CHAPTER – VII

SUMMARY OF FINDINGS, SUGGESTIONS AND CONCLUSION

7.1. Introduction

The living environment is an important factor that determines the quality of life. The quality of life depends significantly, on the condition of surroundings of their houses and also on the availability of various essential facilities including proper and scientific management of solid wastes. Rapid urbanization has given rise to overcrowding that has adversely affected the quality of life. Unsanitary conditions and the absence of other basic facilities have made living conditions miserable in the urban areas. Population growth, economic development, changing lifestyles and social attitudes, the long-term impacts of past human interventions are all contributing to increasing problems of environmental health. SWM problem in Erode continues to grow exponentially.

7.2. Findings

The study highlighted the various impacts of the improper SWM in the municipal area. It can be found that waterborne diseases and vector borne diseases are quite common. This indicates the level of environmental degradation that has occurred in the area. Analysis of the health impacts show that regarding the different signs and symptoms, 41.7% were affected
with diarrhea, 34.6% with skin infection, 33.6% with fever and 18.2% had persistent headache. The respondents mainly attribute physical environmental factors as the cause for disease symptoms and for the occurrence of diseases. Regarding the occurrence of diseases among the respondents, 44.4% of the respondents were affected by acute respiratory infection followed by cholera 42.4%, 29.3% of the respondents were affected by Chicken guinea.

Children are very often the victims of the various diseases with 72.1% the respondents agreeing that children are getting affected by the diseases. The survey also highlights the seasonal occurrence of diseases and finds that monsoon season as the most disease prone season with 48% of the respondents agreeing to it. About the expenses for treatment of an episode of a disease the survey finds that the average outpatient expense as slightly less than the average inpatient expense. 96.1% of the respondents had an average outpatient expense of less than of Rs.500 while 75% of the respondents had average inpatient expenses of less than of Rs.500. 14.3% had an inpatient expense between Rs.500 and Rs.1000 and 10.7% had expenses above Rs.1000. 86% of the respondents agreed that the occurrence of diseases in the municipal area has increased in the last few years. 78.6% of the respondents consider solid waste pollution as the main reason for the increase in the occurrence of diseases. Another important finding was that 62.9% of the respondents had no insurance cover.
Regarding the impacts on residential land values, it seems that being a densely populated state, solid waste pollution has not impacted the residential land values. 88.8% of the respondents are of the opinion that pollution hasn’t reduced residential land value in the corporation. The current value of the residential land is high with 74.4% of the respondents being of the opinion that the value of one cent of land in the corporation area is above Rs.1 lakh while 25.6% consider it as below Rs.1 lakh. In addition, 68.9% of the respondents are of the opinion that the land value will not increase in the absence of solid waste pollution. Pollution in the area seems to having some effect with about 48.1% of the respondents ready to relocate to place with less pollution. The survey found that 73.2% depend on corporation water as the main source for drinking water while 18.7% depend on bore well and 8.1% of the respondents use well water. The water quality in the area seems to have deteriorated with 86.7% being of the opinion that the quality of water available has deteriorated over the years. Solid waste pollution is seen as the main cause for the deteriorated water quality with 70.2% of the respondents giving their response in the affirmative.

On the disamenities created by solid waste pollution, mosquito and flies were considered as the main disamenity due to sold waste. 29% were of the opinion that all the given disamenities are present in the corporation area due to solid waste. About 75.1% has ranked the disamenity of
mosquito and flies as number one. Regarding solid waste disposal habits of
the respondents, 77.2% depend on municipal waste bin for disposing solid
waste. Burning solid waste is an option for almost 22.8% of the
respondents. This gives an idea regarding the dependence of the
households on the corporation for the solid waste disposal. Only 16% of
the respondents segregate the solid waste into bio degradable and non-bio
degradable before disposal. On the frequency of solid waste collection by
the corporation. 63.2% of the respondents put the frequency of collection
as once in a week while 33.5% gave it as once in three days. Regarding the
awareness of the respondents about various environmental issues, 89.2% of
them were aware of the issues. On the environmental condition of the
Erode area, 73.5% of the respondents rated the environment of the
corporation area as bad. An overwhelming 91.1% of the respondents cited
solid waste pollution as the main reason behind the environmental
degradation of the municipal area.

