Annexure -III
UNIVERSITY GRANTS COMMISSION
BAHADUR SHAH ZAFAR MARG

NEW DELHI – 110 002

Final Report of the work done on the Minor Research Project
(Report to be submitted within 6 weeks after completion of each year)

1. Project report No. Final : **Final Report**

2. UGC Reference No. : **F-23-2194/10 (WRO) dated – 6th Oct., 2010**

3. Period of report: from : **December 2010 to December 2012.**

4. Title of research project : **"*The Study of Urban Services in Municipal Corporation: in the Context of Urban reform in Solapur City*"**

5. (a) Name of the Principal Investigator : **Mr. S. J. Neela**

(b) Deptt. and University/College where Work has progressed : **Walchand College of Arts and Science, Solapur 413006**

6. Effective date of starting of the project : **November, 2010.**

7. Grant approved and expenditure incurred during the period of the report:
a. Total amount approved Rs. : **Rs.1, 20,000/-**

b. Total expenditure Rs. : **Rs. 1, 21,799/-**

Report of the work done: (Please attach a separate sheet)

i) Brief objective of the project :

1. To conduct survey of sources of municipal solid waste in Solapur city.
2. To study the impact of solid waste handling and disposal on human health.
3. To study the resource recovery and recycling potential from municipal solid Waste.
4. To suggest some measures for evolving sustainable municipal waste Management system.

ii) Work done so far and results achieved and publications, if any, resulting from the work (Give details of the papers and names of the journals in which it has been published or accepted for publication:- **2 Papers-Prints enclosed** :

iii) Has the progress been according to original plan of work and towards achieving the objective: **Yes**

iv) Please indicate the difficulties, if any, experienced in implementing the project: - **No**

v) If project has not been completed, please indicate the approximate time by which it is likely to be completed. A summary of the work done for the period (Annual basis) may please be sent to the Commission on a separate sheet: **No, the Project has been Completed to my Satisfactions.**

vi) If the project has been completed, please enclose a summary of the findings of the study. Two bound copies of the final report of work done may also be sent to the Commission:- **Two Copies of the Final report are attached**

vii) Any other information which would help in evaluation of work done on the project. At the completion of the project, the first report should indicate the output, such as (a) Manpower trained (b) Ph. D. awarded (c) Publication of results (d) other impact, if any- **Two Research Papers Published**.

(Mr. S. J. Neela)
PRINCIPAL INVESTIGATOR

(Dr. A. H. Manikshete)
PRINCIPAL

Annexure – VIII

UNIVERSITY GRANTS COMMISSION

BAHADUR SHAH ZAFAR MARG

NEW DELHI – 110 002

PROFORMA FOR SUBMISSION OF INFORMATION AT THE TIME OF SENDING THE

FINAL REPORT OF THE WORK DONE ON THE PROJECT

1. NAME AND ADDRESS OF THE PRINCIPAL INVESTIGATOR: - **Mr. S. J. Neela**
2. NAME AND ADDRESS OF THE INSTITUTION: - **Walchand College of Arts and Science, Solapur 413006**
3. UGC APPROVAL NO. AND DATE : - **F-23-2194/10 (WRO) dated – 6th Oct., 2010**
4. DATE OF IMPLEMENTATION : - **November, 2010**
5. TENURE OF THE PROJECT : - **2 Years**
6. TOTAL GRANT ALLOCATED : - **Rs. 1, 20,000**
7. TOTAL GRANT RECEIVED : - **Rs. 95,000/-**
8. FINAL EXPENDITURE : - **Rs. 1, 21,799/-**
9. TITLE OF THE PROJECT : - **"*The Study of Urban Services in Municipal Corporation: in the Context of Urban reform in Solapur City"***
10. OBJECTIVES OF THE PROJECT : -

I) Brief objective of the project :

1. To conduct survey of sources of municipal solid waste in Solapur city.
2. To study the impact of solid waste handling and disposal on human health.
3. To study the resource recovery and recycling potential from municipal solid Waste.
4. To suggest some measures for evolving sustainable municipal waste Management system.

11. WHETHER OBJECTIVES WERE ACHIEVED: - **Separate Sheet attached**
(GIVE DETAILS)

12. ACHIEVEMENTS FROM THE PROJECT :-

13. SUMMARY OF THE FINDINGS :-**Separate Sheet attached**
(IN 500 WORDS)

14. CONTRIBUTION TO THE SOCIETY : - **Separate Sheet attached**
(GIVE DETAILS)

15. WHETHER ANY PH.D. ENROLLED/PRODUCED: - NO
OUT OF THE PROJECT

16. NO. OF PUBLICATIONS OUT OF THE PROJECT: - **2 Papers-Prints enclosed**
(PLEASE ATTACH RE-PRINTS)

(**Mr. S. J. Neela)** **(Dr. A.H. Manikshete)**

PRINCIPAL INVESTIGATOR **PRINCIPAL**

SUMMARY OF THE FINDING

With the rapid urbanization and uncontrolled growth rate of population in cities, municipal solid waste management (MSWM) has become acute in India. Municipal solid waste management is given low priority among the all urban environmental problems. Lack of financial resources, institutional weaknesses, lack of proper advice, guidance and control, improper choice of technology and public apathy towards municipal solid waste (MSW) has made this service far from satisfaction. The current practices of the uncontrolled dumping of solid wastes on the outskirts of towns and cities have created a serious environmental problem and a serious threat to the public health.

Urbanization is a common process in all the nations and it is has become a global phenomenon. Its ramifications are more pronounced in developing countries. Growing population, reclassifications of habitation patterns and migration trends are important in urban population in India. As per 2001 census, the population of urban India was 285 million, which accounts for 27 per percent of the total population of the world. Global experience shows that when a country's urban population reaches above 25% of the overall population, the pace of urbanization accelerates. The case of Indian cities is almost same. Municipal bodies in India provide Solid waste management services in most of the cities as an essential service, but it is not attaining proper priority, which it deserves. These solid waste management services are very poor.

