CHAPTER - X

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INTRODUCTION

Having discussed the various issues connected with the solid waste management in Kolhapur Municipal area, we propose to summarise the main findings of this study in this final chapter. The conclusions and suggestions are based on the data collected, which will be helpful for policy formulations.

10.1.0 CONCLUSIONS

The following conclusions have emerged from the present study of solid waste management in Kolhapur Municipal area.

10.1.1 The solid waste is generated in two main sectors i.e. household sector and non-household sector. The household sector includes residential area and the non-household sector includes the commercial centres like schools and colleges, hospitals, large hotels, hostels, slaughter houses, mutton shops, community halls and religious places etc. It is estimated that in Kolhapur city 230 TPD solid waste is generated in both the sectors. Out of it, 138.5 TPD (60.2%) solid waste is generated in household sector and remaining 91.5 TPD (39.8%) is
generated in nonhousehold sector. It shows that households (residential area) is the main source of solid waste generation in the Kolhapur Municipal area.

10.1.2 The estimation of per capita per day generation of solid waste in the KMC area is 0.475 kg/day.

10.1.3 The per household MSW generation is 1.62 kg/day in household sector and per household MSW generation in nonhousehold sector is 1.07 kg/day. The household sector and non-household sector together generate 2.69 kg/day per household in Kolhapur city.

10.1.4 As per the KMC 160,820 TPD solid waste is collected and transported by municipal refuse transport vehicles to dump sites. The collection efficiency is estimated at 70%. It means that 30% solid waste generated in the KMC area is remained uncollected.

10.1.5 The chemical analysis made of solid waste in Kolhapur city by KIT College of Engineering, Kolhapur shows that moisture content varies from 18-35%, the organic content varies from 72-85%, and inorganic content varies from 15-28%. The maximum carbon content was 38% at hotel sites and minimum was at Kasaba Bawada dump sites. The highest N.P.K. was 84% at Kasaba Bawada, 76% at hotel site and 77% at Udyamnagar in Kolhapur.
As per the analysis made by AIC Waston Company Limited, Mumbai who worked on behalf of KMC, 61% is the dry matter and 39% wet matter in solid waste of Kolhapur. The organic matter was 75% and inorganic matter was 25%. The C/N ratio was 27% which shows more scope for recycling of organic waste for the purpose of compost.

There were in all 2348 Municipal storage bins and 624 refuse heaps in the Kolhapur Municipal area. There was no distribution ratio for communal storage bins in Kolhapur city. The community bins were also not available at convenient locations in city for depositing domestic waste. Even in some places, it has been observed that there were often unsuitably designed, inadequate in size and spaced too far municipal dust bins.

The calculated ‘Bin-Population Ratio’ was 1:204. Though it seems to be low, the people of Kolhapur city have asked for more and more bins for storage of solid waste because of their small and inconvenient size.

In Kolhapur city by and large people do salvage reusable or salable material from waste and sell it for a price such as newspaper, glass bottle, empty tins, old cloths etc. and to that extent such reusable waste material is not
thrown out for disposal. However, a lot of recyclable dry matter paper, plastic, broken glass, metal and organic domestic waste is not segregated. Segregation of recyclable waste at source is not seriously practiced by households and establishments who throw such waste on the street or in the municipal bins unsegregated.

10.1.9 Out of 1420 existing staff of Health and Sanitation Department of KMC only 1023 (72%) staff was engaged in conservancy work of KMC. As per the norm of National Environmental Engineering Institution (NEERI), Nagpur norm; the ratio should be 1000:3 population : worker ratio. As per this norm, in all still 1452.3 workers are required. It means that there is deficiency of 429.3 workers in conservancy Department of KMC. It adversely affects the day to day working of solid waste management. It indicates the inefficient solid waste management.

10.1.10 Approximately, 60% of the surface area was covered in terms of sweeping and collecting waste in Kolhapur city.

10.1.11 The solid waste was cleared once in day in some areas, once in two days in others and other areas once in a week. But the priority was mainly given to middle and high income areas.
The primary collection of solid waste was made by sweepers of the KMC. There were 779 sweepers to sweep and collect the solid waste generated in KMC area. The sweepers have given old and traditional type of short handed brooms which has affected the efficiency of collection.

The KMC had provided total 39 ringing bells to collect the solid waste but this number was inadequate so far as 66.82 sq.km. Municipal area is concerned.

Out of the total health and sanitation expenditure, the expenditure incurred on purchase of tools of sweeping, collecting, loading and unloading was 0.65%. It is inadequate.