Regarding the attitude of the respondents towards solving the
environmental issues in the municipal area, 88.4% of the respondents were
of the opinion that solid waste pollution must be solved without
considering the cost involved. An overwhelming 85.3% of the respondents
were of the opinion that there is a need for projects solving environmental
issues which reflected their environmental ethic. The survey analysis
shows that the respondents are generally willing to pay for an improved

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solid waste management system irrespective of public private initiative. On the WTP for the first solid waste management project to be done by the Erode Corporation and the private agency, only 8.9% and 11.9% of the respondents were unwilling to pay any amount for the projects respectively. Regarding the WTP for the second solid waste management project to be done by the municipality and the private agency, only 14.8% and 13.9% of the respondents were unwilling to pay any amount for the projects respectively. The respondents have good faith in the private agency than the municipality for carrying out such projects. Health issues followed by disamenity concerns dominate the reasons for the willingness to pay for the projects. Regarding the unwillingness to pay for the projects, financial problems and the feeling that corporation should bear the expenses for the projects are the main reasons. Some of the respondents stated as their WTP amount the initial bid values given to them which reflect the initial bid bias.

The parameter estimates shows that the variables average monthly income and house ownership show consistent positive relationship with the WTP supporting the hypothesis. Variables like environment ethic and children, shows a positive relationship with WTP and the variable gender shows a negative relationship with WTP generally. Education did not show the expected relation with WTP and it showed a negative relationship generally.
7.3. Suggestions

Although there are no comprehensive data on waste generation rates, collection coverage, storage, transport, and disposal volumes and practices, the Central Public Health and Environmental Engineering Organization (CPHEEO) estimated a per capita waste generation in Indian cities and towns in the range of 0.2 to 0.6 kilograms per day. The typical urban growth rate has been determined at around 2.5 percent annually (Globalis 2005), the growth of waste generation is outpacing the urban population growth in Indian cities (Singhal and Pandey 2001). Therefore, urban population growth as well as increasing per capita waste generation will continue to amplify the waste problem. To prevent future problems, India must take immediate steps to control waste generation, to enhance recycling recovery and reuse, and to ensure better collection and sustainable disposal.

According to the Central Pollution Control Board (CPCB), average collection coverage ranges from 50 to 90 percent. Furthermore, of all collected waste, 94 percent is disposed of in an unacceptable manner without any consideration of state of the art engineering principles. Hence, there is severe degradation of groundwater and surface water through leachate, as well as degradation of air through uncontrolled burning of waste.
In India, SWM is the primary responsibility and duty of the municipal authorities. State legislation and the local acts that govern municipal authorities include special provisions for collection, transport, and disposal of waste. They assign the responsibility for provision of services to the chief executive of the municipal authority.

Most state legislation does not cover the necessary technical or organizational details of SWM. Laws talk about sweeping streets, providing receptacles in various parts of the city for storage of waste, and transporting waste to disposal sites in general terms, but they do not clarify how this cleaning shall or can be done. The municipal acts do not specify in clear terms which responsibilities belong to the citizens (for example, the responsibility not to litter or the accountability for storing waste at its source). Moreover, they do not mention specific collection systems (such as door-to-door collection of waste), do not mandate appropriate types of waste storage depots, do not require covered waste transport issues, and do not mention aspects of waste treatment or sanitary land fills. Thus, most state legislation, with the exception of that of Kerala, does not fulfill the requirements for an efficient SWM service. Given the absence of appropriate legislation or of any monitoring mechanism on the performance of municipal authorities, the system of waste management has remained severely deficient and outdated. Inappropriate and unhygienic systems are used. At disposal sites, municipal authorities dump municipal waste, human excreta from slum settlements, industrial waste from small
industrial establishments within the city, and biomedical waste without imposing any restrictions, thus provoking serious problems of health and environmental degradation.

The Municipal Solid Waste (Management and Handling) Rules (2000) lay down the steps to be taken by all municipal authorities to ensure management of solid waste according to best practice.

**Collection of Solid Waste**

To prohibit littering and to facilitate compliance, Erode Corporation authorities must take the following steps:

- Organize collection of MSW at household level by using methods such as door-to-door, house-to-house, or community bin service. Collection must be on a regular pre-informed schedule or by acoustic announcement (without exceeding permissible noise levels).
- Give special consideration to devising waste collection in slums and squatter areas, as well as to commercial areas such as areas with hotels, restaurants, and office complexes.
- Segregate at the source all recyclable waste, as well as biomedical waste and industrial waste, to prevent special waste from being mixed with ordinary municipal solid waste.
- Collect separately all horticultural waste and construction or demolition waste or debris, and dispose of it following proper
norms. Similarly, waste generated at dairies will be regulated in accordance with the state laws.

