



Chapter - I

Chapter – 1

INTRODUCTION, DATABASE, RESEARCH METHODOLOGY AND REVIEW OF LITERATURE

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Chapter – 1

INTRODUCTION, DATABASE, RESEARCH METHODOLOGY AND REVIEW OF LITERATURE

1.1 Introduction

Now a days environment has become part and parcel of living things in general and human beings in particular. It is the conducive environment that promotes growth and well being of humans as well as all the living beings. Hence, the environment has become an important and a thing of serious concern. Previously, no much attention was paid towards the environmental degradation and its evil consequences on the flora, fauna and human beings.

Environment plays three important functions, namely providing productive or environmental, assimilation of wastes. But, waste assimilation has limitations. It performs this function to some extent only. When wastes of all kinds become excessive than the assimilative capacity of environment, then it starts affecting very adversely the various segments of environment. This result in environmental pollution or degradation and it has a variety of bad effects.

Waste in general and solid waste in particular in an important environmental problem of especially urban areas or cities. It adversely affects the spheres of environment and more particularly the human beings. The growing population and increasing a variety of productive activities, concentration of socio-economic overheads in cities have

been increasing the problem of solid waste and to incur expenditure in the cities. The solid waste management has financial implications in cities. The demands to study the financial implications of solid waste management.

Belgaum is an important and famous city in Karnataka state, which is located on the border of Maharashtra and Karnataka states. Belgaum is an important industrial, commercial and educational hub with growing population as well as density of population. This shows the need for studying solid waste management and its financial implications. It is against this overall backdrop, the present study endeavours to examine the implications of solid waste management in Belgaum city, which has a municipal corporation, for the latest period by six years from 2003-04 to 2008-09.

1.2 Statement of the Problem

Belgaum is one of the developed, popular, industrial, commercial and educational centres in Karnataka. Its population has increased from 3.26 lakh in 1991 to 3.99 lakh in 2001 and further to 4.31 lakh in 2005. During 1991 to 2001, its density of population has rose significantly from 2900 to 4200 persons per square km. The number of slum households was 5915 in 2001, with 58 slum areas and 2300 population (6% of total); likewise, it has 15 marks, 331 biomedical establishments, 509 hotels and restaurants, 3951 offices and industries. The generation of solid waste in the area has increased from 120 tonne/day in 2001 to 104 tonnes/day in 2005,

and expected to increase to 160 tonnes/day in 2010. The waste generation per day is estimated at 140 tonnes. But out of this, only 108 tonnes/day (80%) is collected and transported at present. Belgaum Municipal Corporation expenditure on solid waste management has stood at Rs. 636 lakh in 2003-04 and Rs. 531.71 lakh in 2007-08. The generated solid waste causes problem of greenhouse gases in the atmosphere. Unpleasant odours and threat to aquatic life, heavy metals to the soil and consequently into food chain.

It is against this overall background, the present study intends to study the financial implications of the solid waste management in Belgaum city.

1.3 Significance of the Study

The study of financial implications of solid waste management in Belgaum has a special significance. It can be described as follows :

1. The present study for the first time, examines the financial aspect of solid waste management. This will be the first study of this kind.
2. The study significantly contributes to research in Economics of Environment about the financial side of the solid waste management in cities.
3. The study highlights before us the present practices of solid waste management and lacunas there in, those can be overcome.

4. The study guides the people about the present state of solid waste management, and proper direction of the efforts.
5. The study will be of a greater use to the local governments as well as to the state governments in policy formulation and implementation about the solid waste management.

1.4 Hypothesis of the Study

This study tests the following hypothesis.

“The growing solid waste generation demands to incur increased expenditure on its management. The proper expenditure pattern along with necessary growth, supported by recycling (reuse) facilitates the best management of solid waste.”

1.5 Objectives of the Study

Following are the major objectives of the present study.

1. To study the growth and composition of solid waste generation in Belgaum city.
2. To review the solid waste management practices and its recycling (reuse) in Belgaum.
3. To examine the growth and pattern of expenditure on solid waste management by Belgaum Corporation during 2003-04 and 2008-09.

