



SOLID WASTE MANAGEMENT IN CURCHOREM - CACORA MUNICIPAL COUNCIL, GOA (INDIA)

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AUTHORS' CONTRIBUTIONS

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Solid Waste Management must be incorporated into environmental planning. It has profound impact on health and hygiene of the community. Waste is generated from different sources such as industrial, residential and commercial activities in a given area and goes through a process of segregation, treatment and final disposal in the landfill. Waste segregation and management is a scientific process by which we can categorise waste products and garbage on the basis of what we can re-use, recycle, reduce. Garbage collection is the responsibility of the respective municipalities in urban areas. In the present investigation garbage management issues of Curchorem - Cacora Municipal Council were scrutinized. Total garbage collected during the study period in the municipal council was 239 tonnes. Ward number 2 produced maximum garbage i.e., 5.0428 tonnes/day and ward number 8 produced minimum garbage with 1.0285 tonnes/day. It is opined that existing system of segregated garbage collection is satisfactory; however more prompt services are required at public places.

Keywords: Environmental planning; garbage; health and hygiene; solid waste management.

1. INTRODUCTION

In the sixteenth century as a result of industrial revolution, people began to move from rural areas to industrial areas, which gradually transformed into cities. Urbanization due to this migration resulted in

population explosion which in turn led to a surge in the volume and variety in the composition of wastes generated in cities [1]. This resulted in indiscriminate littering and open dumps, which in turn formed breeding grounds for rats and other vermin, posing significant risks to public health. Several outbreaks of

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epidemics with high death tolls resulted due to the unscientific waste management practices [2].

Most anthropogenic activities generate waste [3]. In recent times, volume and variety of waste generation increased at rapid rate [4]. Several definitions for waste are available in literature. Waste is the useless by product of human activities which are available within the useful product [5]. wastes are materials that people would want to dispose of even when payments are required for their disposal [6]. Waste production is the result of inefficient production processes leading to the loss of vital resources [7].

Municipal Solid Waste (MSW) include household waste, commercial and market area waste, slaughter house waste, medical waste, institutional waste (e.g., from schools, community halls), horticultural waste (from parks and gardens), waste from road sweeping, silt from drainage. A substance considered as waste by one individual, may be a resource to another. Therefore, a material can only be thought to be a waste when the owner labels it so [6]. Similarly, [8] reported that, MSW mainly consist of food and garden waste, textiles, paper or cardboard, plastics, glass and metals. They suggested that, owing to the composition of MSW, the waste could easily be used for energy recovery or the production of fuel. [4]

observed that Municipal Solid Waste (MSW) reflects the lifestyles and customs of the people that produce it. They added that, MSW can have a negative impact on the well-being of the public and the environment if not properly managed [9].

Today, most of the developing countries have effectively addressed much of the health and environmental pollution issues related to waste generation. In contrast, the increasing rate of urbanization and developments in emerging countries is now resulting in a repeat of the identical historical problems that developed countries have had to address within the past [1].

The Curchorem - Cacora town is the commercial headquarter market for all the villagers of Sanguem and Quepem taluka and the municipality in the South Goa District (Fig. 1). Sunday is the weekly market day on which the people from all the nearby villages visit Curchorem town for all types of purchases. Curchorem - Cacora Municipal Council has 15 wards. Like most of the municipalities in Goa, CCMC has started waste management with the open community bins placed at different places. After filling it was collected by the municipal workers and carried by the municipal vehicles and then dumped at the dumping site at Cacora.

