities
6. Transferring
7. Compost activities

In addition to the above mentioned costs, the analysis also considered the various external costs associated with each option, such as groundwater pollution, transportation of waste and local property devaluation. Past studies have calculated various values for the external costs of landfills, these values are proposed to be used to calculate the external costs by using the most prevalent studies on landfills (Jackson and Strauss, 2007).

Three basic steps to calculate accurately the full cost of MSW
services and programs are summarized in the following:

1. Identify all direct costs associated with providing MSW services
2. Identify all indirect costs associated with providing MSW services
3. Using financial records, and assign directly or allocate the costs of MSW management (identified in Steps 1 and 2 above) to the various solid waste programs (for example, collection, recycling, and disposal program areas).

The calculations include estimates for the items listed in the following sections.

3.3 Wages and benefits

Wages and related benefits include the following:

- Total annual wages
- Total annual benefits (insurance, holydays). Noting that these benefits are considered additional cost for the Municipality budget.
- Total annual post employment benefits

3.4 General operation, maintenance and insurance

Includes the costs of general operation and maintenance (O&M) for MSWM operations, such as vehicles maintenance, insurance and licensing.

3.5 Depreciation of capital outlays

A “capital outlay” is an outlay of cash made to acquire a resource that will be used in MSW operations for more than one year.The established accounting technique of “depreciation” can be used to convert capital outlays into annual costs. Depreciation is a method of allocating the costs of capital outlays over the useful life of the resource,which is the period of time during which the resource is expected to provide services adequately and efficiently. A simple “straight-line” method of depreciation calculates depreciation costs by dividing the capital outlay minus any anticipated salvage value, by the useful life of the resource acquired (FCA,

1997).For example, a collection truck that costs $160,000 with an anticipated salvage value of $10,000 and a useful life of 10 years would have an annual depreciation cost of one-tenth of its total adjusted capital cost, or $15,000 (($160,000 - $10,000) ÷10) = $15,000.Under FCA, up-front costs can be depreciated evenly, on a straightline basis, over the expected operating life of the facility, no matter how far in advance of actual operation of the facility they are incurred. For example, if total costs of predevelopment and construction of a landfill are $10 million, and the landfill is expected to last 20 years, the annual depreciation cost for that landfill would be one-twentieth of the total upfront cost, or $500,000 (FCA, 1997).Buildings, vehicles, equipment, and other capital goods should be depreciated over their remaining useful lives. However, land acquired for use as a landfill has a finite useful life (capacity) and therefore should be depreciated. The cost of depreciation for all capital outlays should be recognized annually until they are fully depreciated. No depreciation expense, however, should be recorded for assets that have remained in service after their estimated useful life has ended.

3.6 Indirect costs:

Indirect costs represent the costs of essential services provided to the MSW program by other departments of the Municipality, as well as costs incurred by other departments for general administration and executive oversight.The method of allocating indirect costs requires that the Municipality first calculate the ratio of its MSW employees to its total employees. Second, the Municipality has to list the total budgets for each individual,group, or department that provides support services to the MSW program.The total budget for each individual, group, or department is then multiplied by the ratio of MSW employees to total employees. By following this methodology, the Municipality can estimate the total amount of indirect costs incurred by each individual, group, or department to provide support services to the MSW program. Subsequent allocations of indirect costs can be derived by calculating the percentage of MSW employees who are associated with each solid waste program area (FCA,1997).

3.7 Benefits:

It is important to consider all the proposed benefits associated with each MSWM option. Air and groundwater protection, reducing transportation of waste, reducing the local property devaluation, reducing health risks caused by air and water pollution, recycling benefits, job creation, resold of compost and recyclables materials, all of these benefits are to be measured and compared for each MSWM option.