4. To study the possibilities of the participation of other partners along with the local government in the proper management of solid waste.
5. To identify the lacunas in the proper management of the solid waste as well as financial implications, growth and pattern of expenditure or it, and suggest measures on the same.

1.6 Database and Research Methodology

The present study endeavours to study all the dimensions of the problem of solid waste management before the cities. The study tries to examine the growth of solid waste and its management along with its financial implications with references to the Belgaum city, and its corporation for the latest period of six years from 2003-05 to 2008-09. The present study relies on both the secondary as well as primary data.

The necessary secondary data has been collected from the publications of Belgaum Municipal Corporation such as Budgetary Documents, Action Plan for Solid Waste Management, Socio Economic Survey as well as important publications of the state government.

The primary data about the various aspects of solid waste management practices, its nature and extent, satisfaction and expectations of the citizens, participation of other partners etc. has been collected by administering a well structured questionnaire,

and holding discussions and interviews, for this, the non-probabilistic sample of in all 50 respondents was taken, that consisted of the stratified sampling of teachers 10, corporators 5, professional 5 (Engineers, Doctors, Chartered Accountants).

The collected both the secondary as well as the primary data was classified and tabulated in the light of hypothesis, objectives and chapter scheme of the study. The tabulated data was processed by employing the suitable statistical tools like compound growth rate, standard deviation, mean, correlation, regression and others. For this, the use of computer software packages like Excel, SPSS was made.

The present study makes use of the parameters such as growth of solid waste, growth of expenditure on waste management, extent of recycling pattern on expenditure, practices of waste management, extent of waste collection, argumentation of revenue, participation of others in waste management.

1.7 Chapter Scheme

Following is the tentative chapter scheme of the present study.

- Chapter – 1 : Database, Research Methodology and Review of Literature
- Chapter – 2 : Growth and Composition of Solid Waste in Belgaum City
- Chapter – 3 : Solid Waste Management Practices in Belgaum City

Chapter – 4 : Financial Implication of Solid Waste
Management for Belgaum Municipal
Corporation

Chapter – 5 : Conclusions and Suggestions
Bibliography

1.8 Review of Literature

The literature on solid waste and its management can be classified into theoretical, conceptual and research oriented literature.

Reddy, Sudhakar S. and Gulab S. (1999)¹ studied the different concepts like –

- a) The economic and environmental assessment of solid waste management with reference to Hyderabad Municipal Corporation. They have examined the issues like experiences of composting of municipal solid waste in different parts of the world, scale of operation and success/failure, performance of completing.
- b) Reddy and Gulab enclosed the another project namely 'Management of Urban Organic Waste in India : A Case of Hyderabad City'.

In the third chapter of the study, they studied the composting practices in Hyderabad city, profile of Hyderabad city and variants of scale of operation. The city has two types of composting practices,

namely centralized and decentralised composting, anaerobic composting. The anaerobic composting is a method of composting, the organic wastes that are decomposed by the activities of anaerobic micro organisms in the absence of air particularly oxygen. The Municipal Corporation of Hyderabad has entered into an agreement with private sector companies for this type of composting units to generate power and pellets. Lastly, the project study examined the environmental impact with significant increase in logarithm of hydrogen ion concentration, electrical conductivity, pH, penta acetic acid (PTPA). The project observed the significant changes in the textural character of soil of the farmers field.

Another study done by same authors Sudhakar Reddy and Gulab (2000)² in this project they have analysed the role of community based organisations, civil society and NGO's in solid waste management with reference to Municipal Corporation of Hyderabad and nine Municipalities. There were different agencies which are involved in solid waste management namely formal sector and informal sector agencies. The formal sector agency includes local civic bodies and private sector. The informal private sector agencies include NGO's and CBO's. The characteristics of solid waste in developing cities demand two issues to be kept in management of solid waste namely frequent collection and appropriate vehicles for the transportation of solid waste. They have studied the scheme called 'Voluntary Garbage Disposal Schemes'. This scheme is operating in 1123

residential colonies. This scheme has worked very well in Hyderabad city and at present about 550 tricycles are from house to house and collect the waste and dump it at the pre-designated place.

At the last part of the project the study examined the role of non-government organisation. A case of Sukuki Exnora, this is an non-governmental organisation affiliated to the Madras based excellence novelty and Radical International established in 1998.

