

IJEAST

INTERNATIONAL JOURNAL
OF ENGINEERING APPLIED SCIENCE
AND TECHNOLOGY

VOLUME : 2 ISSUE : 2 Print / Issue Publication Date: 27-Jan-2017

ISSN : 2455-2143

Indexed In

Google SCHOLAR OPEN ACCESS doi Crossref

WWW.IJEAST.COM

editor@ijeast.com

International Journal of Engineering Applied Sciences and Technology, 2016
Vol. 2, Issue 2, ISSN No. 2455-2143, Pages 103-105
Published Online December-January 2016 in IJEAST (http://www.ijeast.com)



SMART SOLUTION FOR SANITATION INCLUDING WASTE MANAGEMENT FOR BELAGAVI CITY

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***Abstract*— Increase in landfill and incinerators, disposal of industrial waste, electronic, medical and municipal are affecting risks to the health, planet and population. Waste management in big cities is a hot issue in growing cities like Belagavi. Spread of diseases and impurity of water bodies and soils are the results of inaccurate discarding of waste. According to research studies, production of waste reach 15 million tons per day by 2100 globally. The amount of waste unmanageable is 2.2 million tons per day. By investing waste in recycling we can reduce disposal cost. Recycling helps us to solve the issue of waste production by understanding the waste eco-system.**

Keywords—**Diseases, smart cities, recycling, eco-system, smart technologies, sanitation, solid waste**

I. INTRODUCTION

The city Belagavi is the district headquarters in North Karnataka. As it contains Suvarna Vidhana soudha, it is also known as second capital of Karnataka state. The city falls in the center of the seven-culture areas bordered by Maharastra state on the west and north, Bijapur district on the northeast, Bagalkot district on the east, Goa state on southwest, Gadag district on the southeast, Dharwad and Uttara Kannada district on the south. The names of taluks those come under the Belagavi district are as Athani, Bailhongal, Belagavi, Chikkodi, Gokak, Hukkeri, Khanapur, Raibag, Ramdurg and Saundatti. As one of the hundred Indian cities to be developed as a smart city under PM Narendra Modi's project of Smart Cities Mission, Belagavi selected in first phase of 20 cities. The objective of smart city is to provide core infrastructure, decent quality of life, clean and sustainable environment with application of smart solutions to the citizens.

Using smart technologies, local areas can be redeveloping to improve infrastructure and services to get quality life to citizens. Create employment and enhance incomes for all can be applied by enabling cities to use technology, information and data.

Belagavi, the second capital of Karnataka, does not have the infrastructure nor the economic capacity to properly treat and dispose of solid waste. It has population as above 5 lakhs. In Belagavi, an estimated 200 to 220 tons of solid waste is generated every day.

All traffic whether by rail or road going North invariably passes through Belagavi thus making it a major transport node at the regional level as well as at the national level. This has also led to an extremely rapid and haphazard growth pattern. The city has a vibrant economy and reasonably good physical infrastructure as compared to many other one million plus cities in India. As a result, the Nagar Nigam has planned for modernization of its Solid Waste Management Services in the city and to do away with littering of domestic waste and commercial waste on the streets, dumping the waste in open places along the roadside, transporting it in uncovered trucks and disposing off the waste unscientifically at the dumpsite.

Solid waste refers to a variety of old and used articles, For example stained small pieces of metals, broken glass wares, plastic containers, polythene bags, ashes, floppies, CDs, etc. dumped at different places. These discarded materials are also termed as refuse, garbage and rubbish, etc.

Two sources of solid wastes:

1. Household or domestic establishments: - The household wastes are disposed off either on public lands or on private contractors' sites.

2. Industrial or commercial establishments: - The solid wastes such as ashes and debris of industrial units are collected and disposed off through public (municipal) facilities at low-lying public grounds (landfill areas).

