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Solid Waste as a Major Environment Problem in Major Cities: A Case Study of Chandigarh

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Abstract: The problem of municipal solid waste is an alarming today and it seems to be growing with each passing day. The generation of solid waste is closely associated with the increasing population, changing, life style increased dependency on synthetic product and consumerism pattern of the people. This has serious and intricate consequences on the environment which therefore affects the human health. The problem needs to be addressed as it has crucial harmful impacts on the environment.

Keywords: Solid waste, Environment problem;

I. INTRODUCTION

Household waste, construction and demolition debris, sanitation residue, and waste from streets are collectively called municipal solid waste. Residential and commercial complexes are the main sources for generation of this garbage. The amount of municipal solid waste has been increasing rapidly and its composition changing with rising urbanization and change in lifestyle and food habits. By comparison it is found that in 1947 cities and towns in India generated an estimated 6 million tones of solid waste, in 1997 it was about 48 million tones. More than 25% of the municipal solid waste is not collected at all; 70% of the Indian cities lack adequate capacity to transport it and there are no sanitary landfills to dispose of the waste. The existing landfills are neither well equipped nor well managed and are not lined properly to protect against contamination of soil and groundwater.

The consumer market has grown rapidly over the last few years leading to products being packed in cans, aluminum foils, plastics, and other such non-biodegradable items that cause incalculable harm to the environment. In India, some municipal areas have banned the use of plastics and they seem to have achieved success. Ladakh district is the better example of solid waste management as no one can see a single piece of plastic in the entire district where the local authorities imposed a ban on plastics in 1998. Other states should follow the example of this region and ban the use of items that cause harm to the environment. One positive note is that in many large cities, shops have begun packing items in reusable or biodegradable bags. Certain biodegradable items can also be composted and reused. In fact proper handling of the biodegradable waste will considerably lessen the burden of solid waste that each city has to tackle.

II. HISTORY OF SOLID WASTE

In ancient cities, wastes were thrown onto unpaved streets and roadways, where they were left to accumulate. It was not until 320 BCE in Athens that the first known law forbidding this practice was established. At that time a system for waste removal began to evolve in Greece and in the Greek-dominated cities of the eastern Mediterranean. In ancient Rome, property owners were responsible for cleaning the streets fronting their property. But organized waste collection was associated only with state-sponsored events such as parades. Disposal methods were very crude, involving open pits located just outside the city walls. As populations increased, efforts were made to transport waste farther out from the cities.

After the fall of Rome, waste collection and municipal sanitation began a decline that lasted throughout the Middle Ages. Near the end of the 14th century, scavengers were given the task of carting waste to dumps outside city walls. But this was not the case in smaller towns, where most people still threw waste into the streets. It was not until 1714 that every city in England was required to have an official scavenger. Toward the end of the 18th century in America, municipal collection of garbage was begun in Boston, New York City, and Philadelphia. Waste disposal methods were still very crude, however. Garbage collected in Philadelphia, for example, was simply dumped into the Delaware River downstream from the city.

III. DEVELOPMENTS IN WASTE MANAGEMENT

For management of solid-waste a technological approach was begun to develop in the latter part of the 19th century. Watertight garbage cans were first introduced in the United States, and sturdier vehicles were used to collect and transport wastes. A significant development in solid-waste treatment and disposal practices was marked by the construction of the first refuse incinerator in England in 1874. By the beginning of the 20th century, 15 percent of major American cities were incinerating solid waste. Even then, however, most of the largest cities were still using

primitive disposal methods such as open dumping on land or in water.