Dr. Mahamuni, V. V. (2002)³ has studied the nature and practices of solid waste management with reference to Kolhapur Municipal Corporation.

The first chapter deals with the research methodology and database of present study, objectives of the study, methods of data collection and methods of data analysis.

The second chapter deals with the environment concept and environmental economics. In this chapter concept of environment, working of environmental system, different bio-geochemical cycles, human environment, environmental problems like pollution and global awareness were explained.

The third chapter deals with the review of literature of solid waste management systems. This topic deals with the issues related to generation, collection transfer, reuse, recovery, reutilization and role of private sector, informal sector, NGO's, CBO's and community participation in solid waste management.

The fourth chapter deals with the profile of study area, legal provisions regarding the solid waste management. The factors that were affecting the solid waste management in Kolhapur Municipal Corporation area.

The fifth chapter deals with the sources of solid waste generation, quantity of solid waste and physical, chemical and biological characteristics of solid waste were studied.

In the sixth chapter, they have studied solid waste management of Kolhapur. In this administrative setup, storage, collection, disposal were studied.

The seventh chapter deals with characteristics of sample household, opinions and suggestions of samples heads of households.

The eighth chapter deals with projection of energy from recycling of organic waste in Kolhapur.

The ninth chapter deals with the impact of solid waste on environment.

The tenth chapter deals with main findings and conclusions. This chapter gave the suggestions for the better solid waste management in the Kolhapur Municipal area.

Cointreau (1982)⁴ carried out one of the first inventory studies concerning environmental aspects of solid waste management followed it up in 1984 with a study on recycling of municipal solid waste. Since then series of research studies have been carried out.

Issues covered by the studies on solid waste management broadly covers the following aspects;

- a) Whether the formal system of urban government bodies handle solid waste management efficiently?
- b) Whether the involvement of private agencies, non-government organisation (NGO's) and community based organisation (CBO's) improves the efficiency in solid waste management?
- c) What is the role of the informal sector in solid waste management?
- d) What are the rural urban linkages in solid waste management?

Another study is being conducted by Mr. Ogra Aurobindo (2000)⁵ in Centre for Environmental Planning and Technology (CEPT), Ahmedabad. The study is based on the practical observations in area of solid waste management in Dehradun city. The outcome of the study is "Logistic Management and Spatial Planning for Solid Waste System" using geographic information system (GIS).

1. This system will help to identify the exact location of dust bins properly along the entire city. This is an innovative system of managing solid waste by using spatial analysis tools. The objective is simply to increase the revenue

base of the local bodies and deliver the services in an efficient way.

2. The minimum distance between the dust bins can be found easily using GIS system.
3. Location of problematic area where more waste is collected can be found based on the waste generated from different areas and particular storage bins.
4. Proper inventory of the bins will be available ward wise/sector wise.
5. Each bin will be having a unique number by which bins can be located easily for the complaint redressal system.
6. Identification of the areas where the platform needs to be raised.
7. Identification of the areas where hoarding can be provided for the bins.
8. Daily waste generation maps showing the waste generated along the main roads, along the streets and ward wise, sector wise.
9. Identification and inventory of the permanent and temporary sweepers ward wise, sector wise.
10. Lifting cycle pattern identification based on the waste generated along the main roads.

From this innovative system one can define the travel collection route waste generating areas, presence of NGO's location of bins, efficient redressal system, cost reduction and efficient planning for the overall solid waste management system for a city.

According to Karnataka State Policy on Integrated Solid Waste Management (2000)⁶ municipal solid waste management is a major task of the local government, typically accounting for sizeable portion of the municipal budget – about 20% to 50%, yet the urban local bodies (ULB's) are unable to provide effective services. MSW Rules : it includes –

- a) Dumping of MSW in oceans, open areas, and compaction or bailing are not acceptable.
- b) The biodegradable waste has to be processed by means of composting, vermi composting, anaerobic digestion or any other appropriate biological processing for stabilization of wastes.
- c) Mixed waste containing recoverable resources should be recycled.
- d) Other technologies for treatment such as pellitisation, clarification, incinesation etc. require clearance from Pollution Control Board before planning and implementation.