3.8 **Estimating the external costs of landfill:**

The various external costs associated with landfill operations are to be considered in the estimations. Some of the most widely recognized and largest external costs associated with landfills are air and groundwater pollution, transportation of waste, local property devaluation. An important document in this field is the policy brief Getting Waste Management Prices Right, by the Resource Recovery and Recycling Authority of Southwest Oakland County. The salient information from this paper for this analysis is the summary it provides of estimates for various external costs associated with landfill operations. The marginal cost of greenhouse gas pollution is $3.27 per ton for landfills without energy recovery and $2.22 per ton for landfills with energy recovery. The odor,visibility, and general appearance cost is between $3.05 and $4.39 per ton,the costs of waste transportation to landfills (congestion, air pollution, and the increased probability of road accidents is $0.51 per ton for urban landfills and $1.69 per ton for rural landfills. (Policy Brief: Getting Waste Management Prices Right, Resource Recovery and Recycling Authority of Southwest Oakland County. January 2007).Another relevant issue is scarcity rent, which is a function of the variable costs of operating plus a component of the cost of opening a new landfill and closing the previous one. In this way, the price of landfilldisposal increases as the resource becomes increasingly scarce. The amount of scarcity rent added to the variable cost of operating the landfill will be very low when the resource – that is, the landfill – is plentiful, but increasingly becomes a factor as the resource is reaches exhaustion (Jackson and Strauss, 2007).

IV. CASE STUDY

Coverage of doorstep waste collection
Household Coverage with user fee recovery = 3,78, 419 households
No. of Waste Collectors = 2300
Supervisors = 80
Coordinators = 11
Cycle rickshaws = 689
Buckets = 5958

(4.1) : pmc ward office map

4.2 Study area

Pune is the second largest fast developing urban agglomerations in Maharashtra and ranks eight at national level. It is now rapidly changing its character from an education-administrative center to an important industrial hub and the IT center. Pune is a plateau city situated near the western margin of the Deccan Plateau. It is situated at an altitude of 560 m above the mean sea level. PMC lies between latitudes 18° 25'N and 18° 37'N and longitudes between73° 44'E and 73° 57'E and the geographical area is around 243.84 Sq.Km with a population of 3.1 million composed of 76 general electoral wards(according to 2011, Census of India). These wards were converted in 14 administrative wards by Pune Municipal Corporation (Figure 1). The density of the
city was 12,777 persons/ Sq.Km. The area in the central part of the PMC is densely populated than the marginal regions.

4.3 MSW Generation

Generation of MSW has an obvious relation to the population of the city, caused by bigger cities generate more waste. Kolkata metropolitan area generates the largest amount of MSW (11,520 TPD or 4.2 million TPY) among Indian cities.

Municipal Waste is generated as Dry Waste and Wet Waste. It is observed that the previous literature tropical countries show the higher percentage of wet waste than dry. Pune city generates dry and wet waste approximately in equal proportion (i.e. 50%-50%). The garbage generated is dependent on the activity prevalent in the area where as wet waste generation is more in residential and commercial area such as hotels or food industry.

About 40 per cent of the waste is generated from households (domestic waste), followed by hotels, restaurants and other commercial establishments which together account for over 50 per cent of the waste generated (Figure 4.4).

Table 4.4 : Quantity of Waste Generated per day- tons

Sr no.	Source	Quantity of Waste Generated per day- tons	Composition in %
1	Domestic (Households)	400	40
2	Commercials	250	25
3	Market Areas	50	5
4	Hotels and Restaurants	250	25
5	Vegetable waste (19 Markets)	50	5
Total		**1000**	**100**

Source: Revised City Development Plan for Pune - 2041,
The total waste generated is in the range of 1300 to 1400 metric tonnes (MT) per day (per capita of 500 grams per day). The waste generated was collected, transported and disposed at land fill site which is about 20 km away from Pune at Uruli Devachi from the 1st of June 2010.

PMC has stopped open dumping and total waste generated is processed scientifically.

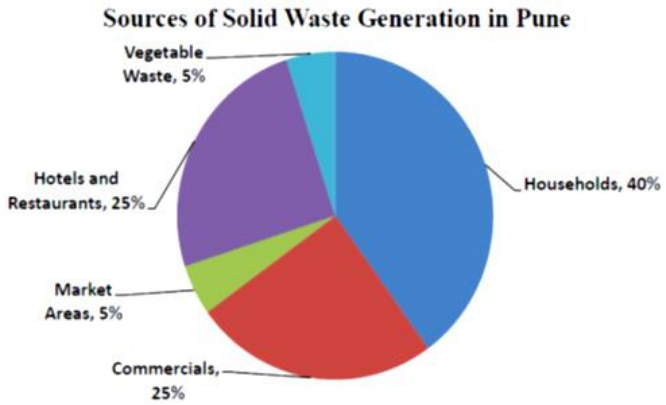

Figure 4.5 : Sources of MSW Generation in PMC

Figure 5.2 represent the ward-wise solid waste generated in MTD. It can be seen that the major contributing wards for Pune city are Mahatma Phule Smarak (Bhavani Path), Kasba Peth. This is due to higher population density in the old city areas and commercial activities.