Technological advances continued during the first half of the 20th century, including the development of garbage grinders, compaction trucks, and pneumatic collection systems. By mid-century, however, it had become evident that open dumping and improper incineration of solid waste were causing problems of pollution and jeopardizing public health. As a result, sanitary landfills were developed to replace the practice of open dumping and to reduce the reliance on waste incineration. In many countries waste was divided into two categories, hazardous and nonhazardous, and separate regulations were developed for their disposal. Landfills were designed and operated in a manner that minimized risks to public health and the environment. New refuse incinerators were designed to recover heat energy from the waste and were provided with extensive air pollution control devices to satisfy stringent standards of air quality. Modern solid-waste management plants in most developed countries now emphasize the practice of recycling and waste reduction at the source rather than incineration and land disposal

IV. TYPES OF SOLID WASTE

Solid waste can be classified into different types depending on their source:

a. Household waste is generally classified as municipal waste,
b. Industrial waste as hazardous waste, and
c. Biomedical waste or hospital waste as infectious waste.

V. CHANDIGARH - AN INTRODUCTION

Chandigarh was planned as a standalone city surrounded by a controlled rural belt around it to nourish it. Although, the city has largely developed as per the original plan and its clearly defined land uses, the controlled periphery even within the UT of Chandigarh has been completely transformed due to re-organisation, majority of the area of the periphery has gone to the state of Punjab (73%), State of Haryana has 24% of the area of the periphery whereas remaining 3% is with the Chandigarh. Accordingly, the area available under periphery with the Chandigarh has been reduced considerably in the post 1966 re-organisation. Over a period of time, large number of developments have been taken up in the periphery, these developments are both of planned and unplanned nature. With these developments, the city has been extended towards the East, South and West to accommodate new requirements without any comprehensive plan. New residential, institutional and other uses have been added both within and outside the sectoral grid. The establishment of the IT park, rehabilitation colonies for unauthorized settlements, Sarangpur Institutional area, Botanical Garden, Milkmen Colony-Dhanas, Dumping Ground for solid waste etc towards the east and west has entailed overstepping of the natural boundaries of the Patiali Ki Rao and the Sukhna Choe.

Considering the development already taken up within the area comprising of the periphery, the same is now proposed to be included as part of the Chandigarh Master Plan 2031 with the exception of the unauthorized constructions raised in violation of Periphery Act. Thus the present landuse plan will define the area covered under Phase I (Sector 1 to 30), Phase-II (Sector 31 to 47) and Phase-III (Sector 48 to 56) besides the area of the periphery.

VI. SOURCES AND QUANTITIES OF MUNICIPAL SOLID WASTE IN CHANDIGARH

The quantity of municipal solid waste generated depends on factors such as food habits, standard of living of people, seasonal variations and the number of commercial activities being taking place. Since solid waste is an environmental health hazard, its effective management by local authorities is a posing problem. The municipal corporations are continuously seeking new management strategies to deal with this huge quantity of solid waste generation. To design an appropriate collection and disposal system of municipal solid waste it is necessary to have complete data on quantity generation and variation of the solid waste produced. With increasing urbanization and changing lifestyle, Indian cities produces eight times more solid waste as was produced in 1947. Presently, around 90 million tons of solid waste is generated as by product from industrial, municipal, agricultural, commercial and other processes. The amount of municipal solid waste generated is estimated to increase at a rate of 1 to 1.33% annually in India. Recent studies show that 45 MT/ year of solid waste is generated from the urban centers of India which are inefficiently collected, inadequately transported and disposed off in an unscientific manner (Khatib; 2011). The projected increase of solid waste is expected to rise to 125 MT/ year by 2025 (Das et al., 2010).

The major sources of municipal solid waste in Chandigarh municipal corporation area are residential area, commercial areas, offices and institutions. Chandigarh generates approximately 370 tons/ day i.e., 0.39kg/cap-d of waste daily

VII. COLLECTION AND STORAGE OF SOLID WASTE

For an effective solid waste management system, the collection capacities have to be greater than or equal to the solid waste generation rates. However, in India collection capacity provided is often less than the actual waste generated which is a major drawback in proper implementation of solid waste management system. Collection and storage of municipal solid waste is an important issue which has great impact on the overall solid waste management (Annepu, 2012). In India, generally common bins are provided for collection of decomposable and non-decomposable waste. Collection of municipal solid waste is the responsibility of the

municipalities itself. Every city has its own collection and storage points including Chandigarh city.

