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HOUSEHOLD LEVEL WASTE MANAGEMENT IN ALIGARH CITY

Doctoral Dissertation Abstract (2009)

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In this work, an attempt has been made to examine the 'Household Level Waste Management in Aligarh city'. The problem of waste is not only limited to larger cities but equally confined to the small and medium cities. These cities also have in plenty of overloaded bins, dump yards and overflowing choked drains. Much work has been done on the waste management in larger cities but little or no attention has been given to smaller cities. Keeping this aspect in mind Aligarh city was chosen as the study area. The focus of the thesis is to conduct in depth investigations of households belonging to different income groups from the different wards of the city.

The study is mainly based on primary sources of data which have been collected through household and city survey with the help of questionnaire interviews put to respondents from the sampled households belonging to different income groups, municipal authorities and workers. Multi-stage stratified random sampling method was adopted. The sample design consisted of two stages. The first stage consisted of selection of wards from the 60 wards of Aligarh city, 16 wards were selected on the basis of their location (10 wards from old city zone and 6 wards from the civil lines zone) and population. In the second stage, 10 per cent households were sampled from each selected ward keeping in mind that these households were from different income groups. The total sample size consisted of 3,258 households and field work was done during 2006-07.

This thesis is divided into three parts and spreads over six chapters. Part one is devoted to an overview of Aligarh city. This part comprises of only one chapter in which an attempt has been made to examine the present status of population, area, solid waste and waste water and future projection for Aligarh city. The population of Aligarh city has increased from 480,520 in 1991 to 669,087 in 2001 and is likely to be 912,388 by 2011 and 1,249,352 by2021. The city area has also increased from 36.70 sq km. in 1991 to 44.82 sq. km. in 2001 and is likely to be 78.23 sq. km. by 2011 and 114.70 sq. km. by 2021 (Census of India, 2001; ADA, 2001). So it is for certain that with high rate of population growth the amount of waste generated will also increase. With the expansion of city area, the municipalities work will also increase and for this they will require more workers and better equipments to cope with the extra load. Waste generation is directly linked with population growth, urbanization, industrialization, life styles and living patterns. The city generates about 400 metric tones per day of solid waste (2008) and by 2011 solid waste generation will be 507 metric tones per day. The main sources of city waste generation

are residential areas, commercial, industrial, hospitals / nursing homes, restaurants / hotels, drains, slaughter houses, street sweeping, demolition and construction sites.

Part two is devoted to an assessment of generation, collection and disposal of household waste in Aligarh city. This part comprises of three chapters. In the second chapter an attempt has been made to examine the general characteristics (income group, religion and caste, education, employment, housing etc.) of the sampled households, the third chapter examines how households handle their solid waste and waste water (nature, amount, storage and disposal practices and final disposal).

The higher income households generate more amount of waste (both biodegradable and non-biodegradable). The per capita per day solid waste generated by them is more than 1 kg. They generate maximum waste because they are a consumerist lot. Economic prosperity increases the amount of waste both in volume and weight. They are aware of the fact that if waste is not stored properly indoors it will create problems. They store the waste indoors properly in closed containers. Their neighbourhoods are neat and clean without heaps of solid waste, because of good frequency of municipal collection and disposal. The amount of water wastage was also the highest in these households. They had mostly pucca drains and were disposing their waste water into it. Since each household pay for these services to municipal workers or they employ private workers their neighbourhoods are clean.

The medium income households generate lesser amount of waste than the higher income households. The per capita per day solid waste generated by them is 0.67 kg. Most of them store waste indoors in close containers. Three- fourth of the waste produced is mostly disposed by themselves at least once a day in the municipal waste bins or in the open plots or in the waste dumps. They reported that the huge quantities of waste dumped in their neighbourhoods is because of low frequency of waste collection and disposal by the municipality. They have pucca drains around their houses and were disposing waste water into these drains.

The lower income households generate lesser amount of waste in comparison to higher and medium income households. They generate less waste because they mostly re-use their things. About 0.5 kg. of waste is generated per day per capita by the lower income households. Mostly they do not store waste indoors, either it is thrown outside or it is seen pilfered in the house. Few households store it either in open containers or in polythene bags. The frequency of disposal from the house is good because whatever waste they generates they throw it by themselves mostly on roads, or in drains or in open plots / dumps. Waste heaps can be seen in their localities because of low frequency of waste collection and disposal by the municipality. They lack proper drainage, most of the time household waste water accumulates near or around their houses. This shows that level of income and education has a close link with type of handling of households waste.