- Prohibit burning of waste.
- Do not permit stray animals at waste storage facilities.

**Secondary Storage of Waste**

With respect to secondary storage of waste, the Erode Corporation authorities must do the following:

- Make available sufficient storage facilities in accordance to the quantities of waste generated.
- Provide covered storage facility so that waste is not exposed to open atmosphere.
- Ensure that storage facilities are attended daily and are emptied and cleaned regularly.
- Ensure that storage facilities or bins are of an appropriate design for ease in handling, transfer, and transport.
- Ensure that manual handling and multiple handling of waste are avoided or are done with proper safety and care.

**Transport of Waste**

The following rules may be applied to transport of waste:

- Ensure that vehicles used for transport of waste are covered.
♦ Ensure that waste is not visible to public or exposed to the open environment, thus preventing the scattering of waste.

♦ Attend to storage facilities daily for clearing of waste.

♦ Empty bins or containers before they start overflowing.

♦ Ensure that transport vehicles are designed so that multiple handling of waste is avoided before final disposal.

**Waste Treatment**

The following waste treatment rules may be implemented:

♦ Ensure that biodegradable waste is processed by composting, vermicomposting, anaerobic digestion, or any other appropriate biological process for stabilizing waste. Compost or any other end product must comply with the standards specified in Schedule IV.

♦ Ensure that mixed waste containing recoverable resources follows the route of recycling. Incineration with or without energy recovery may be used in special cases.

**Waste Disposal**

The following rules may be strictly followed:

♦ Restrict landfilling to non biodegradable and non recyclable waste.

♦ Ensure that landfilling meets the specifications defined in Schedule III.
But, no consolidated official data are available about the status of compliance of MSW.

Storage of waste at the source of its generation is the first essential step toward appropriate SWM. Most households, shops, and establishments throw their waste just outside their premises, on streets, in drains, in open spaces, in water bodies, and in other inappropriate places. Because such waste contains high levels of biodegradable material, it attracts rodents and stray animals and thus contributes to the spread of filth and disease.

Segregation of recyclable waste at source is not seriously practiced by households, shops, and establishments in any city. At least 15 to 20 percent of the country’s total waste could be conveniently segregated at its source for recycling if the practice of segregation of waste at source were adopted. Large numbers of waste buyers purchase recyclable waste from the doorstep and pass it on to a subdealer or a dealer with a good margin, who, in turn, passes on the material to the recycling industry in bulk.

Rag pickers are generally poor women and children who pick up discarded recyclables from the streets, bins, and dumpyards; segregate various components; and sell them to a dealer for a small price to earn a living. Those recyclables are often soiled with food waste, human excreta, and biomedical waste. Accordingly, the price of such waste is much lower than the dry and clean recyclable material that is picked up directly from households or shops. Furthermore, because rag pickers are very poor, they have little bargaining power to negotiate a higher price.
A sizable amount of recyclable dry waste such as wastepaper, plastic, broken glass, metal, and packaging material is not picked up, because it is soiled substantially or is directly buried under a huge pile of waste in the bin or at the disposal site. Quite often, rag pickers focus their search and recovery on a few varieties of recyclables that have good returns. Other materials are discarded. Hence, much potentially recyclable waste from streets and bins ends up at the disposal site, along with other domestic waste and street sweepings. Rag pickers, who search disposal sites as well as streets, nevertheless, recover some of those materials; however, most of the waste gets buried.

The current practice of material recovery and recycling often leads to additional littering in streets when rag pickers are rummaging the waste bags and bins. A denial to rag pickers in the streets forces them to collect recyclables from landfill sites as well. This practice leads to even higher health threats and environmental pollution. In most cases, rag pickers are women and children from low-income groups, which compose the weakest group in the Indian society. They are often exploited by waste merchants because of their status.

Construction and demolition waste that is generated during the course of repair, maintenance, and construction activities comprises bricks, stones, tiles, cement concrete, wood, and so forth. Such waste is generally not stored by the waste generator within its premises until disposal. By and
large, this waste is deposited just outside the premises on the streets or in open spaces and may hinder traffic and adversely affect the aesthetics of the city.

The industries produce hazardous and nonhazardous industrial waste, which the industries must dispose of following the standards laid down under hazardous waste management rules framed by the government of India and following directions given by CPCB and by state pollution control boards. In practice, however, very few sites are authorized for the disposal of industrial waste. Some states do not have even a single facility for disposal of industrial waste. Industrial solid waste is, therefore, disposed of in an unscientific manner, often surreptitiously on open plots or on the roadside, thereby creating environmental pollution and subsoil contamination.