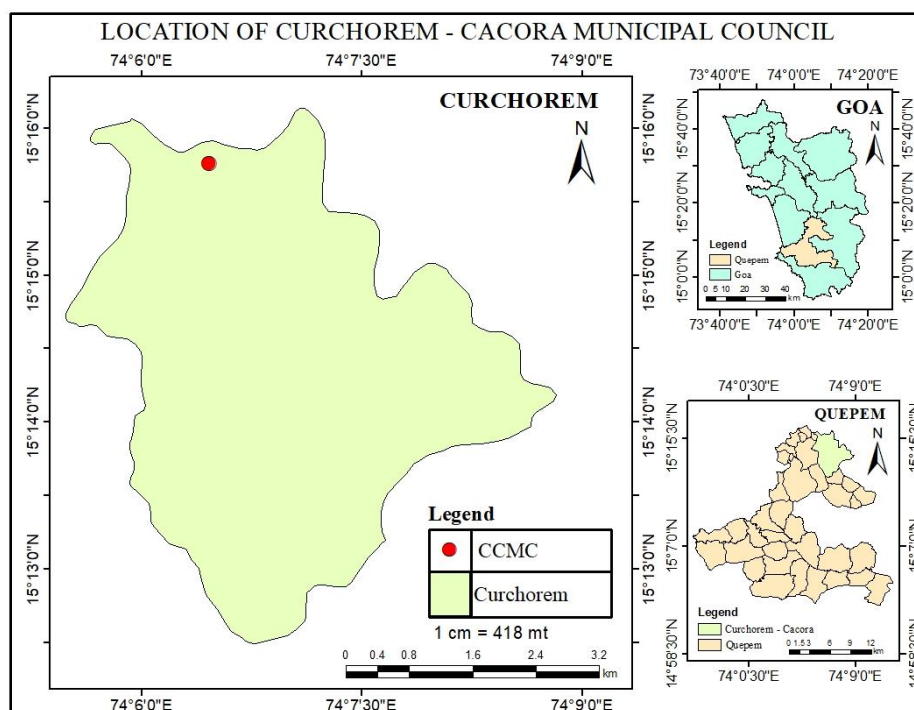


Fig. 1. Location of Curchrem – Cacora Municipal Council, Goa



Fig. 2. Curchorem Market Area.



Fig. 3. Curchorem - Cacora Municipal Council



Fig. 4. Tipper truck used for waste collection



Fig. 5. 240 liters capacity bins used for daily collection of waste



Fig. 6. 10 liters capacity dust bins for dry and wet waste at individual house



Fig. 7. Vermicomposting units



Fig. 8. Vermicompost ready for free distribution



Fig. 9. Garbage composting machine



Fig. 10. Garbage segregating platform

Now recently, CCMC has started with the door-to-door garbage collection method in which two separate color-coded dustbins were given to each household in Curchorem town for the dry waste and wet waste; blue coloured for the dry waste and green coloured for the wet waste (Fig. 6).

The collection of the waste from this council jurisdiction is done through the contractor M/s Rosario Dantas. Prior to this, the waste from the commercial establishments and municipal market was done by the Urban Local Bodies (ULBs) staff. There are total 41 labourers under the CCMC and 5 rickshaws, 3 trucks and 3 compactors for the garbage collection in Curchorem town (Fig. 4). At present, this municipal council is utilising the MRF facility constructed and operated by Goa Waste Management Corporation at IDC Cacora in plot number 80-IDC. The site acquired by this municipal council for setting up of treatment facility is handed over to the Goa Waste Management Corporation for setting up of common facility i.e., treatment plant and sanitary landfill site. Present investigation is carried out to study the effectiveness of waste management in Curchorem - Cacora Municipal Area.

2. METHODOLOGY

In the present study a random survey was conducted to analyse various issues associated with Municipal Waste Management. Primary data of daily waste collection by the municipality workers from different wards was collected and types of waste generated in the municipal area for one week was recorded. Percent composition of waste collection constituents and annual collections were computed to analyse the life style and social responsibilities of the residents.

3. RESULTS

Around 50 bins of 240 litters capacity were used for daily collection of waste from the entire jurisdiction



Fig. 11. Modern Garbage Treatment Plant under construction at Khargatagati - Cacora

of this council (Fig. 5). Around 7000 bins of 10 litres were also provided to the individual households for storing the segregated waste at household level (Fig. 6). At present there are around 18 component pits of size 1.80x1.40x1.50 meters having a capacity of 52 cubic meters (Fig. 7). There are total 13 open composting pits at Khargatagati Cacora in survey no 165/1P, 164/8P, 167, 168/1 of village Cascara of Quepem taluka where the waste plant is coming up. In the said pits, composting is done and the compost produced is distributed to public free of charge, which can be used for plants (Fig. 8).

During the study period total waste collected was 239 tonnes in the municipal council. Ward number 2 Kanirial, produced maximum waste on an average of 5.0428 tonnes/day and ward number 8 Serlem produced minimum waste of 1.0285 tonnes (Table 1).

The Fig. 12 revealed that the majority of waste collection is done in ward number 2 i.e., Kanirial with 35.3 tonnes/week. The least collection of waste is collected from wards number 8 i.e., Serlem with 7.2 tonnes/week.

The Fig. 13 shows the percentage of daily waste collected in the study area. It is observed that on Monday the garbage collection was maximum with 38.50 tonnes (14 percent) and it was minimum on Thursday with 30.80 tonnes (13 percent).

The Fig. 14 shows the percentage of types of waste collected in Curchorem - Cacora Municipal Council. During the investigation period it was observed that the biodegradable waste constitute maximum with 66.35 percent, recyclable waste was 23 percent, domestic hazardous waste was 6 percent and construction waste debris was minimum with 5 percent.