In all 19 trucks were used to collect and transport the solid waste. Out of these 19 refuse vehicles, 17 were trucks and 2 were refuse collector. Out of these 17 trucks, 50% trucks were old and not in good condition which affect adversely the efficiency of transportation. Out of 17 trucks, many are open trucks. They were not covered with tarpaulin or hassien cloth during the time of transportation of solid waste.
10.1.16 The method adopted for the solid waste in Kolhapur city was open dump and land filling which was very crude, unscientific method of solid waste disposal.

10.1.17 At present, there are five disposal sites on the outskirt of the Kolhapur city at a distance ranging 3 to 9 kms from the heart of the city. The transported MSW is unloaded manually from the trucks at four dump sites i.e. in quarries. No pesticide treatment is provided at dump sites. The facilities of dozing are also not provided because of shortage of funds.

10.1.18 No recycling of organic solid waste is made in Kolhapur city.

10.1.19 No privatisation of solid waste services is made in the Kolhapur city. The study of privatisation of solid waste services in Mumbai and Hyderabad shows that the cost of private solid waste management services is low as compared to public solid waste management services.

10.1.20 There is no community participation in the MSW management in Kolhapur city especially in operations of storage and collection of solid waste.

10.1.21 The rag picking practice in Kolhapur is done in controlled and disorganised manner which affects the work of formal solid waste management in the city.
10.1.22 The Non Government Organisations (NGOs) and Community Based Organisations (CBOs) were not active in Kolhapur city except giving some pollution news in the news papers.

10.1.23 At present, bio-medical solid waste is disposed off by following scientific incineration method but the existing system covers only private hospitals and not the government hospitals. Thus, the problem of bio-medical waste of Government hospitals is remained as it is. This bio-medical waste is unhygienic from health point of view.

10.1.24 Out of total expenditure incurred on Conservancy Department of KMC, 96% expenditure was incurred on wages and allowances of conservancy employees and remaining 4% was on cleaning material, vehicle maintenance, fuel, insurance and office etc. It means that major expenditure incurred was on salaries and wages of the employees.

10.1.25 The per ton cost of solid waste management services in Kolhapur city with wages and salaries was Rs. 1219.09 and without wages and salaries Rs. 59.96. Thus, major cost was of wages and salaries only.
10.1.26 The per ton costs of collection, transportation and disposal of solid waste was Rs. 609.54, Rs. 548.59 and Rs. 60.95 (with salaries and wages) respectively.

10.1.27 The per ton costs of collection, transportation and disposal without salaries and wages was Rs. 29.98, Rs. 26.98 and Rs. 2.99 respectively.

10.1.28 The per capita expenditure on conservancy (solid waste management) with salary and wages was Rs. 148 and without salaries and wages was Rs. 7.00 only.

10.1.29 The cost comparison of various type of vehicles shows that the cost of conventional vehicles of solid waste collecting and transporting is Rs. 135 per cu.m., the cost of 'Compactor' (vehicle) is Rs. 40 per cu.m. and the cost of 'Dumper placer' is Rs. 26 per cu.m. It shows that the cost of 'dumper placer' is lower than that of compactor and the cost of compactor per cu.m. is lower than conventional vehicles. The dumper placer and compactor need the capital investment. It is learnt the KMC have not enough funds so the conventional vehicles like trucks, lorries were used to collect and transport the 'solid waste' generated.

10.1.30 The sample survey shows that high locality like Tarabai Park and Nagala Park generate solid waste in the range of 1001 to 2000 grams. In the new extended area, the
generation of solid waste was in the range of 500 grams to 1000 grams, while very less households generate more than 2000 grams. The generation of solid waste in the old Kolhapur was same as mentioned above. The low standard of living household and also the slum area localities households were generating the solid waste in between 500 grams to 2000 grams. The very negligible i.e. (11.2%) of the total households had generated the solid waste more than 2001 to 3001 grams.

10.1.31 It was found in the survey that 66.4% people in Kolhapur were not segregating the domestic solid waste which affected adversely the solid waste management in the city.

10.1.32 The survey showed that 49.6% sample households used the plastic bins to store domestic waste and remaining people used the bucket, tin pot and other things like boxes to store the domestic solid waste.

10.1.33 So far as disposal of plastic carry bags is concerned, 20.8% people segregate the bags and sale it, while 68.8% people throw in municipal bins, and 6.4% people gave it to the rag pickers.

10.1.34 It was seen that, 83.2% people throw their solid waste in the municipal dust bins, 8% people throw solid waste
outside their house, 5.6% people make the compost, and 3.2% people throw the solid waste at road side.