Management of biomedical waste (BMW) is governed by the Bio-Medical Waste (Management and Handling) Rules 1998. Under the rules, the waste producer is responsible for managing the waste. Each generator of BMW is expected to store BMW separately from general municipal waste and to keep different categories of BMW in color-coded bags. The implementation of the 1998 rules has of late started to improve, with the establishment of common regional BMW treatment and disposal facilities in the country. However, in some states a large proportion of BMW generated by hospitals, nursing homes, and health care establishments is
now disposed of on the streets or in open spaces around those medical establishments. Such BMW contains a variety of infectious and toxic substances. Without adequate facilities for the collection, transport, and disposal of BMW, this unhealthy practice is likely to continue.

Citizens are allowed simply to throw the waste on the streets. The primary collection of waste is, therefore, done by picking up the waste deposited on the streets through a street-sweeping operation, which is not carried out regularly.

Each sweeper is given a “beat” (that is, an area demarcated for sweeping). The area allotted is swept in the first half of the day, and the street sweeper then carries the street sweepings to the designated waste storage depot. In the afternoon, either street sweepers generally are deployed to other areas for group sweeping or they return to the same place to repeat their sweeping. Their output in the afternoon is almost negligible given the lack of supervision and control. Hence, inadequate use of personnel is a problem.

The street sweepers are not given appropriate tools to perform their duties effectively. They are given short-handled brooms, which necessitate constant bending and cause fatigue and loss of productivity. The waste collectors who accompany the street sweepers are also given inefficient equipment. Their handcarts and tricycles are not adapted to the secondary collection system, often resulting in deposition of waste on the ground. In
some wards, they are available in a large numbers and are very close to one another. In other areas, they are far apart, thus making it difficult and time consuming for the sanitation workers or sweepers to use them.

Bins frequently overflow because of their inadequate capacity, and often more waste is found outside the bin than in it. In addition, waste depots are not emptied on a regular basis. Serious complaints from neighborhood residents and resistance to new bins are a consequence. Fearing mismanagement of secondary waste facilities, citizens object to having a waste storage depot nearby and agitate over placement of any new container near their premises.

Waste in the town is not transported on a daily basis. Unfortunately, this service is performed very inefficiently and in an unhygienic manner. Open trucks and tractors used to transport waste are loaded manually. This time-consuming activity results in loss of labor productivity and increases the occupational health risk to workers. Waste treatment is intended to reduce the amount of waste to be disposed of or to change its composition in a way that prevents adverse effects on humans or the environment.

This organic matter could potentially be treated and converted into stabilized degraded organic matter, often called compost. Compost is a product that can be used to improve soil quality by increasing its porosity and moisture retention and by supplying nutrients and organic matter for enhanced soil structure and agricultural yield. At the same time, diversion
of organic waste from the overall waste stream reduces the burden on landfills so that less land is required for the disposal of waste. The MSW generated in Erode, not treated but is directly taken to the open dumpsites.

Waste is dumped in low-lying areas that are within or outside the cities and that are designated as dumping grounds. Because no segregation of waste at its source takes place, domestic waste of all types, infectious waste from medical facilities, and even hazardous industrial waste are deposited at dumpsites that are actually designated for domestic waste. The waste deposited at such sites is neither spread nor compacted. It is left uncovered to degrade under natural conditions. The sites generate leachate and thus pollute surrounding water bodies, contaminate the air with methane emissions and uncontrolled burning, and create serious health and environmental problems for the city as a whole and, more particularly, for the poor people living in the vicinity of the dumping ground.

In the present study, the Erode Corporation have been facing a challenge in managing their urban waste. With rapid increase in the population of Erode town, there has been an increase in solid waste generation which is becoming a serious problem for Erode Corporation to manage. The Erode Corporation do not have the necessary equipment that could insist in the efficient management of urban solid waste. This is really due to the problem of inadequate funding which is responsible for the poor SWM.
People think that the management of waste in the town is the responsibility of municipalities and corporation. That is why people frequently throw their waste anyway and anywhere. Erode corporation has been taking a lot of initiatives in managing the municipal solid waste so as to reduce negative impact on the urban environment and people. If the corporation has not been able to cope with the efficient management of this solid waste, it is due to lack of funds and inadequate equipment.