Table 1. Daily collection of waste from different wards of CCMC

Ward Name	Sun	Mon	Tues	Wed	Thurs	Fri	Sat	Total in tonnes	Average /day in tonnes
1. Baagwada	3.6	3.2	2.8	2.9	2.5	2.7	3.3	21.0	3.0000
2. Kaniral	5.4	5.7	4.2	5.7	4.5	4.6	5.2	35.3	5.0428
3. Pontemol	1.0	3.2	3.2	3.2	2.1	2.0	1.4	16.1	2.3000
4. Pongirwal	3.4	2.7	1.2	1.9	1.7	3.7	3.0	17.6	2.5142
5. Carriamoddi	1.9	1.9	1.7	2.2	3.0	1.2	1.9	13.8	1.9714
6. Madhegal	1.7	4.0	3.7	2.0	1.5	1.7	1.7	16.3	2.3285
7. Moraillem	2.0	1.2	1.9	1.7	1.1	1.5	2.0	11.4	1.6285
8. Serlem	1.2	1.0	1.2	1.4	0.5	0.9	1.0	7.2	1.0285
9. Vodlemol	1.8	2.3	2.3	1.5	2.9	2.5	1.9	15.2	2.1714
10. Karmaliwada	1.4	3.6	1.6	2.5	1.5	1.9	1.1	13.6	1.9428
11. Ghadiwada	2.2	2.2	2.0	2.4	2.1	2.0	2.4	15.3	2.1857
12. Sawantwada	2.8	2.9	1.2	1.6	2.0	1.1	2.4	14.0	2.0000
13. Ghotmorod	2.0	1.3	2.1	2.1	3.1	2.1	2.3	15.0	2.1428
14. Bepquegal	2.6	2.2	3.2	2.8	1.2	3.2	1.3	16.5	2.3571
15. Vastwada	2.1	1.1	1.5	1.7	1.1	2.2	1.0	10.7	1.5285
Total	35.00	38.50	33.80	35.60	30.80	33.30	32.00	239	34.1422

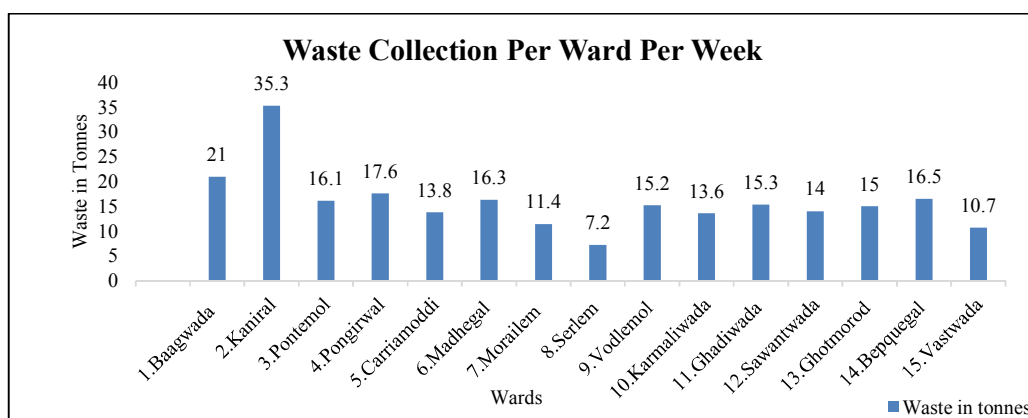


Fig. 12. Waste Collection per ward per week in Curchorem - Cacora Municipal Council