- e) Land filling should be the waste disposal method for non biodegradable, inert waste and other waste that is not suitable either for recycling or for biological processing.

The objectives of this state municipal waste management plan are :

- a) Providing directions for carrying out the waste management activities.
- b) Establishing an integrated and self contained operating framework for MSWM.
- c) Enhancing the ability of ULB's to provide effective waste management.

In Karnataka the total amount of waste generated per day was 4312 tonnes except Bangalore, and total amount of waste collected was 3304 tonnes per day.

Another study was conducted by Dr. Hoestti and Basaling (2006)⁷ they published book namely "Prospects and Perspectives of Solid Waste Management".

About the book :

Chapter first deals with general aspects and basic principles of solid waste management.

Chapter second deals with the solid waste management in USA and solid waste management of US, India and rest of the world are explained in chapter fourth. Manuals of biomedical waste is collected

and provided in chapter five and chapter sixth deals with hazardous waste management and urban agriculture and solid waste management. At last the comparative approach to SWM in US and in India.

It is observed that a good number of books are available on the technology, principles of waste treatment, however meager titles exist on waste manuals. Hence, book is an appropriate attempt to fill the lacuna. This book will be for undergraduate and graduate students, environmental managers and general as well.

Another study by Shri Satishkumar R. and TV Ramachandra "Solid Waste Management System Using Spatial Analysis Tolls" (2000)⁸

Urban society generates and rejects solid material regularly. Due to rapid increase in production and consumption, volumes of wastes generate have increased considerably. Improper management of these wastes led to public health hazards, most parts of India are not efficient in handling wastes, when compared to developed countries. In order to improve the present practice, an effort is made to arrive at optimal solid waste management strategy.

This study is being carried out at Indian Institute of Science (IISC) campus, Bangalore, India. IISC campus sprawling over 180 hectares with interdisciplinary activities have generate various kinds of wastes ranging from paper, plastic materials, garbage etc. to metal, glass, construction debris, hazardous wastes, quantification

of various wastes from different sector through field investigations covering collection mechanism, primary constituents, rates of generation were done. Apart from this litter generated in vegetative and other areas has been quantified through land use analysis. Optimal management strategy is proposed with these attribute information and various layers of spatial information i. e. road network, distribution of bins, types of bins, land use, topography and drainage work.

Solid Waste Management in Kottayam Town (Project No. 195/99) (1999)⁹ by Prof. Varkey Mathew, this project conducted provides information and suggestion for establishing an effective solid waste management system to Kottayam town.

Objectives of Project :

1. To assess qualitatively and quantitatively the solid waste being generated in the town.
2. To examine the existing system in large and small quantitative.
3. To conduct studies on possible solid waste disposal system – emphasis on recycling, or conversion into useful product, into small scale.

The project was done into 2 phases :

1. A detailed study for assessing the quality and quantity of solid waste in Kottayam town.

2. An action research for disposal of solid waste by way of processing, recycling/reuse, at local level without the need for transportation and massive disposal.

Community based solid waste management project by Dr. G. William, Borda Partner, RLHP (2000)¹⁰ in this study the project did the effort towards preventing environmental pollution, discussion were held with member of two communities of Ranganathnagar and Leprosy colony in Srianagapattana in Mandya district of Karnataka. A total 80 families live in these two slums. Taking stock of solid waste and contamination it was causing in these slums and surrounding areas, the community members expressed the need for solid waste management intervention and pledged support for the project. The project was launched with the distribution of two dust bins red and green, to each family and each family contributed Rs. 5 towards the purchase of dust bins. The families assured taking responsibility for segregation of dry waste and wet waste at source and for the safe disposal of the same in two pit unit.

This project helps to keep homes and their respective areas of operation clean from pollution, thereby improving the health of the community.

Another book is published namely 'Integrated Solid Waste Management : A Life Cycle Inventory with CDROM' (2002)¹¹. The first edition described the concept of Integrated Waste Management (IWM) and the use of Life Cycle Inventory (LCI) to provide a way to assess

the environmental and economic performance of solid waste systems, actual examples of IWM systems and published accounts of LCI models of solid waste are now appearing in the literature. To draw out the lessons learned from these experiences a significant part of this 2nd edition focuses on case studies both of IWM systems, and of where LCI has been to assess such systems. The 2nd edition also includes updated chapters on waste generation, waste collection, central sorting, biological treatment, thermal treatment, land fill and material recycling.