The present scenario of Indian cities and streets are generally treated as the receptacles of waste. As a result, unsanitary conditions affect overall human health in particular and environment in general. Waste management and disposal is a growing environmental concern in almost all cities in India. Waste paper, plastic, metal, glass, rubber, rags, and so on are thrown on the streets along with domestic, trade, and institutional wastes are very common. There is partial segregation of some recyclable wastes. Transportation is not well coordinated right from the stage of collection, resulting in multiple and manual handling of waste to the end of treatment. The handling and collection method is injurious to the health of workers. Solid waste transportation systems are characterized by poorly maintained equipment that is inefficiently operated. Wastes are dumped or disposed of on the roadside or open

spaces within or just outside the city boundaries. The method of crude dumping is adopted for waste disposal without spread, compacted or covered.

Proper disposal of the urban wastes is not only essential for reducing its adverse human health and environmental impacts, but also presents a large potential for resource recovery. Solid waste management systems include onsite-handling, storage, collection, transportation, processing and recovery and final disposal. The municipal solid wastes (MSW) are heterogeneous in its nature and vary with respect to their individual components and size, moisture content, density etc. Waste composition also affects an effectiveness of the waste management system. As per the experience in Indian cities, there are many challenges in this area including analysis of quality and quantity of these wastes, as well as appropriate institutional mechanisms.

The study will be limited to the municipal solid waste of Solapur city as a case study. In the present paper, it has been planned to study the impact of municipal solid waste on surrounding area and its management in and around Solapur city. In the present investigation the detailed study of the solid waste disposal sites located within the city area and at the border areas of Solapur city at about 07 to 10 Km is made and some possible solutions have been recorded. It will also help the researchers to do further research on the concerned topic.

Recommendations for adoption of the measures below.

Awareness-raising:

1) At the national level to protect individuals and communities from the adverse impact of toxic and dangerous health-care waste on their human rights, including the right to life, the right to health and the right to a safe environment, States take all appropriate measures to raise awareness of the problems, especially among policymakers and communities living in the vicinity of sites where waste is incinerated or land filled.
2) Non-governmental organizations working in the field of public health or environmental protection should include the promotion of sound health-care waste management in their advocacy and conduct programmers and activities that contribute to sound health-care waste management.
3) In some cases, a healthy lifestyle represents the most efficient way to avoid medical treatment and the waste it generates as a by-product.

4) States that have not yet adopted a specific law on health-care waste management principles of international environmental law, such as the precautionary and the "polluter pays" principles, should be taken into account when drafting such legislation.

5) This legal package should specify approved methods of treatment and disposal for different waste categories identify safe practices for the minimization, segregation, collection, storage and transport of waste and outline the responsibilities of public health authorities, the national environmental protection body, managers of health-care facilities and managers of private or public waste-disposal agencies.

6) The health authorities should organize educational programmes and training opportunities to raise awareness about health, safety and environmental protection issues relating to medical waste management and occupational risks to which they are exposed and on the correct procedures for handling waste in a safe manner.

7) The appropriate personal protective equipment for persons handling hazardous health-care waste should be provided.

8) The donor community, international and regional organizations, financial institutions and the private sector to provide developing countries with technical assistance and financial support to help them achieve safe and sustainable management of medical waste. Technical assistance should include the transfer of scientific and technological knowledge, as well as state-of-the-art technologies for the safe disposal of hazardous medical waste, such as autoclaving and non-burn technologies.

9) Recycling Waste segregation at source is a basic requirement for the recycling of non-hazardous components of health-care waste. Some kinds of hazardous waste can also be recycled.

10) A disposal method of hazardous medical waste be substituted with more environmentally-friendly and safe methods of disposal.

Mr. S. J. Neela
Principal Investigator

CONTRIBUTION TO THE SOCIETY

Since from 1950's due to expanding cities with quickly increasing populations, land use pattern caused concerns for many of the existing dumps. Household wastes varied, but quantitatively very less as compared to today's waste quantities. There were no plastic containers, only glass bottles and tin cans were the main containers. Paper boxes were in use for breakfast food and meal packing. Pop, beer and milk were being served in returnable glass bottles. By the mid-1990s the situation for the municipal service company became intolerable. Solid waste handling equipment was of no more use as it was old and obsolete. Illegal dumping of solid waste had become a major problem. The problem of solid waste gave rise to several health related problems. In contrast, today, one is impressed by the cleanliness of the streets, new collection trucks are out and visible, collection points are safe and there is much confidence in the system.

Though the solid waste was there in past, it was not a big issue. Garbage dumps and burning dumps were located everywhere in the cities. These wastes were characteristically much different than today's wastes. The household wastes were comparatively less in volume and less problematic than today. Most meat, fruit and vegetables where bought preferably fresh from markets or were raised and processed by the household techniques involving least or no chemicals. Canning was the common method for preservation of food. Fruit and vegetables were usually sent home in paper bags or burlap bags those could be reused. But today the situation has drastically changed and has become worst in many cities and has been considerably improved by proper management techniques in a few cities.

The findings of the project will help reduce the health related problems. It will also serve as a solution to the problem of electricity, as the project recommends formation of the electricity production units based on solid waste management. The project also recommends various projects based on solid waste material. The recommendations have been mentioned in the project and summary of the findings.

Mr. S. J. Neela

Principal Investigator

Final Report of the work done on the

Minor Research Project

(F. No. 23-2194/10 (WRO) dated **06.10.2010)**

"The Study of Urban Services in Municipal Corporation: in the Context of Urban Reform in Solapur City"

Submitted to

UNIVERSITY GRANTS COMMISSION

Western Regional Office,

Ganesh kind, Poona University Campus,

Pune - 411 007 (MAHARASHTRA)

By

Mr. S. J. Neela

Principal Investigator

Walchand College of Arts & Science,

Solapur-413 006

October -2014

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ACKNOWLEDGEMENT

Firstly, I am very much thankful to Dr. A.H. Manikshete, Principal, Walchand College of Arts and Science, Solapur for his help by providing necessary facilities during research tenure. I take this opportunity to express my deep sense of gratitude towards my research guide, Dr. Mallikarjun Minch, Head, Department of Pollitical Science, A. P. Porwael College, Sindagi, Karnataka.