10.1.35 The 42.4% of sample households said that every day municipal refuse vehicles lift the solid waste in the morning, 27% sample heads of the household said that these service were available on alternate days, and 28.8% said that it was done once in a week. It means that some areas in Kolhapur city were served better and while other area was neglected in the refuse collection process.

10.1.36 The 85.6% heads of the sample households said that they faced the problem of solid waste pollution (i.e. odour) and nuisance of rats, pigs and stray animals.

10.1.37 The 76.8% heads of the sample households did not know the name of sanitary inspectors and their duties. It means that people were not aware of the solid waste management services.

10.1.38 Regarding the honest working of the workers of the conservancy department, it was found that 45% heads of the sample households said that workers were working honestly, 50.4% heads said that they were not working honestly. They were lingering and avoiding the work of the time of work.
10.1.39 About the resale of the plastic carry bags, 71.2% heads of sample households said that they were selling the carry bags and remaining all were throwing in the dust bins.

10.1.40 It is seen that the Pollution Control Board in Kolhapur had not taken any action against the people and industrial units those who were responsible for the solid waste pollution in Kolhapur city. Out of 125 sample heads of the households, 96.0% heads said that no action was taken by Pollution Control Board against the defaulters. It means that the Pollution Control Board has not entered in the controlling of solid waste pollution.

10.1.41 The projection of recycling of organic waste in Kolhapur city shows that out of 160.820 MT per day collected solid waste, about 34 TPD compost fertilizer will be produced. This will give per day approximately Rs. 54,400/- income to KMC. At the same time about 11058 M³/ day biogas will be generated. This bio-gas can be used to Government and Municipal hospitals for hot water and cooking purposes. The same biogas if it is used for generation of electricity approximately 1.032 MW electricity will be generated.
10.1.42 There is need of environmental education to keep the environment clean. Out of 125 households 96.0 per cent heads of the sample households said that there was need of environmental education.

10.1.43 The environmental pollution impact of the solid waste in Kolhapur was the production of odour and breeding of flies. Out of 125 sample heads of the households, 107 (85.6%) heads told that they were facing the problem of odour and breeding of flies. The low standard area like Shahu Mill Workers Colony, Sidharthnagar, Sadar Bazar and Rajendranagar slum area was severely facing the problem of odour and breeding of flies. Further it leads to the different diseases in that area.

10.1.44 Approximately 90 to 100 tonnes of solid waste was burnt per day in different places of Kolhapur and at dump sites which led to the air pollution in Kolhapur.

10.1.45 Existing crude methods of solid waste disposal had led to the land and ground water pollution in KMC area. The citizens of Kolhapur were facing the problem of water pollution. Many people were suffering from jaundice and different diseases of stomach.

10.1.46 Due to the direct contact of solid waste, municipal conservancy workers had faced the problem of
eyeburning, injuries, skin diseases, body aching and asthma. This was seen on the body of workers

10.1.47 More than 50% workers has taken the treatment in the private hospitals and had spent Rs. 50 to 100 per month. While 10% of the workers were spending more than Rs. 200 per month in private hospital.

10.1.48 Majority of workers said that they were taking casual leaves and medical leaves. Total 70 days leave was enjoyed by the majority of workers. Some time workers remain absent without any notice which affect adversely the working of solid waste management system.

10.1.49 About 90% workers were taking liquor to forget the fatigue of the work. It affects the health of the workers as well as the standard of living of family.

10.1.50 The economic status of workers is very low. They were not in position to buy T.V. and residential houses. The children of workers get adversely affected due to the poor economic conditions.

10.2.0 SUGGESTIONS FOR BETTER SOLID WASTE MANAGEMENT IN THE KMC AREA

Following are the different suggestions made for the better solid waste management in the KMC area.
10.2.1 In order to make the formal solid waste management better, the reduction of solid waste at source is must. The citizens of Kolhapur city should segregate the solid waste generated and reduce the volume and burden of solid waste. This can be done by giving them the separate dust bins to each tax payer.

10.2.2 There is no community participation in solid waste management in Kolhapur. The Youth Clubs, NGOs and CBOs should actively participate in the formal solid waste management in Kolhapur city.

10.2.3 The community (municipal) refuse storage bins should be big in size and adequate in number so that the problem of overflooding of solid waste could be reduced.

10.2.4 The rag picking practices in Kolhapur were uncontrolled and unauthorised. The KMC or Non-Government Organisations (NGOs) must take lead to organise and control them.

