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Diagnosis of Municipal Solid Waste Management

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Solid waste is a continually growing problem at global and regional, as well as at local levels. Solid waste management is a worldwide phenomenon. It is a big challenge all over the world for human beings. Without an effective and efficient solid-waste management program, the waste generated from various human activities, both industrial and domestic, can result in health hazards and have a negative impact on the environment.

Management of solid waste may be defined as that discipline associated with the control of generation, storage, collection, transfer and transport, processing, and disposal of solid wastes in a manner that is in accord with the best principles of public health, economics, engineering, conservation, aesthetics, and other environmental considerations. Solid wastes have the potential to pollute all the vital components of living environment (i.e., air, land and water) at local and at global levels. The problem is compounded by trends in consumption and production patterns and by continuing urbanization of the world.

The Solid Waste Management (SWM) is one of the important obligatory functions of the urban local bodies in India. It is also one of the primary responsibilities of the municipal authorities. Over the years, the quantum of waste generated by different category of waste producers has been increasing keeping in pace with the increase in urbanization, population growth and associated activities.

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Solid Waste Generation in India

Urbanization is one of the important factors affecting the generation of solid waste. The number of urban population is increasing rapidly, in India, from a mere 10.89% of her total population living in urban areas in 1901; it has reached 31.16% by 2011. It is obvious that, this rapid growth in urban population and urban areas generates more and more solid waste. Shankar U and Mathur POM (1998) state in their article *'Economic Instrument of Sustainability'* that Indian cities produce wastes in the aggregate 100,000 – 110,000 metric tones, or a per capita average of 0.40 – 0.42 kgs a day. The National Commission on urbanization (1988), on the basis of sample of 40 cities over 100,000 population found that the mean per capita waste/day to be 0.27 kg. An average Indian generates about 400 – 500 g/day of solid waste and it is increased by 1.3% annually. On an average 82.8% of solid waste generated in metropolitan cities are collected and disposed. The average increase in solid waste in India is 5.0% yearly.

> The present system of MSWM in Belgaum city is satisfactory based on MSW(M & H) Rule 2000 in spite of that more emphasis needs to be laid on segregation and collection of waste at door step. Segregation of recyclable material from mixed waste not only is tedious but also wasteful, therefore the residents should be sensitized towards the importance of segregation of wastes at source. Rather than considering the municipal solid waste simply as residue to be thrown away, it should be recognized as resource materials for the production of energy, compost and fuel depending upon the techno-economical viability, local condition and sustainability of the project on long term basis.

On the basis of available data, it is estimated that 23 metro cities in India generates about 30,000 tones of such waste per day, while about 50,000 tones are generated daily from the Class I cities. As per recent estimates, Belgaum city generates about 180 tones per day. Out of this 80% is collected and transported out daily.

Study Area

Belgaum City is situated in the northwest part of Karnataka state (15° 51' North Latitudes and 74° 51' East Longitude), is a crossroad of cultures due to its peculiar geographical location. Since the city is well known for industries, commerce, medical, hospital, education, administration, and pleasant climate, it has attracted a huge number of the people from its hinterland and surrounding regions.

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Table-1 – Urban waste situation in some major Indian cities

State	City	Garbage generatedTPD	Kg/Person/day
WB	Greater Kolkata	12060	0.66
MH	Greater Mumbai	11645	0.51
Delhi	Delhi	11558	0.65
TN	Chennai	6404	0.71
AP	Hyderabad	5154	0.65
KA	Greater Bangalore	3501	0.45
Guj	Ahmadabad	2636	0.42
KA	Belgaum	315	0.45

Table-2
Belgaum City the Growth of Popu-lation Solid Generation 1991-2011

Period	Population In Lakh	Solid waste (in TPD)	Period	Population In Lakh	Solid waste (in TPD)
1991	3.12	85	2001	4.06	109
1992	3.23	87	2002	4.16	115
1993	3.33	89	2003	4.18	118
1994	3.43	91	2004	4.25	122
1995	3.54	93	2005	4.31	125
1996	3.65	95	2006	4.43	138
1997	3.70	98	2007	4.51	146
1998	3.87	100	2008	4.63	158
1999	3.90	103	2009	4.71	162
2000	3.95	105	2010	4.82	175
			2011	4.88	180

* Source: Belgaum City Corporation

Table-3 – Physical and Chemical Composition of solid waste

Physical Characteristics of Solid Waste Item	Percentage (%)	Chemical Characteristics of solid waste Item	Percentage (%)
Paper	4.76%	Moisture Content	25.05%
Plastics	0.59%	Organic Matter	22.21%
Metals	0.39%	Carbon	12.55%
Glass	0.34%	Nitrogen	0.61%
Ash and fine dust	39.97%	Phosphorus	0.71%
Total Compostable-Matter	39.76%	Potassium	0.73%
Other	14.19%	C/N	20.73%
—	—	Others	17.41%
Total	100%	Total	100%

-Source : (City Corporation and Percentage is computed by Author.)