I heartily thank Dr. S.N. Salawade, Head & Associate Professor, Department of Political Science, Walchand College of Arts and Science, Solapur for extending support and cooperation in completing this project.

I would also thank my institute and my colleagues and non teaching staff without whom the project would have been a distant reality. I also extend my heartfelt thanks to my family and well wishers.

Date:

Place: Mr. S. J. Neela

Urban Services in Municipal Corporation: In the Context of Urban Reforms in Solapur City

Chapter: 1

Introduction

Solid waste management is one among the basic essential services provided by municipal authorities in the country to keep urban centers clean. However, it is among the most poorly rendered services in the basket—the systems applied are unscientific, outdated and inefficient; population coverage is low; and the poor are marginalized. Waste is littered all over leading to insanitary living conditions. Municipal laws governing the urban local bodies do not have adequate provisions to deal effectively with the ever growing problem of solid waste management. With rapid urbanization, the situation is becoming critical. The urban population has grown fivefold in the last six decades with 285.35 million people living in urban areas as per the 2001 Census.

With the rapid urbanization and uncontrolled growth rate of population in cities, municipal solid waste management (MSWM) has become acute in India. Municipal solid waste management is given low priority among all urban environmental problems. Lack of financial resources, institutional weaknesses, lack of proper advice, guidance and control, improper choice of technology and public apathy towards municipal solid waste (MSW) has made this service far from satisfaction. The current practices of the uncontrolled dumping of solid wastes on the outskirts of towns and cities have created a serious environmental problem and a serious threat to the public health.

Urbanization is a common process in all the nations and it is has become a global phenomenon. Its ramifications are more pronounced in developing countries. Growing population, reclassifications of habitation patterns and migration trends are important in urban population in India. As per 2001 census, the population of urban India was 285 million, which accounts for 27 per percent of the total population of the world. Global experience shows that when a country's urban population reaches above 25% of the overall population, the pace of urbanization accelerates. The case of Indian cities is almost same. Municipal bodies in India provide Solid waste management services in most of the cities as an essential service, but it is not attaining proper priority, which it deserves. These solid waste

management services are very poor (Aliyu Baba Nabegu, 2010).

The present scenario of Indian cities and streets are generally treated as the receptacles of waste. As a result, unsanitary conditions affect overall human health in particular and environment in general. Waste management and disposal is a growing environmental concern in almost all cities in India. Waste paper, plastic, metal, glass, rubber, rags, and so on are thrown on the streets along with domestic, trade, and institutional wastes are very common. There is partial segregation of some recyclable wastes. Transportation is not well coordinated right from the stage of collection, resulting in multiple and manual handling of waste to the end of treatment. The handling and collection method is injurious to the health of workers. Solid waste transportation systems are characterized by poorly maintained equipment that is inefficiently operated. Wastes are dumped or disposed of on the roadside or open spaces within or just outside the city boundaries. The method of crude dumping is adopted for waste disposal without spread, compacted or covered.

Proper disposal of the urban wastes is not only essential for reducing its adverse human health and environmental impacts, but also presents a large potential for resource recovery. Solid waste management systems include onsite-handling, storage, collection, transportation, processing and recovery and final disposal. The municipal solid wastes (MSW) are heterogeneous in its nature and vary with respect to their individual components and size, moisture content, density etc. Waste composition also affects an effectiveness of the waste management system. As per the experience in Indian cities, there are many challenges in this area including analysis of quality and quantity of these wastes, as well as appropriate institutional mechanisms.

Study Area:

The study will be limited to the Municipal Solid Waste of Solapur city as a case study. In the present paper, it has been planned to study the impact of municipal solid waste on surrounding area and its management in and around Solapur city. In the present investigation the detailed study of the solid waste disposal sites located within the city area and at the border areas of Solapur city at about 07 to 10 Km is made and some possible solutions have been recorded.

Solapur is one of the leading urban centers in India. The management and disposal of solid waste is not scientific and it creates serious environmental problems. In sanitary method of waste disposal is also a serious health concern, particularly in rainy season. Open dumped

garbage serves as breeding ground for disease vectors such as flies, mosquitoes, cockroaches, rats and other pests. Even the surrounding areas are also suffered from garbage and associated problems. The combined effects of uncollected wastes, poor handling and inadequate disposal safeguards for municipal wastes have always implication for public health. Among these are the chances of transmission of disease and the spread of epidemics and loss of healthy urban and amenable environment.

Objectives

The present study aims to understand the qualitative and quantitative aspects in Solapur city area and its impacts on surrounding area. The study will include different aspects of solid waste management with a view judge its sustainability in a long run of time. The aspects like collection, transportation, treatment and disposal will be assessed in the present investigation. The main objectives of the present study are-

5. To conduct survey of sources of municipal solid waste in Solapur city.
6. To study the impact of solid waste handling and disposal on human health.
7. To study the resource recovery and recycling potential from municipal solid Waste.
8. To suggest some measures for evolving sustainable municipal waste Management system.

In the present investigations, samples of solid waste from dumping sites will be collected, segregated and analyzed for its composition by using known standard methods. The waste will be collected in lots in each season and segregated by adopting different methodologies by using standard methods. The qualitative and quantitative variation with seasons in solid waste will be studied by conducting survey and field visits too. The data from Municipal Corporation and other reliable sources will be studied and correlated with the present investigation. The research work will include the efforts for the exploration of possibilities of energy recovery potential of solid waste and assessment of its economic feasibility, if possible. The results will be analyzed in light of different aspects including the impact of solid waste on human health and the surrounding area.

(IV) Methodology

Primary and secondary Data will be collect for fulfill objectives.

A) Primary Data: survey of citizens. Respondents will be selected with random sample method to understand problems in Solid Waste Management. Questionnaire will be made for data collection. Interview method will be used for understand reason and constraints in Solid West Management. Interview schedule will be made for

taking interview of Mayer, Solid Waste Management committee Corporates, and administrative staff of Solid Waste Management.

B) Secondary data: form Municipal Corporation: Staff information, data regarding Solid West Management, budgets, General Body of Solid west Management Community.