In Chandigarh due to climatic factors like high temperature, humidity and also due to high organic composition in the solid waste, the collection of the solid waste is done regularly as the waste gets decomposed rapidly [1]. Different collection methods include house-to-house collection of the waste by using handcarts or tricycles and also collection of roadside waste by street sweeping. The remaining uncollected waste is often dumped on available vacant land. An overall collection of 90% has been achieved in Chandigarh with collection efficiency of 60-70% for the registered households and 20% for the slums and surrounding villages [2]. Once the waste has been collected they are unloaded at the community based Sehaj Safai Kendra's into the containers, from where these containers are loaded on the vehicles (trucks, trolleys, tractors etc) used for transporting the waste to final disposal site. The Sehaj Safai Kendra acts as a primary collection point wherein the wastes are segregated.

VIII. PRIMARY COLLECTION OF MUNICIPAL SOLID WASTE IN CHANDIGARH

After the implementation of solid waste management programme, Chandigarh Municipal Corporation is working systematically towards effective street sweeping, collection, transportation and disposal of waste[3]. The services provided are same in all the wards. Every day roads are swept and waste is collected at a particular time slot starting from morning 6 AM to 4 PM. Sweepers are provided with the handcarts or tricycles, scrappers and brooms to clean the roads and lanes properly, to clean the open drains, to collect the waste and load it into the carts provided and then transfer them to the primary collection points called the Sehaj Safai Kendra's which are situated in different sectors. The handcarts on an average have a capacity of 2-3 m3. Roads are first swept before proceeding for collection of household wastes. The waste is collected by sweepers going from house-to-house and collecting the waste which the residents have collected in the dustbins. This house-to-house collection is done in all the residential sectors and covers about 70-80% of the registered households (Personal communication with Chandigarh Municipal Corporation). Figure 3 shows how the collection is being done in carts and transferred to the primary collection points. Earlier the bins were placed at different places in sectors but the residents used to throw waste outside those bins instead of inside which created unsanitary conditions around the bin locations. However, with progression of time, people are becoming aware of the hazardous effects of solid wastes through information circulated via electronic and social media and the importance about the proper disposal of solid waste and its impact. Along with such educational programs, the government and other entities involved in tackling solid waste related problems are making considerable efforts including inculcation of strict legislative actions in keeping the city cleaner and healthier.

To determine the efficiency of this method, an experiment was carried by the Municipal Corporation of Chandigarh termed as "Bin Free Collection". For this purpose the Municipal Corporation of Chandigarh allotted about 1/5 of the area of the city to the private company for providing proper sanitation services. An appointment of 400 safaiwalas (cleaners) to collect the waste from each house was done for this purpose. Mechanical sweepers were also provided after certain intervals of time. In this experiment instead of providing the dust bins in each sector, two or more places were marked around the sectors where the bins were placed and residents were asked to arrange for the disposal of house hold waste at Sehaj Safai Kendra's by engaging cycle carts for house to house garbage collection. Another option provided was that dustbins of Sehaj Safai Kendra were placed in the sector itself where the door-to-door collectors dumped the waste after segregation including different sized containers. This experiment gave positive result as people were more particular about the disposal of waste and with the allotment of house-to-house collection of waste, the daily collection and disposal of waste became an easy task. This is primary reason for achieving 90% collection efficiency in view of the fact that only 35 out 56 sectors have been equipped with collection bins. However, it was observed that certain proportion of residents did not participate in the experiment and also a proportion of participating residents did not abide by the rules of 'bin-free experiment'.

In practice, Chandigarh Municipal Corporation aims to provide daily collection routine but overflowing bins and problem of bad odor emanating from the bins are frequent view, which are a human environmental risks. This situation persists despite the presence of excess storage capacity of the bins. This is primarily due to lack of suitable trained manpower, inappropriate collection routes and often unavailability of collection vehicles. Another major drawback is the lack of community Sehaj Safai Kendra's in all the sectors of Chandigarh city which could increase the collection efficiency further. Further available manpower should be motivated for working diligently as delaying in collecting waste can prove harmful due to accumulation of harmful gases and odor. Chandigarh Municipal Corporation should also ensure construction of the community Sehaj Safai Kendra's in each sector which would help in curbing the problem of ineffective waste collection and storage.