This 2nd edition also provides a more user friendly model (IWM-2) for waste managers to make it more widely accessible. This edition provides the new tool in window format, with greatly improved input and output features, and the ability to compare different scenarios. A detailed users guide is provided to take the reader through the use of the IWM-2 model, step by step. IWM-2 is designed to be an "Entry Level" LCI mode for solid waste user friendly and appropriate to user's starting to apply life cycle thinking to waste system while more expert users will also find many of the advanced features of IWM-2 model helpful.

The book written by Dr. P. A. Koli and Dr. V. V. Mahamuni (2002)¹² namely 'Environmental Economics of Solid Waste Management'.

The contents of the book are –

1. Environment : Concept and Economics
2. Solid Waste Management System a review of literature
3. Legal provisions of solid waste management
4. Sources, composition and magnitude of solid waste
5. Solid waste management of Municipal Corporation
6. Economics of solid waste management
7. Impact of solid waste on urban environment and health of conservancy workers
8. Opinions and suggestion for solid waste management.

From the days of primitive age human and animals have been using the resources of earth to support their life and dispose the waste. But in early times the disposal of human and other waste did not pose any significant problem for the reason that population was small and the amount of land available for the assimilation of waste was large. But the growing needs and greeds of humans put higher demand for environment resources which led to increasing human activities. Human activities involve utilisation of energy, air, water, soil and other solid materials and production as well as consumption of goods resulting in residual waste materials. While the inputs like energy, water, raw materials etc. sustained the momentum of growth and development of the area. The book highlights that waste materials need to be properly managed to keep the environment clean and safe.

The book also explained that if solid waste is recycled and reused in rational manner, it brings some income to the city authority as well as it protects the environment.

The article was published by Adam T. Samargon (1994-95)¹³ entitled as "Global Perspective on Solid Waste Management". It consists of 6 parts : 1st part according to author modern world function are as a throw away society. The price for that is a growing problem of how to handle all the waste that is generated. Precious space for it is decreasing. The solution is not just reducing, reusing and compositing, but also a complete re-education of how we live. A mere 13% of American waste is recycled, recycling is resource recovery programme, which extent the globe's mineral supply by reducing the amount of virgin materials and need to be removed from the globe to meet the demand.

Part – II deals with introduction. Waste management is a vital component of the environmental movement. Everyone on the plant contributes to the problem. The solution is, very simply reducing, reusing and recycling.

Part – II consists of literature of review. In this section – A – a fossil fuels : This fossil fuels are non-renewable natural resources that originate in the earth, crust, for example : phosphate rock is strip-mined in Florida, all this mining and processing of fossils fuels can cause land disturbances, erosion, air pollution etc.

Section – B deals with Land fills. In India till 1988, over 5500 land fills took 80% of municipal solid waste. By 2009, four of five land fills operating today will be full. New land fill can cost near \$ 90 million.

Section – C consists of incineration burning of solid waste in incinerators kills disease carrying organisms and reduces the volume of waste by 90% and weight by 75% over 100 incinerators exist in India and 250 are being planned for use.

Section – D deals with recycling and section – E deals with reducing and recycling. Section – F deals with composting and Section – G deals with hazardous waste.

In conclusion article says that 50% to 80% of national resources could be recycled by 2012. some measures to achieve this includes enacting a national bottle bill into law, banning disposal of plastic items, requiring labels on products made by recyclable materials and providing subsidies for secondary material industries and conducting waste reduction programmes.

The model was developed by Shri Hita Unnikrishnan, Brunda Gowrav and Sabrina Juthanbu (2004)¹⁴ as “Sustainable Decentralized Model”.

The model attempts to access the various factors that govern the subsistence of decentralised solid waste management system in urban India. The model studied composting facilities in decentralised manner in Bangalore city. The parameters covered under the study

were the technology and technical expertise, managerial influencing factors and economic viability. Our findings indicate that success and long term sustain ability of the model depend on sustenance parameters to varying degree.