The population of Belgaum city is increased sharply from 83483 in 1951 to 4, 88,432 in 2011, which has led to generate more and more waste in the city. In addition to this, the growth of industries, commercial establishments and complexes, educational institutions leading to increase in the amount of solid waste in the city.

Objective of the study

The improvement of solid waste management is one of the greatest challenges faced by the Indian Government. The Government and the local municipal authorities have taken many initiatives towards the improvement of the current situation.

To understand the level of success in these initiatives, it is necessary to carry out an audit or study. Thus, the focus of this research is to diagnose the present situation of solid waste and to evaluate the existing solid waste management in the City.

Methodology

The present work is carried out for Belgaum city through the collection of data (i.e. both primary and secondary data), which has been collected mainly from two departments, the City Municipal Corporation (MC) and Public Works Department (PWD).

Solid Waste in Belgaum City

Today, Belgaum city is plagued with inefficient and insufficient civil amenities. With the growth of city, its trash mainly hazardous plastic, metals, residential wastes, commercial wastes, papers and packaging is growing exponentially. Since last decade, the solid waste is increasing very fast as compared to previous decades, which has become a great threat to the City Corporation and Cantonment board as well as to the city dwellers.

Belgaum city which had a population of 3,12,352 in 1991 now, it reached 4,88,432 during 2011 at the same time solid waste in the city has also increased greatly from 85 Tons to 315 Tons per day. Per capita generation of solid waste is increased from 210 grams/day in 1991 to 450 grams/day in 2011 and it is going to be increase further in days to come.

Solid Waste generation is more in the city during the festivals. This apart the overflowing drains water and sewage gets mixed up with garbage dumped indiscriminately. Even if the people complained to the city corporation officials, it was not attended properly and garbage was cleared once in every three, four days in the area owing to which accumulation of waste was inevitable. The concerned authority lifts the waste at certain places of the city but waste clearance was not done in a proper manner. Much of the garbage was left behind; it posed unhygienic conditions in the city area.

Even after the corporation trucks lift garbage it was spilled on the roads during transportation. The people who travel on bike complain that they have to race with waste dumping trucks on their way to work on the busy road, for fear of the waste falling on then. The trucks leave foul smell too on their way to dump sites outside the city. Heaps of uncleared waste was seen scattered in the city

Generation of Solid Waste

According to the data collected from the Municipal Corporation and Cantonment Board, the generation of solid waste in Belgaum city and Cantonment is 1,80,000 kg per day. The city corporation and Cantonment are able to left 1,00,000 kg every day leaving 80,000 kg left behind which creates unhealthy condition of the city. Per capital generation of solid waste in Belgaum city is 0.35 to 0.45 kg per day. Table-2 shows the growth of population as well as solid waste generation in Belgaum city during 1991-2011

Composition of Urban Solid Waste: Composition is the term used to describe the individual components that make up solid waste stream and their relative distribution, usually based on percent by weight. Information on the composition of solid waste is important in evaluating equipment needs, systems and management programmes and plans.

Table-3 shows the composition of urban solid waste as weight in percentage.

Solid Waste Management in Belgaum Municipal Corporation

Current SWM Practice in Belgaum City: City Corporation of Belgaum (CCB) has recently received the ***"Green Leaf Award"*** for the best municipal corporation for an effective and scientific garbage disposal. The award constituted by Sukuki Exnora (Hyderabad) and assessed by ASCI (Administrative Staff College, of India), Hyderabad, is given to individuals and organisations contributing to solid waste management and demonstrating practical solutions & actions. The criterion for the 'Green Leaf'award was on primary segregation, secondary segregation and plant maintenance.

Today the *City Corporation of Belgaum* is managed to achieve only 50 percent in the primary segregation of waste/segregation at the source process. But now the primary collection or door-to-door collection is being done by five-six agencies. These agencies collect Rs. 20 from every household for a month. The waste collected is then transferred to a container mounted on a vehicle. CCB operates these containers and takes it to the disposal centre at Tumuri in the outskirts of the city.

SWM Staff: The road sweeping is undertaken by Pourakarmikas. There are about 375 Pourakarmikas of whom 309 are deployed for sweeping and other works and 66 are involved in lifting garbage to trucks. There are 15 drivers available. There are totally 22 supervisors and 14 health / sanitary inspectors. An environmental engineer has been appointed as part of Nirmal Nagar Program. One Health officer manages the whole system. There is adequate staff in the city corporation for solid waste management.