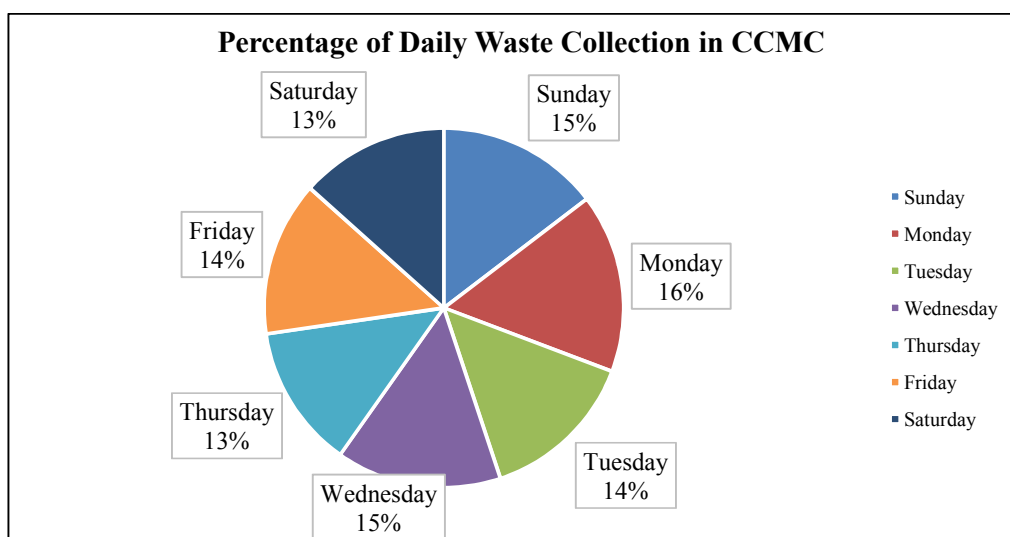


Fig. 13. Daily Waste Collection in Curchorem - Cacora Municipal Council

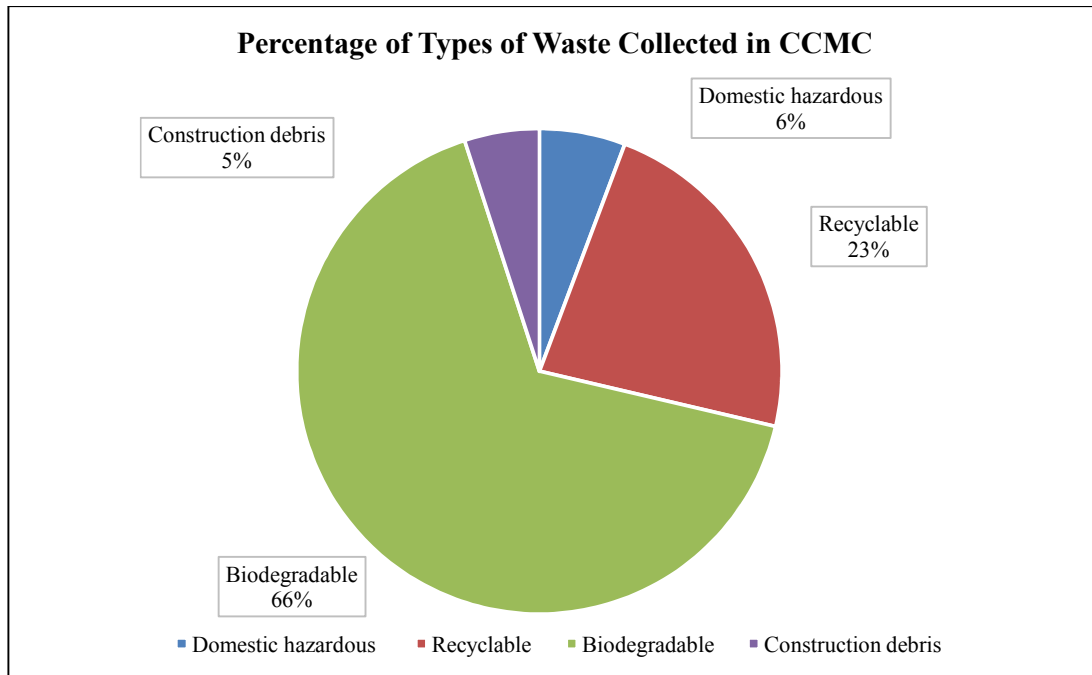


Fig. 14. Types of Waste Collected in Curchorem - Cacora Municipal Council

4. DISCUSSION

In the pre-historic period, wastes were merely a source of nuisance that needed to be disposed, as the population was small and a vast amount of land was available to the population. At that time proper waste management was not a major issue. In the past, our needs and our requirements were very limited. Therefore, the waste generated was also very low. The waste generated was easily absorbed by the environment without any form of degradation [2]. It is in the later part of 19th Century, the scientific approach and use of technology to Solid Waste Management started in the country.

Waste generation is the result of interactions of Man with his immediate environment. However, [10] reported that waste production and management will not be a significant issue until people began inhabitation in communities leading to urbanization of the area. [4] reported that as population and buying power increased worldwide, more goods are produced to fulfil increasing demand, thereby resulting in the assembly of more waste. All citizens have a right to have clean air, water and food which can be assured by maintaining a clear and healthy environment.