Chapter: II

History of Municipal Corporation

Solapur is a Station on the South –East branch of the Central Railway, 263 Km South –East of pune 455 km South East From Bombay ,and 335 Km North –West of Hyderabad . Solapur City is the Headquarters of Solapur District, Maharashtra State .The climate of Solapur is described as healthy and dry throughout the year. It is considerably hot during the months of April and May the temperature exceeds 43 C. Though it is very hot during the day, nights are fairly cool. The rainy season ranges between June to October. The heaviest falls usually tack place during June, August and September. Solapur normally has a rain falls of about 30 inches. (Gadgil; 1965: 01)

Solapur through History

The ancient history of Solapur before the 10^{th} century is shrouded in darkness. Solapur, as a small village, passed through a number of regimes like those of Satavahana, early Rashtrakutas, Chalukyas, Imperial Rashtrakutas, etc., Which obtained in Maharashtra since 90 B.C. It was under later Chalukyas and Yadavas, in the 11^{th} and 12^{th} centuries, that Solapur began to fiourish as a religious center .The persons responsible for making solapur a religious center were 'Revanasidda' and 'Siddharama' . It is found that the Yadavas left several vestiges of their rule in solapur district among which are a few Hemadpanti temples including a temple in the Solapur fort. The fort of solapur was built originally at the time of the Adilshahi sultans of Bijapur, and rebuilt, according to inscriptions on its wall, during the reigh of Ali Adil Shah I in 1578 A.D. The history of Solapur from 1430 to 1670 was characterized by a perpetual warfare between the two of the five Bahamani off-shoots (Gadgil; 1965: 01).

History of Municipal Corporation

Solapur is found in the south eastern part of Maharashtra, near Karnataka border. Solapur is the Administrative headquarters of North and South District Which consists of eleven Talukas. Solapur was once famous as a textile capital and was even known as the labor city in ancient times

The city is having separate importance because of having on the border of three states namely, Maharashtra, Andhra Pradesh and Karnataka . The city is having mix population of three states and mix of community. According to 1991 census the city was having population of 620846 and according to 2001 it was 873009. Hence there is population growth of 40% with an area of 179 Sq. Km Geographically Solapur is located between 17.10 To 18.32 degrees to the north latitude which it is about 74.42 to 76.15 degrees to the east longitude.

Solapur is also an important junction situated on the north-south railway line. It provides connectivity between Maharashtra, Andhra Pradesh and Karnataka with it being connected by both road and rail to most cities and districts. This provides easy access to Solapur, and the reason for its flourish in industries.

Solapur is Famous for its small and medium scale industries mainly for cotton mills and power looms Chaddars (Solapur bed sheets).

HISTORY OF SOLAPUR MUNCIPALITY:

Solapur municipality, which was established in 1852, The Collector of Solapur was given the right of implementing the Government Resolution. Thomas Charles Loughnan the Collector of Solapur by his letter of 2th July 1852 nominated nine persons to constitute first Municipal Council of Solapur. All the Municipal Councilors from 1852 to 1884 were nominated by the government. However, in the next year the first elected Municipal Council of Solapur came into existence. These member were elected on the principal of property franchise. The first elected body of the Councilors consisted of twelve elected members and fifteen nominated members. Therefore, in 1888 there were thirteen nominated and thirteen elected member in Solapur Municipal Council. In 1913 T.C.Loughnan the collector of Solapur nominated the cast wise and community wise nine peoples to constitute Municipal Council of Solapur. The Collector was the President of Municipal Council up to 1884 Rao Bahadur Appasaheb Degaonkar became the first President of Municipal Council. President like Appasaheb Degaonkar, S.R.Kirloskar, G.K.Sathe and many other were influenced by National Freedom Movement. (Rananaware; 2000: 17-22)

The separate electorate for Muhammadans was created in 1924 when five seats were reserved for them. In 1926 a few seats were reserved for the Scheduled Castes. After The Indian Independence separate representation for women and Scheduled Castes. By 1950, the number of municipal Councilors was raised from fifty- two to fifty- nine (Rananaware; 2000:17-22).

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Chapter: III

The problem of Municipal Solid Waste Population-

The population of Solapur as per 1991 census was reported to be 6, 20,846 and has increased to 8, 73,009 as per 2001 census. The growth rate of Solapur is 0.4% Area of Solapur is 179 Sq. Km. the population density of each zone is as below:

Table 1

Zone	No. of Wards	Area in Sq. Km	Population as of (2011)	No. of Households
Zone 1	16	33.189	142321	31148
Zone 2	17	25.674	154664	33618
Zone 3	16	11.585	140462	30776
Zone 4	16	22.522	143023	31297
Zone 5	16	46.999	142110	31116
Zone 6	17	44.097	149809	32645
Total	98	184.066	872389	190600

Source: Solapur City Sanitation Plan, Final Draft, 2011.

Waste Generation –

Solapur city has 98 wards; are divided in 6 Zone. Each Zone consists of 16/17 wards. The existing solid waste management in SOLAPUR corporation area is scheduled zone wise. Total waste generated in SOLAPUR city is 420MT/day

Table 2

Sr. No.	Zone No.	Biodegradable	Recyclable	Debris & Slit	Green Waste	Total
1	Zone 1	35000	20000	6000	9000	70000
2	Zone 2	37500	18750	7500	11500	75000
3	Zone 3	34000	15500	6200	9300	65000
4	Zone 4	40000	12500	7000	15500	75000
5	Zone 5	32000	16000	7000	10000	65000

6	Zone 6	34000	15000	6000	15000	70000
	Total	212500	97750	39700	70050	420000

Source: Solapur Municipal corporation report. May 2010.

Institutional arrangement

Table 3

Zones	**Zone 1**	**Zone 2**	**Zone 3**	**Zone 4**	**Zone 5**	**Zone 6**
Department In	Charge	Of	SWM	In the	City	
Total no. of supervisory staff	CSI-1 SI-9	CSI-1 SI-9	CSI-1 SI-9	CSI-1 SI-9	CSI-1 SI-9	CSI-1 SI-9
Total no. of subordinate staff	Jamadar-0 Bigari-92 Driver-9	Jamadar1 1 Bigari-153 Driver-9	Jamadar-7 Bigari-54 Driver-10	Jamadar-4 Bigari-91 Driver-6	Jamadar-5 Bigari-107 Driver-6	Jamadar-4 Bigari-101 Driver-7

Source: Solapur Municipal corporation report. May 2010.