10.2.5 The provision should be made to segregate at source the hazardous and non-hazardous as well as organic and inorganic solid waste which will avoid the solid waste pollution.

10.2.6 There was deficiency in the existing staff of Conservancy Department of KMC. At present, Conservation Department needs 430 additional workers. The KMC
should recruit the 430 workers, so that the efficiency of solid waste will be increased. The Government of Maharashtra should also give permission for such recruitment.

10.2.7 The hand brooms and chest gown should be provided to women who sweep the street. For this purpose, the 'Delhi Municipal Pattern' may be accepted.

10.2.8 Boots and handgloves etc. should be made compulsory to the workers engaged in the Conservancy Department of KMC.

10.2.9 The existing KMC conservancy staff is unmotivated. The motivations by giving awards and rewards, the better solid waste services can be achieved.

10.2.10 The number of ringing bells in Kolhapur was inadequate. For better collection of solid waste the number of ringing bells should be increased.

10.2.11 The existing 19 refuse collecting vehicles are not sufficient to collect the solid waste generated in Kolhapur. The additional refuse collecting vehicles may be provided. If possible modern vehicles like dumper placer and compactors can be employed.
10.2.12 The 50% refuse lifting vehicles are not covered with tarpaulin or hassien cloth during transportation. These vehicles should be covered with tarpaulin or hassien cloth so that solid waste pollution can be controlled.

10.2.13 Approximately 60% surface area is covered in terms of sweeping. Maximum area should be covered in terms of sweeping.

10.2.14 The collection efficiency is The cost comparison of various type It should be increased. For that purpose additional expenditure should be incurred on collection and transportation of solid waste.

10.2.15 The existing methods of disposal of solid waste are crude and unscientific. Some solid waste was burnt at road side, some solid waste was used to fill quarries in the Kolhapur city and some was thrown at dump sites. The sanitary landfilling of solid waste must be made of solid waste. Eco-friendly methods of disposal solid waste like composting, vermi composting and incineration of hazardous waste can be accepted.

10.2.16 The leaves of trees and compostable part of the solid waste should not be burnt. Instead that it may be collected and provided to the farmers for compost fertilisers. For this purpose ‘collect and carry system’ may be implemented.
10.2.17 Schools, colleges and offices may be trained in the making of compost in their premises.

10.2.18 Hotels, hostels, community halls should make the compost of their food waste and organic waste.

10.2.19 The KMC have not designed dump site. The KMC should make the designed dump site where water, light and sanitation facilities will be available.

10.2.20 At present, no recycling is made of organic waste on institutional level. An attempt should be made to make the compost on institutional level which will generate energy and money.

10.2.21 NGOs and CBOs and Youth Clubs must be given incentives to participate in the solid waste management services.

10.2.22 The capacity of the present incinerator installed by private doctors to dispose of bio-medical waste is very low. It should be raised or new plant should be installed to incinerate the bio-medical waste of Government hospitals in Kolhapur.

10.2.23 Hotel owners should be charged an additional fees for disposal of solid waste. For this the rules may be framed by the KMC.
10.2.24 Licences and permits should be issued to approve solid waste facilities to ensure safe waste disposal practices.

10.2.25 Solid waste authorities are required to prepare plans for the disposal of all household, commercial and industrial waste likely to arise in their areas and to review and modify the plans where appropriate.

10.2.26 The users at the places such as market places, marriage halls, recreation centres, automobile service centres should be charged for the collection and treatment of municipal solid waste.

10.2.27 The product charges may be charged on waste like non returnable containers, lubricant oils, plastic bags, feed stock, tyres and car fuels and repair centres etc.

10.2.28 Subsidies may be provided to the authorities and private sector for various operations of solid waste management.

10.2.29 The 'Deposit Refund Systems' which imposes special charges or fees on consumers may be applied in the Kolhapur city.

10.2.30 The unauthorised parking on public roads, encroachment roads by hawkers should be controlled for the purpose of better solid waste management services.

10.2.31 The nuisance of stray cattle, pickers, squatting around the dust bin should be controlled.
10.2.32 There is need of environmental education and civic sense. It should be made by making the awareness about clean environment on local T.V. (City News), radio and news papers.

10.2.33 Education alone is not likely to be sufficient, but enforcement of laws should be envisaged to achieve the better solid waste management.

10.2.34 It is the experience of some foreign countries as well as Mumbai and Hyderabad Municipal Corporation is that the privatisation of solid waste services serve the purpose better. The KMC should also make to some extend the privatisation of solid waste services.