[1] Chandigarh development report, 2011

[2] Personal communication with Chandigarh Municipal Corporation

[3] Chandigarh development plan, 2011, Personal communication with Chandigarh Municipal Corporation

IX. STORAGE OF SOLID WASTE

Chandigarh Municipal Corporation have set up various community Sehaj Safai Kendra's in 35 out 56 sectors where the waste after collection is stored primarily before getting transported to the disposal site. For those sectors which do not have Sehaj Safai Kendra, wastes are collected and stored in Sehaj Safai Kendra of adjoining sectors. These constructed buildings are provided with boundary wall also act as segregation platform with drinking and toilet facilities, storage and a room for rag pickers to take rest. Segregation of waste take places here as some items are picked up by the sweepers.

Waste is brought to these community Sehaj Safai Kendra's with the help of handcarts during primary collection and is emptied in storage containers. Segregation of waste is carried out by rag pickers and sweepers in informal way in these Kendra's (Aljaradin, 2012). Trucks or dumpers can also enter these Sehaj Safai Kendra's and pick up the waste from these storage sites to the disposal site. These Sehaj Safai Kendra's act as transfer stations except that there is neither compaction unit nor any proper segregation unit. This scheme was started by the corporation as an experiment to have a stabilized solid waste management. Positive results were obtained from this experiment and were converted into a large-scale project by Central Pollution Control Board (CPCB India) when they came to visit the city and analyze the results. A detailed pilot project report was prepared and finally the project was sanctioned and Municipal Corporation of Chandigarh got 3.14 cores for this project. Till now the project is getting positive response from this scheme and is also in process of getting further extended to other sectors in Chandigarh.

X. EXISTING PROBLEMS IN THE PRESENT SOLID WASTE MANAGEMENT AND POSSIBLE SOLUTIONS FOR CHANDIGARH CITY

- **Littering by residents after collection**

Although the sweeping and collection of waste is often done regularly, residents cause littering of waste. Instead of disposing of waste in the garbage bins provided to them, they litter the waste in open. The households particularly from the slums, low income areas and local shopkeepers frequently throw waste onto streets and roads and any available open spaces causing excessive littering and clogging of drainage systems in Chandigarh city.

To combat this problem the corporation should strictly specify and notify residents about the timings of the waste collection so as to avoid the problem of littering. Big containers or bins should be placed outside shops so that the waste is disposed in those bins and penalize the offenders with heavy fine and punishment. The lack of an adequate policy and regulatory framework further compounds the problem. Legal actions must be taken against the individuals or the industrial units which are found guilty. Chandigarh Municipal Corporation should also campaign aggressively for more awareness and education about maintaining cleanliness in public areas. Further, the Chandigarh municipal corporation should reorganize allotment of municipal budgets to prioritize upgrade of waste infrastructure and services.

- **Poor Conditions of Collection Containers and Areas around them**

The condition of the open containers used during the primary collection and storage is very unhygienic in most collection points in different sectors in Chandigarh. Foul smell and odor, propagation of flies and other disease causing vectors are common site at these sites. We suggest that these open containers must be replaced with the closed containers and handcarts be used for the collection of waste. If open collection containers are to be continued with for collection of wastes they should be regularly cleaned, disinfected and should be replaced after certain years of service else they should be replaced by close collection containers. Another important suggestion is using proper volume storage containers to be sufficient enough to cater to the entire waste generation for that particular location. This will not cause an overflow and will prevent poor conditions around the collection container.

- **Distribution of Labor and Resources**

Sweepers or sanitation workers are assigned to different sectors on the basis of population. There are total 56 sectors in Chandigarh city about 10-15 sweepers are assigned to each sector[4]. For collection of waste from each of these sectors handcarts have been provided operated by a team of two persons. Workers and handcarts are allocated based on population, commercial activities and vehicle road kilometers in various sectors in Chandigarh. It has been envisioned to use rag pickers supervised by certain NGO's for improving the collection frequency. The rag pickers must be motivated to work which can help both ways. It will help in separating out the biodegradable and recyclable waste. This would help in improving the efficiency of urban solid waste collection and recovery and would also provide job opportunities for the informal waste collectors.