Zone wise Details of collection System:

Prevention of littering and storage- To enable citizens to dispose waste, community bins are provided at reasonable distances depending on local requirement. But still in some areas the people throw the waste in open spaces. In Solapur there are 949 community bins .And 553 open spaces where people throw the waste.

Table 4

Zone	**Container**	**Square Bin**	**Round Bin**	**Open Spaces**
Zone 1	46	82	16	98
Zone 2	23	64	54	86
Zone 3	35	117	27	93
Zone 4	21	36	44	78
Zone 5	16	100	87	97
Zone 6	46	93	42	101
Total	187	492	270	553

Source: Solapur Municipal corporation report. May 2010.

Waste Collection-

Generation of waste in Solapur is 420 MT /day out of which 347 MT/day is collected by the Corporation solid waste management authorities and 73 MT /day remain uncollected i.e.20% of the waste generated remains uncollected daily.

Table 5

Zone	Solid waste Generated	Solid Waste collected through hand carts through door to door collection (In MTD)	Number of hand carts	Labor
Zone 1	70	1.6	8	8
Zone 2	75	1.2	6	6
Zone 3	65	2.4	12	12
Zone 4	75	2.0	10	10
Zone 5	65	3.2	16	16
Zone 6	70	1.6	8	8
Total	420	12.0	60	60

Source: Solapur City Sanitation Plan, Final Draft, 2011.

Efficiency of collection of Municipal Solid Waste:

The city generates solid waste to the tune of 425 MTD of which 364 MTD is collected. Out of this 12 MTD is collected through door to door collection and 154.52 MTD is collected from community bins. Waste collected through other sources and street sweeping, market waste, commercial establishments is 201.28 MTD.

Table 6

Zones	Total Solid Waste Generated (In MTD)	Door to Door collection (In MTD)	Waste from community bins (MTD)	Waste from other sources (sweeping, markets, commercial establishments, etc)	Total Solid Waste collected (In MTD)
1	73.00	1.6	30.88	38.52	71.00
2	75.00	1.2	24.48	30.32	62.00
3	67.00	2.4	29.04	37.76	62.00
4	75.00	2.0	22.16	29.04	52.00
5	65.00	3.2	21.40	31.8	55.00

6	70.00	1.6	26.56	33.84	62.00
Total	**425.00**	**12.0**	**154.52**	**201.28**	**364.00**

Source: Solapur City Sanitation Plan, Final Draft, 2011.

Vehicles and transportation-

The waste generated is collected daily with the vehicles like truck, dumper placer, Compactor, tempo, etc.

Table 7

Zone	**Truck**	**No. of trips /day**	**dumper placer**	**No. of trips /day**	**comp actor**	**No. of trips /day**	**407 Temp**	**No. of trips / day**	**Distance from the disposal site**
zone 1	3	9	2	11	1	1	1	3	3 KM
zone 2	3	9	2	10	1	3	0	0	5 KM
zone 3	3	9	2	10	1	2	0	0	6 KM
zone 4	2	4	2	8	1	3	0	0	11KM
zone 5	3	9	2	10	1	3	0	0	11KM
zone 6	2	7	2	10	1	3	1	3	10KM
Total	16	47	12	59	6	15	2	6	

Source: Solapur Municipal corporation report. May 2010.

The problem of Municipal Solid Waste:

In the developing countries the most crucial problem is the problem of solid waste management. As per the Solid Waste Management Act 2012 the sole responsibility of the disposal of solid waste has been put upon the Local Self-Governing Bodies. The act has made it mandatory for the Local bodies all the activities like collection, separation, transportation, processing and disposal of the solid waste.

At present, in Solapur city, there 150 Rag Pickers. The process of disposal of solid waste has been made on the places where the waste is created and on the dumping ground. There are two processing centers at Tuljapur Road and Bhogaon covering 55 acres and 18 acres respectively. For the disposal of Medical waste there is a disposal center at Barshi Road on BOT basis. Throughout the city the solid waste has been collected in two stages. For this 689 sweepers are working. There is a special plant established to generate electricity from the solid waste at the premises of Tuljapur Road Fertilizer Project. Everyday 450 tons solid waste has been supplied to this project. It has a target to produce 2 Mega Watt electricity every day. This project will generate approximately Rupees One Carore every year. (Daily Sakal:

29/9/2012). The Municipal Corporation has made privatization of collection of Solid waste and the contract has been signed with Samiksha Construction, Malegaon. Along with the 35 collection vehicles the contractor has his own 50 vehicles. There are 50 small trollies, 12, containers, 12 compacters, 8 trucks, 1 mobile flush cleaner and 1 water tanker to collect the solid waste.

The problem of Tendu Leaves:

Though the Solapur Municipal Corporation has adopted Zero Garbage concept, the solid waste has not been collected regularly. Strayed cattle feeding on overflowing garbage cans, the waste mixing in to the draining water spreading bad out door and diseases is a frequent picture in the East area of Solapur city. This area has a problem of Tendu leaves. Everyday approximately 50 tons of solid waste of Tendu leaves has been created due to the business of Bidi. Everyday approximately 3.5 corer Bidis have been produced by 65000 local domestic workers who work for 18 Bidi factories and their 108 branches. These factories provide the raw material for Bidis. When the workers produce bidis the waste material like the leaf and tobacco powder spreads in to the adjacent area through air which is unhygienic for the people living in that area. As a solution to this the Municipal Corporation and the Bidi Factories have signed an MOU. It has been stated in that MOU that the workers have to deposit the Tendu Leaf waste along with the Bidis in the factory and the corporation vehicle will collect the waste from the factories. The waste has been being deposited in the factories, but the MOU has been failed as the corporation is unable to collect the waste from the factories every day. The problem of Tendu Leaves has remained unsolved (Daily Divya Marathi: 28/7/2012).