Erode urban solid waste to be sustainably managed only if there is need for cooperation from the urban people. They should dispose their waste in dumper placer containers where it can be carefully managed by the corporation workers. There is also an absolute need for special waste collection trucks with special facilities for loading and unloading. Such equipments will facilitate effective collection, transportation and disposal of solid waste.

The sorting and segregation of solid waste could be done at the house level and it will be easier for biodegradable and non-biodegradable waste to be effectively managed by the Erode corporation. This segregation could also help in resource recovery of some solid waste that could be recycled to produce fertilizers.

It is also highly recommended that the four recovery sources of effective management of waste resources should be implemented. These include : Reduce, Reuse, Recycle and Restoration. Erode people can
minimize the use of certain resources in order to reduce solid waste. The reuse of certain products should also be encouraged. Plastic plates, spoons and cups used for special occasions could be cleaned and reused instead of being disposed. Finally, to efficiently manage Erode urban solid waste, there is need for much initiative and co-operation between the corporation, public, producers and environmental non-governmental organizations. It is from this perspective that we can achieve the much needed goal of sustainable urban solid waste management in Erode.

- Risk perception studies and impact assessment studies must be conducted on a regular basis so that community values can be incorporated in the environmental management policies.

- Solid waste management activities can be a success only through an integrated and well-planned programme with the active participation of all the stakeholders. A holistic approach is the need of the hour which can be attained through decentralization process.

- The willingness to pay of the public to pay for improved solid waste management programmes must be used for developing economically feasible programme strategies for solid waste management.

- Information, Education and Communication (IEC) campaign should be intensified and to focus more on knowledge and behavioural change. Based on the survey findings, the people having high level
of knowledge and perception towards health and the environment but they are still exposed to health risks. Hence, a more comprehensive understanding of the relationship between our environment and health should be emphasized in the IEC campaign. Awareness campaigns can bring about considerable changes in the attitude and perception of the people towards solid waste management. Public awareness action can be made to address specific environmental and health issues.

- The minimization of the negative impacts of solid wastes on health, environment can be attained through the 3R’s of reuse, recycle and reduce. Waste minimization by reducing the volume of waste generated and increasing recovery and reuse of waste must be encouraged at all levels.

- Social Engineering through proper networking of the various stakeholders is an important factor for the success of any sanitation activity. The Residents Associations and the voluntary organizations can play a major role in this context.

7.4. Conclusion

Indian municipalities have overall responsibility for solid waste management (SWM) in their cities. However, most of them are currently unable to fulfill their duty to ensure environmentally sound and sustainable ways of dealing with waste generation, collection, transport, treatment, and
disposal. The failure of municipal solid waste management (MSWM) can result in serious health problems and environmental degradation. Because of deficient collection services, uncollected waste often also mixed with human and animal excreta is dumped indiscriminately in the streets and in drains, thereby contributing to flooding, breeding of insect and rodent vectors, and spreading of diseases. Furthermore, even the collected waste is disposed of in uncontrolled dumpsites or burned openly, thus contributing to severe environmental impacts including pollution of water resources and air.

Environmental problems occur due to non-optimal pricing and misallocation of resources. The presence of complete markets is essential for the optimal distribution of resources in the economy and the lack of it will result in the inefficient distribution of resources. For environmental goods there is either the complete absence of markets or they are incomplete. Environmental degradation and pollution occur when the market fails to take into account the true value of environmental quality. This has led to the unregulated use of the environment and its wide spread degradation. Externalities create MSC, which even a competitive economy fails to consider during pricing. The exclusion of the externality induced social costs will result in non-optimal production of goods. The absence of complete markets makes the use of alternative methods essential to find out the value of environmental quality.
In order to find suitable solutions for the environmental issues, a further follow-up actions on an initiated such as group discussions could be held on various aspects of MSWM involving the (responsible persons) to define the current problems and to solve the same. Regarding management of electronic waste and hospital waste a special training programmes could be conducted. Extra effort should be taken to show the public on the advantages of waste segregation at source. The official employing of rag-pickers in more effective manner could be of great help. Promoting awareness among the younger generation and targeting the students in school and college levels should be given more emphasis. The urban local bodies should be given all help to rehabilitate the existing dumpsites and planning new landfills. Research efforts in future should also concentrate on biological methods of waste treatment that suite Erode wastes and its geography.

In the modern hi-tech age the problem of USWM is to be addressed in a larger dimension. E-waste and plastic pose a great threat to the urban environment and a great menace to the urbanites. Region specific and problem specific strategies and approaches are to be introduced to deal with the emerging issues. Waste can be converted to wealth provided the three R’s are effectively implemented.