Wastes are often solid, liquid or gaseous and every type has different methods of disposal and management. Waste management deals with every type of waste including industrial, biological and

household. In some cases, waste can pose a threat to human health. Appropriate techniques of waste management are crucial for sustainable and livable cities, but for several developing countries and cities it is a herculean task. Cities are now plagued with various issues of high volumes of waste, the prices involved, the disposal technologies and methodologies and also the impact on waste on the local and global environment [1].

Another type of solid waste, perhaps the fastest-growing component in many developed and developing countries is electronic waste or e-waste, which includes discarded computer equipment, televisions, telephones and a variety of other electronic devices. Concern over this type of waste is escalating. Most significant and potentially polluting materials are Lead, Mercury and Cadmium from these electronic devices. Appropriate policies from the government and effective implementation are required to regulate their recycling and disposal.

Solid Waste Management (SWM) is a major problem for many urban and rural bodies in Goa because of a change in lifestyle. Urbanization, industrialization and economic growth due to ever increasing population have resulted in increased municipal waste generation. The primary goal of Solid Waste Management by trained sanitation workers is reducing, reusing and recycling. Most important mission of civic bodies is eliminating adverse impacts

of waste materials on human health and the environment, thus strongly supporting superior quality of life and economic development. It is to be done in the most efficient manner possible to keep costs low and prevent waste build-up [11]. Collection of waste is the responsibility of the respective municipalities. The process of segregation in our country is still done manually by rag pickers. Materials that can be recycled are separated. This process of segregation minimizes and reduces substantially the amount of solid waste, which is ultimately disposed of in the landfills.

The recommended waste management system deals with maximizing recycling and minimizing landfilling of municipal solid waste, and consists of collection, sorting, recycling, composting and sanitary landfilling. The most common management strategy for Municipal Solid Waste is landfill. For this purpose, a disposal site can be selected, designed, constructed and operated carefully to protect the environment and public health [9]. For the same reason municipal administration in the state keeping future needs in priority granted permission to build new ultra-modern recycling plant. The site acquired by the Curchorem- Cacora Municipal Council having an area of around 66000sq mts. is handed over to the Department of Science and Technology, Government of Goa, for setting up to 100 TPD Common Treatment Facility at Khargattegati, Cacora in survey no 165/1P, 164/8P, 167, 168/1 of village Cacora of Quepem taluka. The work of the construction of this plant is ongoing through Goa Waste Management Corporation and the work is expected to be completed by December 2021.

The volume and weight of solid waste can be reduced effectively by burning though it is a source of greenhouse gas emissions. Waste is burned inside a properly designed furnace under very carefully controlled conditions in modern incinerators. Similar provisions are planned at upcoming treatment plant in Cacora. It is observed from present investigation that the bio-degradable waste constitutes 158.6 tonnes per day which makes 66.35 percent of total garbage generated from this municipal council limits. It can be a potential raw material for manufacturing vermicompost. Curchorem - Cacora Municipal Council maintains 13 open composting pits to generate compost for free distribution.

In Curchorem - Cacora Municipal Council, the waste is collected in the segregated form. There are total 41 labourers who are working for garbage collection. The dry and wet waste is collected separately and transported separately. The waste collected by the municipality is transported to the processing site by

this council through its own vehicles with the help of the workers provided by the council appointed for collection of waste. Dry waste collected is transported to the bailing station of Goa Waste Management Corporation for processing and the wet waste is partly treated through open composting and decentralized functional pits and partly dumped at dump site. It is reported during the study that more awareness is needed regarding proper segregation at source to achieve hundred percent total segregation as several times trained sanitation workers face problems in collecting the garbage in mixed state. It is observed during the study period that prompt service is provided by the council in domestic areas. However, more efficiency and frequency of garbage collection is needed in public places.

5. CONCLUSION

The main aim of this Solid Waste Management is to keep the Curchorem town clean and neat. The Curchorem - Cacora Municipal Council is practicing door-to-door garbage collection method. They have waste management plan. A daily collection mechanism for ward collection of segregated waste and waste disposal committees are in place. Most of the residents responded to the survey expressed satisfaction with the existing garbage management system in residential areas. However, they expect better services in public places and market areas. With regards to solid waste treatment facilities, the municipality is sending collected dry waste to the Goa Waste Management Corporation (GWMC) dry waste sorting centre at Curchorem - Cacora and windrow facility for treatment of wet waste. Modern treatment plant with advanced waste management technique is coming up in this municipal council.

DISCLAIMER

The products used for this research are commonly and predominantly use products in our area of research and country. There is absolutely no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but for the advancement of knowledge. Also, the research was not funded by the producing company rather it was funded by personal efforts of the authors.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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