The problem of waste in the Vegetable Market:

In Solapur city especially in the premises of Laxmi Mandi, Kasturba Mandi, Murginala Madi, Sattar Feet Mandi, Madni near the railway station and Market Yard area the problem of solid waste manage is more crucial. The strayed cattle feed on the vegetable waste and also scatter the waste everywhere. The solid waste of the vegetables has not been picked up regularly. In monsoon due to rain this waste gets decomposed spreading bad out door and diseases. Near Murginala Mandi there is an open drainage system, the human waste from the public toilets spreads on the road everywhere. The vendors sell the vegetables in such condition, the remaining vegetable waste has been thrown into the gutter, which again chocks the gutters and the cycle is continued. At Laxmibai Mandi area everyday approximately 3 tons of waste has been dumped, but the corporation has arranged only one truck to collect it. The problem of the solid waste management in the vegetable markets is very crucial.

The problem of the citizens from the extension area:

On 5th May 2005, Solapur Municipal Corporation has made the highest extension, which included 11 villages and increased the city area by 179 Sq. K.M. Now 20 years have been completed. During these 20 years appropriate tax, approximately Rs. 88 corer, has been collected from the people but they have not been provided facilities such as drainage, roads and solid waste management. The Vijapur road and Hotagi road area from the extension part don't have garbage cans at various places, so people throw garbage onto the open space. This waste has not been picked up for two to three months. On some occasions the workers form the municipal corporation burn this solid waste. The smoke and ash spreads into the nearby houses. In the rainy season this waste gets decomposed causing diseases and epidemics. As drainage facility has not been provided the drain water has left on the open spaces, the garbage is also dumped onto it, increasing mosquitoes and affecting the life of the people.

The Problem of Old City Area:

In the old city area there is thick population. Though there are 1608 garbage cans in the city, they are not in the proportion of the population. The solid waste gets saturated at particular area only. Due to wind and strayed animals it is scattered onto the roads and many time into the nearby houses also. At some places small children use open space near the garbage can as toilets. The strayed animals, pigs spread this waste everywhere. The public water taps, vegetable markets all contribute to the spread of such waste. It naturally affects the hygiene of the people of that area. In 2012 there spread an epidemic of dengue infecting many people and tolling the life of more than 10 people. In the city many peon drainages cross each other, in that area drastic unhygienic atmosphere is seen. People throw the waste onto the road divider. The garbage from the garbage cans has not been picked regularly. So the concept of Zero Garbage has been failed.

Electricity Project:

In the corporation area a project of Rs.600, 00,000/- has been established, but electricity generation has not yet been started. This project has been started in the Bhogaon Fertilizer Depot. The contract has been given to the Sicom Environment Company, Bhopal. 10 acre land has been allotted for 29 years to this company. The municipal corporation would supposed to get Rs.100, 00,000/- from the generation of electricity and fertilizers. But the project is yet in process. The project was started on the basis of generating Methane gas which will help generating the electricity. Every day the collection vehicles dump the weighed garbage into this project but the solid waste remains unprocessed there.

The views of the people regarding the solid waste management by the Solapur Municipal Corporation have been collected and analyzed as follows;

Table -8

Socio-Economic Profile of the Respondents				
A	Socio-Economic Profile	Class	No of Respondents	
3	Age	below 20	24	8.00%
		20 to 40	120	40.00%
		40 to 60	147	49.00%
		Above 61	6	2.00%
4	Education	Ill-treat		0.00%
		SSC	60	20.00%
		HSC	39	13.00%
		Graduate	105	35.00%
		Post Graduate	30	10.00%
5	Gender	Male	141	47.00%
		Female	159	53.00%
7	Caste Group	SC	30	10.00%
		ST	6	2.00%
		OBC	48	16.00%
		SBC	84	28.00%
		OPEN	132	44.00%
8	Religion	Hindu	261	87.00%
		Muslim	3	1.00%
		Christen	0	0.00%
		Buddhist	9	3.00%
		Jain	27	9.00%
		Other	0	0.00%
9	No. of Family Member			%
		0-5	213	71.00%
		5-10	66	22.00%
		11-15	12	4.00%
		16-20	9	3.00%
10	No. of earning Member	1	186	62.00%
		2	81	27.00%
		3	24	8.00%
		4	6	2.00%
11	Occupation	Servant	135	45.00%
		Business	78	26.00%
		Labor	69	23.00%
		House Wife	21	7.00%
12	Yearly Income	0-50000	75	25.00%
		51000-100000	129	43.00%

		100000-250000	66	22.00%
		250000-500000	12	4.00%
		500000-above	18	6.00%
13	Mother Tongue	Marathi	165	55.00%
		Hindi	12	4.00%
		Kannada	51	17.00%
		Telgu	42	14.00%
		Other	6	2.00%
		Marwadi	6	2%
		Marathi,Hindi	6	2%
		Marathi, Kannada	12	4%

Table 9

Analysis based on ways of disposing day to day Solid Waste			
Sr. no	Ways	Frequency	%
1	Empty place nearby house	45	15.00%
2	Dustbin	102	34.00%
3	Ghantagadi	150	50.00%
4	Sweepers	3	1.00%
5	Other	0	0.00%
Total		300	100.00%

As stated in table 9 above approximately 15% people throw the solid waste in the adjacent open space. 34% people throw it into the garbage can, 50% into the collection vehicle and 1% give it to the sweepers. It means that the collection vehicle cannot reach to the 50% people.

Table 10

Analysis based on opinion about the size of dustbin				
Sr. no	Opinion			
	Yes	%	No	%
1	147	49%	153	51.00%

Above table no 10 shows that 49% people feel that the size of the garbage can placed in their area is appropriate, while 51% people said that it is appropriate. It means that the number and the size of the garbage cans should be increased.

Table 11

Do you Separate Wet and dry waste						
Sr. no	Opinion					
	Yes	%	No	%	Don't know	%
1	141	47%	147	49.00%	4	4%

The table no 11 given above clearly states that only 47% people classify the dry and wet solid waste, but 53% people don't do such kind of classification.