In the fourth chapter an attempt has been made to examine the physical and chemical characteristics of solid waste and waste water. From the 16 sampling sites located in the residential areas 1 kg. of solid waste was collected from each site for analysis. The physical characteristics of solid waste shows that about 33 per cent comprises of vegetables, fruits and leftover food, another 33 per cent of drain silt, 10 per cent plastic, rubber and synthetic, 9 per cent of rag and jute, 8 per cent of paper and so on. The chemical analysis shows

that about 47 per cent of waste c Samples of waste water were also collected from the 3 different sampling sites (Sarai Rahman, Jamalpur and Kali Deh) during winter, summer and rainy season before they discharged their content into two main drains of the city. Physical analysis shows that the colour of waste water was dark grey due to sewage. Higher values of turbidity were noticed due to sewage mix up.

Part three deals with waste associated problems and its management. This part comprises of two chapters. Fifth chapter deals with the waste associated problems within the house, in the neighbourhoods. Waste related risk factors were identified and the relationship between waste related risk factors and occurrence of associated diseases like malaria, diarrhoeal diseases, infectious hepatitis, typhoid fever, hookworm infections, amoebiasis, cholera and conjunctivitis were evaluated

Household survey results have shown that houseflies, cockroaches, rats/mice and mosquitoes were present inside the house. The relationship between wealth and prevalence of pests inside the house was observed. Mostly the lower income households reported of presence of flies in food preparation areas and in toilets, presence of cockroaches often in large numbers, prevalence of rats/mice often almost every night and mosquito biting not only in the night but also during the day.

Relationship between waste associated risk factors and the 8 frequently occurring (last 2 years) waste associated diseases (diarrhoeal diseases, infectious hepatitis, typhoid fever, hookworm infections, amoebiasis, cholera, conjunctivitis and malaria) were examined. Strong positive correlation between the risk factors and dirrhoeal diseases, r = +0.99; infectious hepatitis, r = +0.99; typhoid fever, r = +0.98; hookworm infections, r = +0.99; amoebiasis, r = +0.95; cholera, r =+0.95; conjunctivitis, r =+ 0.99; and malaria, r = +0.96 was observed. The analysis revealed that the diseases were greatly influenced by the level of income. The lower income households were at greatest risk and they were mostly suffering from various diseases.

In chapter six an attempt has been made to identify the vulnerable households and maps vulnerable areas of the city for future planning and management of waste at household and neighborhood levels. It is generally the lower income households that are exposed to all the waste related risk factors and bear the burden of most of the ill health or premature deaths and other costs of environmental problems. About 90 per cent of the very low and 79 per cent of the low income households reported of being exposed to all the waste related risk factors. Similarly, 73 per cent of the very low and 57 per cent of the low income households reported the occurrence of waste associated diseases. The conditions in medium income households were little better (54 per cent of being exposed to waste related risk factors and 44 per cent reported of suffering from associated diseases). However, the conditions of higher income households were much better.

For waste management and future planning the researcher has tried to map the vulnerable areas of Aligarh city. On the basis of amount of and frequency of solid waste disposal a map was prepared showing the (i) Most vulnerable areas (where more than 30 per cent of the solid waste is disposed and the frequency of disposal is very poor) it includes 20 wards. (ii) Vulnerable areas (where 30-70 per cent of the solid waste is disposed and the frequency of disposal is satisfactory) it includes 40 wards. On the basis of type of waterlogging a map was prepared showing the (i) Most vulnerable areas (permanent waterlogging) it includes 19 wards of the city (ii) Vulnerable

areas (seasonal and occasional waterlogging) it includes 31 wards of the city (iii) Least vulnerable areas (no waterlogging) it includes 10 wards of the city On the basis of amount and frequency of solid waste disposal and type of waterlogging the researcher has divided the city into 5 zones and tried to map the vulnerable areas of Aligarh city.

Household and neighbourhood surveys helped in identifying the deficiencies in solid waste management. A step-wise approach for safe and efficient collection, storage, transportation and disposal of municipal solid waste for Aligarh city has been suggested.