Recovery and recycling of waste is an important component of integrated solid waste management as it decreases the load of waste going to the dumping site or for incineration. At present, there exists no provision for recycling or recovery of the municipal solid waste in Chandigarh. It is recommended that there should be a formation of formal recycling unit where there should be proper and formal recycling of waste so as to derive all the benefits. Presently, in Chandigarh there exist some local non-formal recyclers involved in recycling process. These informal recyclers mainly comprises of unorganized and unrecognized establishments and are not monitored by the government and hence do not contribute to the economy.

[4] Personal interaction with the sweepers of the city

XI. CHANDIGARH MUNICIPAL CORPORATION'S RECENT INNOVATION AND INTERVENTIONS FOR THE MANAGEMENT OF SOLID WASTE

The present Government of India has launched a "Swachh Bharat Abhiyan"- "Clean India Mission" in 2014. The whole movement is to make a significant impact on public health and in safeguarding income of poor, ultimately contributing to the national economy.

As a part of this movement and also with increasing quantity in generation of solid waste, the Chandigarh Municipal Corporation has introduced many recent steps towards a better solid waste management. This includes introduction of more number of garbage bins in different sectors. The Municipal Corporation has also sanctioned buying of more dumpers, trucks and containers for the financial year 2015-2016 (Personal interaction with the employees and drivers of Chandigarh Municipal Corporation). In essence, the Chandigarh Municipal Corporation is now focusing on the development of an integrated municipal solid waste management to addresses all essential activities namely, segregation and storage of waste at the sources, particularly on the importance of source segregation methods.

XII. CONCLUDING REMARKS

Nek Chand's Rock Garden is a very innovative and ideal example of solid waste in Chandigarh. No doubt Municipal Corporation of Chandigarh is rapidly took steps to make environment neat and clean. As Chandigarh is the capital of both Punjab and Haryana states and its population is growing in an increasing manner, but as per the growing growth in population of Chandigarh, it has to face the problems of solid waste as in the other major cities of India. There is a need to handle this problem seriously to make clean the environment of Chandigarh City.

REFERENCES

[1]. Aljaradin (2012 Status of Solid Waste Management in India, Implementation Status of Municipal Solid Wastes, Management and Handling Rules 2000, Central Pollution Control Board, New Delhi

[2]. Anand, Subhash (2005). "Solid Waste Generation and Management in Delhi: A Sustainable Approach" in Singh, J. (Ed.). Environment and Development, I.K. International Publisher, New Delhi, pp. 621 – 639.

[3]. Anjaneyulu, Y., (2005). Introduction to Environmental Science, B.S. Publications, Hyderabad

[4]. Annepu (2012). Status of Solid Waste Management in India, Implementation Status of Municipal Solid Wastes, Management and Handling Rules 2000, Central Pollution Control Board, New Delhi

[5]. ASCE (1993) Fly ash for soil improvement, Geotechnical special publication 36. American Society of Civil Engineering, New York.

[6]. Askarian M., Vakili M., Kabir G (2004), Hospital waste management status in university hospitals of the Fars province Iran, Int. J. Environ. Health Res., 14, 295-305,

[7]. Asnani, P.U. (2004). United States Asia Environmental Partnership Report, United States Agency for International Development, Centre for Environmental Planning and Technology, Ahmedabad.

[8]. Das, R.R. (2009) "Concepts of Environmental Science, Paragon International Publishers, New Delhi.

[9]. Khatib (2011) Urban Solid Waste Series, Vol., 3. Amsterdam and Gouda: Tool, Transfer of Technology for Development and WASTE Consultants.

[10]. Singhal S. & Suneel P (2001), Solid waste management in India, status & future directions. TERI Information Monitor on Environmental Science, 6(1), 1-4