Table 12

Do you Know about Separation of wet and dry waste				
Sr. no	Opinion			
	Yes	%	No	%
1	201	67%	99	33.00%

Table No. 12 shows that 67% people have the knowledge of classification of dry and wet solid wastes, but 33% people don't have any knowledge about such kind of classification.

Table 13

Sr. No	Opinion	No. of Respondents	Percentage
1.	No facility of separation of dry and wet solid waste	129	43%
2.	Nobody has informed about it	66	22%
3.	Both the above	54	18%
4.	Other reasons	51	17%

Table No. 13 states that though people have the knowledge of classifying the dry and wet solid they don't do it only because there is no such facility as throwing it separately. 14% people have not been informed about it. 18% people state both the above reasons and 17% people state some other reasons.

Table 14

Analysis based on frequency of cleaning dustbin or waste on the open space nearby your home.			
Sr. no	**Frequency**		**%**
1	Regularly	117	39%
2	Occasionally	138	46%
3	Never	18	6%
4	When complained	27	9%
5	Not applicable	0	0
Total		300	100

The above table no. 14 states that when it has been asked to the people whether the solid waste thrown on to the adjacent open space and in the nearby garbage cans has been picked up regularly. Regarding this 39% people have stated that the solid waste has been picked up regularly. 46% people feel that it has been picked up occasionally, 6% people feel that the garbage has never been picked. 9% percent people said that the garbage has been picked up only when the complaint is made.

Table 15

Analysis based on opinion about workers of municipal or private firms are carrying their tasks daily to keep your locality clean			
Sr. no	Frequency	No. of Respondents	%
1	Regularly	90	30%
2	Occasionally	135	45%
3	Never	45	15.00%
4	When complained	24	8.00%
5	Not applicable	6	2.00%
Total		300	100

Table no. 15 shows the analysis of the views of the people regarding cleanliness of the area by the private or the municipal workers. 30% people have expressed the view that the waste has been picked up regularly, while 45% people say

that it has been picked up sometimes, 8% people stat that it has been picked up only when some complaint has been made. It clearly shows that the municipal corporation workers and the private workers do not keep the allotted area clean.

Table 16

What are the problems you face due to not carrying waste generated daily			
Sr. no	**Problems**	**No. of Respondents**	**%**
1	spreads bad out dour	180	60%
2	it increases the flies in that area	99	33%
3	it increases mosquitoes on the other hand	159	53.00%
4	solid waste scatter due to wind	144	48.00%
5	Goes into the gutter.	75	25.00%
6	Other	15	5.00%

Table No. 16 shows how due to uncollected solid waste in the area people face many problems. 60% people say that it spreads bad out dour, 33% people say that it increases the flies in that area, 53% people say that it increases mosquitoes on the other hand 48% people say that the solid waste scatter due to wind and 25% people say that it goes into the gutter.

Table 17

Is there Ghanta gadi To carry waste				
Sr. no	Opinion			
	Yes	%	No	%
1	195	65%	105	35.00%

Table no. 17 explains the information, When it has been asked that whether the collection vehicle comes to their area 65% people answered affirmatively, and 35% people answered negatively. It means that the collection vehicle has failed to reach 35% of people in the city.

Table 18

Which Problems do you face about Collection Vehicle			
Sr. no	Problems	No. of Respondents	%
1	Collection vehicle don't go there to collect the solid waste.	87	29%
2	complained about the punctuality of time	99	33%
3	remain unaware about the vehicle	42	14.00%
4	collection vehicle don't reach to their home	75	25.00%
5	waste has not been picked up properly	30	10.00%
6	while collecting the waste it spills in the nearby area	33	11.00%
7	Dry and wet waste has not been classified.	66	22.00%
Total			

When asked about the problems faced regarding the collection vehicle, 29% people said that the collection vehicle don't go there to collect the solid waste. 33% people have complained about the punctuality of time, 14% people have complained that they remain unaware about the vehicle, 25% people have complained that the collection vehicle don't reach to their home, 10% have complained that the waste has not been picked up properly, 11% complained that while collecting the waste it spills in the nearby area and 22% have said that the dry and wet waste has not been classified.

Table 19

Who do you cope up with this problem			
Sr. no	Way to adjust	No. of Respondents	%
1	throw the solid waste onto the open space near their home	84	28%
2	throw it once in three days	93	31%
3	private arrangement	54	18.00%

4	some other arrangement of their own	72	24.00%
Total		300	100%

When asked about how you coped with all these problems, 28% people said that they throw the solid waste onto the open space near their home, 31% said that they throw it once in three days, 18% said that they have made private arrangement for this and 24% people said that they have some other arrangement of their own.

Results and Discussion:

Solapur is one of the leading urban centers in India. The management and disposal of solid waste is not scientific and it creates serious environmental problems. In sanitary method of waste disposal is also a serious health concern, particularly in rainy season. Leachate and high humid conditions will increase the risk of health problems. The land fill sites are not well maintained, and it creates groundwater contamination due to leachate percolation. Open dumped garbage's serves as breeding ground for disease vectors such as flies, mosquitoes, cockroaches, rats and other pests. Even the surrounding areas are also suffered from garbage and associated problems. The combined effects of uncollected wastes, poor handling and inadequate disposal safeguards for municipal wastes have always implication for public health. Among these are the chances of transmission of disease and the spread of epidemics and loss of healthy urban and amenable environment.

Chapter: IV

Reasons and Constraints of Solid Waste Management problems

Problems of the citizens regarding hygiene:

Solid waste directly affects the hygiene of the people, its mismanagement produce many diseases and epidemics for e.g. Dengue, Malaria, Typhoid, and other breathing problems. Similarly it also emits bad smell, dust increasing mosquitoes and flies. People suffer from allergic cough due to it. In past people from Solapur have already suffered from the epidemic of Dengue. So the proper management and disposal of solid waste must be an important agenda of the Municipal Corporation.

Impact on Rag Pickers:

The rag pickers are also suffered from pathogenic diseases and they do not get any medicals facilities for health problems. These peoples belong to poorest categories and they cannot afford even two squares meal in one day. The society peoples are not accepts as friends of the society who helps to keep their locality clean.