Privatization: Out of 58 wards of the city 43 wards have been given out full service contract, which includes sweeping, collection, transport and maintaining the area clean and remaining 15 wards are being managed by corporation pourakarmiks.

Biomedical waste treatment plant: CCB did not have a separate bio medical waste treatment plant. It initiated talks with office bearers of Indian Medical Association (IMA) and medical practitioners who were running hospitals with indoor and operative facilities. "After a series of meetings, the doctors formed an association and installed the incinerator at their own cost. The corporation helped the association with three guntas of land at Khasbag on lease basis to install the plant.

From 1999 onwards, the association has been doing the collection, transportation and final disposal of bio-medical waste on its own. The association has 184 hospitals and nursing homes, 42 clinics, eight dental clinics, nine pathological labs, one government district hospital and one government-run forensic lab as its members. All the medical institutions are trained to segregate and store their garbage in colour-coded bags.

Collection & transportation of BMW

Belgaum city is divided in to eight zones for the purpose of collection and secondary storage of BMW from various hospitals. There are eight

people who collect and transport BMW from various hospitals which is then stored in the secondary storage points. "The secondary storage is done in a big cement box covered with metallic top door which is kept locked. The association has one vehicle which collects BMW from the secondary storage point to the incineration site." There are five such secondary storage points in the cities.

Scientific disposal site

From 2006 onwards, Belgaum city has been disposing the MSW at the landfill scientifically, i.e., by putting sand, clay, HDPE liner and leachate collection facility at village Turmuri. Till then the MSW was neither treated nor converted into manure. Infrastructure Development Corporation (Karnataka) Limited (IDeCk) at Bangalore was entrusted to prepare a project report for final treatment of MSW.

As per IDeCk report, tenders were floated and the work was entrusted to Ramky Enviro Engineers, Hyderabad, for treatment of MSW and convert the waste into manure (which is now sold in the market under the brand name Godhawari Shakti). A unit was established by Ramky for treating the waste and the final disposal. They constructed components like a weigh bridge, security room, electrical panel room, underground reservoir, storm water drainage, water provision, a windrow platform, screening machinery and a leachate treatment plant.

Support of NGO's and Sewer cleaning machines: CCB also take help of NGOs to educate people on cleanliness and hygiene. These NGOs go door to door distributing pamphlets and explaining about the importance of keeping the city clean."

Sewer cleaning machines: The Corporation has also procured two sweepers from Kam-Avida for cleaning the main roads and highways. For cleaning the sewer, the corporation has JCB's gutter/ sewer cleaning machine

Problems of Solid Waste Managements

1. People's participation: Speaking about the cleanliness and hygiene at City Corporation Belgaum, "Belgaum city still face resistance from people. Even the educated people are unwilling to pay 20 for garbage disposal. To initiate any kind of programme, people's participation plays an important role. If people are unwilling to participate and co-operate with the local body, the purpose/mission fails.

2. Problems in Disposal of Solid Waste: The Commissioner of the Belgaum City Corporation has filed a caveat in the Karnataka High Court in anticipation of writ petitions being filed against the corporation by the gram panchayats of Turmuri and three other villages. Land in or around these villages has been identified as a garbage dump for solid waste generated in Belgaum.

The Deputy Commissioner of Belgaum granted 10 acres for the garbage dump in Turmuri village. Another 56 acres and 36 guntas in the same village were granted. But, the villagers are opposing the proposal to dump garbage there on the grounds that it would pollute land, air and water. The villagers have already submitted memorandums to the corporation opposing the proposal. Pariyavarni, a pro-environmental group led by Srihari Kugaji, is supporting the villagers. Given that the villagers are prepared to move the court against the corporation, the Commissioner filed the caveat praying for an opportunity to be heard before the court passes any interim order against it.

Conclusion

The present system of MSWM in Belgaum city is satisfactory based on MSW(M & H) Rule 2000 in spite of that more emphasis needs to be laid on segregation and collection of waste at door step. Segregation of recyclable material from mixed waste not only is tedious but also wasteful, therefore the residents should be sensitized towards the importance of segregation of wastes at source. Rather than considering the municipal solid waste simply as residue to be thrown away, it should be recognized as resource materials for the production of energy, compost and fuel depending upon the techno-economical viability, local condition and sustainability of the project on long term basis.

In order to encourage the citizens, municipal authority should organise awareness programmes for segregation of wastes and shall promote recycling or reuse of segregated materials. The municipal authority should undertake phased programme to ensure community participation in waste segregation. for this purpose, regular meetings at quarterly intervals shall be arrange by the municipal authorities with representatives of local resident welfare associations and non-governmental organisations.

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