The model emphasises the quantum of waste generated and it varies between 0.2 – 0.4 kg./capital day in urban cities. Municipal agencies spends 5% to 25% of their budget of municipal solid waste, which is Rs. 75 – 250/capital/year.

Sustainable decentralised model has many indirect advantages. The localised collection and processing of wastes, avoids the carting of wastes to far off dumping sites. It reduces the expenditure of imported diesel, consequent traffic congestions etc.

The findings of the project indicate that sustainability of a decentralized waste treatment option, which can be achieved with adequate municipal and residential support and the dedicated efforts of these people involved in actual running of the operation.

“An Assessment of Solid Waste Management through Public Participation in Valley of Flowers National Park” Uttaranchal, by Shiva Gurg (2006)¹⁵ to obtain the master degree in Environmental Science. The report is submitted to Gurukul University, Haridwar.

Its contents are as follows :

- I) Introduction
 - 1.1 Solid Waste
 - 1.2 Solid Waste Management

- II) Objectives
- III) Review of Literature
- IV) Materials and Methods
 - 4.1 Study Area
 - 4.2 Methodology
- V) Results and Discussion
 - 5.1 Findings
 - 5.2 Discussion
 - 5.3 Problems
 - 5.4 Recommendations
 - 5.5 Conclusion

The foregoing review of literature relating to my research topic reveals that the number of research studies have undertaken of solid waste management. They have been mainly undertaken in Environmental Science and Environmental Economics. Some aspects of solid waste management have been covered in research in Environmental Economics. But an important aspect of solid waste management in Environmental Economics which is totally missing, that is financial implications of solid waste management, especially in urban areas. This has a special importance particularly for the urban local bodies like municipal corporation. The present study will focus

on that particular important issue and fill in the gap in researches on solid waste management.

1.9 Concluding Remarks

The financial implications of solid waste management in urban areas has a vital importance in Environmental Economics. It is a untouched aspect of solid waste management in Environmental Economics. The present study has focused of that aspect only. Hence, the present research study will be an innovative and new addition to the research of solid waste management in Environmental Economics.

1.10 References

1. Reddy, Sudhakar and Gulab S. (1999), Management of Urban Organic Waste in India : A Case of Hyderabad City.
2. Reddy, Sudhakar and Gulab S. (2000), Solid Waste Management in Hyderabad City : The Role of Local Bodies and Civil Society.
3. Mahamuni, V. V. (2002), Economic Analysis of Solid Waste Management in Kolhapur Municipal Area : An Environmental Perspective.
4. Cointreau Levine, Sandra (1982), Environmental Management of Urban Solid Waste in Developing Countries, A Project Guide, World Bank Urban Development Technical Paper No. 5, World Bank, Washington.
5. Ogra Aurobindo (2000), Logistics Management and Spatial Planning for Solid Waste Management System, Using Geographic Information System, Consultant and Coordinator Uttaranchal State Operation, Dehradun.

6. Government of India has notified the Municipal Solid Wastes Rules (2000).
7. Hoestti and Basaling B. (2006), Prospects and Perspectives of Solid Waste management, Prof. and Chairman of Applied Zoology, Wild Life and Microbiology, Kuvempu University, Shimoga, Karnataka.
8. Satishmukar, R. and Ramachandra T. V. (2000), Solid Waste Management System Using Spatial Analysis Tools.
9. Varkey Mathew (1999), Solid Waste Management in Kottayam Town, Project No. 195/99.
10. William G. (2000), Borda Partner and Rural Literacy and Health Programme (RLHP) Member.
11. Publisher : Blackwell Science, Edition Number 0002, No. of Pages 513 (2002), Integrated Solid Waste Management : A Life Cycle Inventory with CDROM.
12. Koli, P. A. and Mahamuni, V. V. (2002), Environmental Economics of Solid Waste Management, Jaipur University Book House (Pvt.) Ltd., 2005, VII, Page No. 186.
13. Samargon Adam Joshua (1994-95), Updated on 28th June 1999, Global Perspective on Solid Waste Management.
14. Unnikrishnan Hita, Brunda Gowrav and Sabrina Jathanha (2004), Sustainable Decentralised Model for Solid Waste Management in Urban India.
15. Shiva Gurg (April 8, 2006), An Assessment of Solid Waste Management through Public Participation.