In and surroundings areas of landfills sites and dumping places are suffered from many problems. Due to open dumping of solid waste, it emits bad smell due to presence of dead animal waste and biodegradable components. Rodents and dogs are feeding on such dumping place and they may bite peoples present in those areas. Such dumping sites are spoiling environment of nearby villages surrounding the dumping site.

Public Health Hazards:

Within a matter of hours in a warm temperature sterile organic matter, like cooked meat, can become a potentially lethal source of toxic or disease producing organisms. The organisms do not have to be originally present in the host material as the environment is normally well provided with spores bacteria, viruses, insects, vermin and other vectors awaiting a favorable site on which to multiply.

It is estimated that 90% of the urban house fly population breeds in the contents of open trash barrels. (Gaur G., 2005,)

Solid waste workers are the most exposed to the risks of parasitic infections and accidents and therefore, a SWM system must include proper mechanisms to avoid these incidences. To the direct and indirect risks through accidents, exposure and spread of disease, we must add the effect of usual pollution caused by litter and nuisance created by smoke and dust at disposal sites.

Public Health Effect:

(1) Disease Vectors and Pathways :

Wastes dumped indiscriminately provide the food and environment for thriving population of vermin, which are the agents of various diseases. The pathways of pathogen transmission from wastes to humans are mostly indirect through insects – flies, mosquitoes and roaches and animals – rodents and pigs. Diseases become a public health problem when they are present in the human and animal population of surrounding communities.

(2) Flies :

Most common in this category is the housefly, which transmits typhoid, salmonella's gastro – enteritis and dysentery. Flies have a flight range of about 10 km. and therefore, they are able to spread their influence over a relatively wide area.

(3) Mosquitoes :

They transmit disease such as malaria, filarial and dengue fever. Since they breed in stagnant water, control measures should centre on the elimination of breeding places such as tins, cans, tryres, etc. proper sanitary practices and general cleanliness in the community help eliminate the mosquito problems caused by the mismanagement of solid waste.

(4) Roche's :

These cause infection by physical contract and can transmit typhoid, cholera and amoebiasis. The problems of roaches are associated with the poor storage of solid waste.

(5) Rodents (Rats) :

They are responsible for the spread of diseases such as plague. Murine typhus, leptospirosis, histoplasmosis, rat bite fever dalmonelosis, trichinosis etc. The flags which rats carry also cause many diseases. This problem is associated not only with given dumping but also poor sanitation.

(6) Occupational Hazards :

Workers handling wastes are at risk of accidents related to the nature of material and lack of safety precautions. The sharp edges of glass and metal and poorly constructed storage containers may inflict injuries to workers.

It is therefore, necessary for waste handlers to were gloves, masks and be vaccinated. The infections associated with waste handling include:

1) Skin and Blood infections resulting from direct contract with waste and from infected wounds.
2) Eye and respiratory infections resulting from exposure to infected dust, especially during landfill operations.
3) Diseases that result from the bites of animals feeding on the waste.
4) Intestinal infections that are transmitted by flies feeding on the waste.
5) Chronic respiratory diseases including cancers resulting from exposure to dust and hazardous compounds.

In addition the accidents associated with waste handling include:

1) Bone and muscle – disorders resulting from the handling of heavy containers and the loading heights of vehicles.
2) Infecting wounds resulting from contact with sharp objects.
3) Reduced visibility; due to dust along the access routes, creates greater risk of accidents.
4) Poisoning and chemical burns resulting from contact with small amounts or hazardous chemical wastes mixed with general wastes such as pesticides, cleaning solutions and solvents in households and commercial establishments.
5) Burns and other injuries resulting from occupational accidents at waste disposal sites of from methane gas explosion at landfill sites.
6) Serious health hazards particularly for children, due to careless dumping of lead – acid, nickel – cadmium and mercuric oxide batteries.

Animals:

Apart from rodents, some animals (e.g. dogs, cats, pigs, etc.) also, act as carriers of disease for example pigs are involved in the spread of diseases like trichinosis cysticerosis and toxoplasmosis.

(Ramchandra : 2009)

Chapter: V

Conclusion

Recommendations for adoption of the measures below.

Awareness-raising:

1) At the national level to protect individuals and communities from the adverse impact of toxic and dangerous health-care waste on their human rights, including the right to life, the right to health and the right to a safe environment, States take all appropriate measures to raise awareness of the problems, especially among policymakers and communities living in the vicinity of sites where waste is incinerated or land filled.
2) Non-governmental organizations working in the field of public health or environmental protection should include the promotion of sound health-care waste management in their advocacy and conduct programmers and activities that contribute to sound health-care waste management.
3) In some cases, a healthy lifestyle represents the most efficient way to avoid medical treatment and the waste it generates as a by-product.
4) States that have not yet adopted a specific law on health-care waste management principles of international environmental law, such as the precautionary and the "polluter pays" principles, should be taken into account when drafting such legislation.
5) This legal package should specify approved methods of treatment and disposal for different waste categories identify safe practices for the minimization, segregation, collection, storage and transport of waste and outline the responsibilities of public health authorities, the national environmental protection body, managers of health-care facilities and managers of private or public waste-disposal agencies.
6) The health authorities should organize educational programmes and training opportunities to raise awareness about health, safety and environmental protection issues relating to medical waste management and occupational risks to which they are exposed and on the correct procedures for handling waste in a safe manner.
7) The appropriate personal protective equipment for persons handling hazardous health-care waste should be provided.
8) the donor community, international and regional organizations, financial institutions and the private sector to provide developing countries with technical assistance and

financial support to help them achieve safe and sustainable management of medical waste. Technical assistance should include the transfer of scientific and technological knowledge, as well as state-of-the-art technologies for the safe disposal of hazardous medical waste, such as autoclaving and non-burn technologies.

9) Recycling Waste segregation at source is a basic requirement for the recycling of non-hazardous components of health-care waste. Some kinds of hazardous waste can also be recycled.
10) A disposal method of hazardous medical waste be substituted with more environmentally-friendly and safe methods of disposal.

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