CHAPTER 5
DATA COLLECTION

5.1Data collected by the survey from different personal in pune municipal corporation

A systematic approach was used to select the respondents for the survey. The study focused on SWM who sought care for any reason, and PMC staff. Data were collected between March and May 2016, using mixed methods (qualitative and quantitative methods). Several meetings and group discussions with the staff, implementing NGO and caregivers were conducted before designing the data-collection instruments.

Using predesigned and pretested structured questionnaires, quantitative data were collected from pmc health Department staff working in specific wards. Questions on willingness to pay for the alternative SWM were included to estimate indirect benefits; participants were asked to select one of two answers. In addition to this,data were collected from secondary sources, such as PMC records, income–expenditure statements of thePMC department, record book, files, and the health management and information system, among others.

For the collection of qualitative data, two focus group discussions and five key informant interviews were conducted among the assistant municipal commissioner and to collect the required information.

The qualitative method provided the average cost from the undesirable impact of the SWM, and the average benefits from the desirable impact of the SWM, where the estimates of invisible costs and benefits were not straightforward.The results are primarily based on quantitative data. Qualitative data play a supportive role in designing the instruments,understanding the process, and capturing the invisible benefits, among others.

Table5.2 - Segregation MSW at source Total

Waste Segregated	48% to 50%
Wards	20% to 65%
properties	42%
societies	30%
bunglows	47%
Slums and chawl	32%
Hotel and restaurant	85%

Source: Pune City Sanitation Plan, 2011

5.3 Waste Segregation

Segregation at source is the most important step in waste management and is done in two major categories: wet waste and dry waste. Wet waste is the bio degradable solid waste includes residential waste of all kinds and waste from markets and slaughterhouse. Dry waste is the recyclable solid waste that includes paper and plastic of all kinds excluding hazardous waste material.

Waste segregation was made mandatory by Hon. Supreme court and Govt. of India Gazette dated 3rd October 2001 and Municipal solid waste management and handling rules 2000. PMC has implemented solid waste segregation system for dry and wet waste in the city. 1st July 2005 was the last date for the residents for the non segregation waste collection. The corporation has started collection of only segregated waste from households which have forced the residents to segregate the waste. PMC has adopted decentralized pattern of

solid waste segregation and disposal at its source through vermicomposting. From the total waste generated about 500 Metric Tons dry waste is separated and removed by various agencies like rag pickers, crap material vendors and other NGOs. These rag pickers are segregating waste at various sources like from door step collection, ghantagadi, municipal containers and at the dumping site. There are more than 5000 registered rag pickers involved in this waste segregation process. PMC has done ground truthing in 14 administrative wards regarding solid waste segregation practice in six categorized places namely Wards, Properties, Societies, Bungalows, Slums & Chawls and Hotels & Restaurants (Table). Among these except hotels industry, other categories have poor performance in segregation of waste at source.

V. RESULT AND ANALYSIS

6.1 The following are the major suggestions for the study:

The estimation of sufficient annual budget for municipal solid waste management, the pmc has to sanction for funds as much as possible, to solve hindrance of shortage of funds utilized for solid waste management process.

It take proper step to cost allocation between programs. Some participants found it difficult to allocate costs between solid waste services. For example, it may be difficult to divide costs of individuals or equipment that are shared between programs.

Distribution of costs over time. Most local governments were able to annualize their large capital expenditures as this information was generally available through the local finance office. However, other local governments have to take initiative performing necessary expenses in municipal solid waste management.

This study suggests that finally dynamic aspect of MSWM it is challenge to the government as well as society. So it is very needed of economical support to to meet all the process of solid waste management.

VI. CONCLUSION

The solid waste management in pune city appears to be inadequate and needs up gradation. Solid waste management across multiple pune city corporation, and the number of studies presently however, three tangible conclusions can be drawn from this study a full cost analysis, local governments gain a better understanding of their solid waste management costs. A thorough knowledge of its budget helps a local government make better decisions regarding its solid waste management programs and improve program efficiencies overtime, and full cost analysis. It is commonly cited that recycling costs more than disposal. This study demonstrates that such a generalization is a myth. pune City Corporation and the support of public private partnership create and support infrastructure for environmentally sustainable and development of through full cost analysis and cost effective is very much needed to handle overall process of solid waste management such as collection & transportation system, recycling, processing & scientific disposal

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