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II. RELATED WORK

Variety of modeling methods such as correlation analysis, time-series analysis, group comparison, input–output analysis, system dynamics modeling and multiple regression analysis are adopted in forecasting waste generation. The underlying relationships between variables which drive waste generation are identified using these models[2].
Relationship between variables from supplied data in order to predict future values has explored in data-driven model. Zade et al. (2008) used artificial neural networks to predict weekly waste generation in Tehran while Abbasi (2013) used a combination of partial least square for feature selection and support vector machine modeling to predict for the same area[1].

A smart solid waste management system is being put in place using Swiss technology at GIFT City where garbage will be disposed of with minimum human interference. Not only that, the waste will be recycled to make organic manure and generate power that will be consumed in GIFT City itself[6] .

A 'smart city' is developed upon numerous distinct elements and solid waste management is one of these vital aspects. For instance, today, to address the rising concern of carbon emissions in construction process contractors are mandatorily asked to utilize equipments as per Euro-IV standards. Hence, for employing such operational standards we need to have active participation and acceptance from the contractors in utilizing equipments as per the prescribed technologies. Similarly, the effectiveness of solid waste management system depends upon the active participation of all the stakeholders and citizens. Solid waste management is of grave importance to an urbanized region which faces the constant pressure of increasing population density, rising infrastructural demands and expanding inflow of immigrants. Hence, the need for creating a stronger civic sense among the citizens is of pivotal importance for the success and fruitful implementation of solid waste management system. Understanding the concept and context of waste segregation is also a vital component in the solid waste management process. This is the stage where India still lags behind as against the international counterparts. For instance, in a country like Finland, only around 7 percent of the waste gets disposed into the dumping yard and the remaining about 93 percent of the waste component is recycled. This level of effectiveness in implementing the solid waste management system is possible only due to qualitative spread of civic sense, clear understanding and acceptance over the concept of waste segregation[3].

III. PROPOSED WORK

The domestic waste generated by households comprises mainly of organic, plastic and paper waste and small quantities of other wastes. Plastic and glass are segregated at the household level or by rag pickers and sold. The remaining waste is disposed in community bins, which, also contains household hazardous wastes such as batteries, bulbs, discarded ointments and medicines.
In addition, about 1 to 2 percent of biomedical waste also gets mixed with municipal solid waste in the community bins. Though, door-to-door collection has been introduced in Belagavi city, the bulk of the municipal solid waste is still collected in community bins and the waste that reaches disposal sites is usually mixed, containing plastic, glass, metals, etc. Many times segregated waste gets mixed up while transporting. Of the total waste generated, each day about 200-220 tons of municipal waste generated from residential, city market.

The key problems of municipal solid waste include
• mixing of waste
• collection and storage of waste
• transportation of waste
• indiscriminate burning of waste
• illegal disposal of waste

This research aims to analyze and untangle the complex relationships between society, cities and waste through measuring, modeling, forecasting, evaluating and making visible the various waste processes that exist in cities. In particular, this research focuses on Belagavi City's municipal waste stream.
Research aims include:
1) To provide historical data to predict waste generation in order to improve the Belagavi City's Department of Sanitation operations
2) Explore public participation in waste research as an alternate form of outreach and education.

IV. RESEARCH IMPACT

Societies across the globe and throughout history have produced waste. However, it is only within the last half century that the type and quantity of waste has changed dramatically and continue to do so. This makes urban waste analytics a rich area of exploration not only because of the potential to understand society's phenomenological patterns of waste generation, the interdisciplinary nature of waste or the global interconnectedness via waste, but also because data-driven insights can lead to practical and fundamental day-to-day waste management improvements. Furthermore, this research is applicable, extendable and replicable for the growing cities across the globe.

Collection, transportation and disposal of garbage

To avoid open dumping of garbage on the streets and other places, the Corporation of Belagavi has procured 280 closed metal containers of size 1.1cum, 3cum and 4.5cum, 10 twin



bin dumper placers, two 18cum capacity compactors and two 6cum capacity compactors. The compactors help handling of garbage and avoiding spillage during transportation.

There are two separate fully covered vehicles for transportation of hotel waste, chicken shop and mutton shop waste. Corporation has procured back hoe loader for removal of silt, mud debris during cleaning. To avoid open dumping of MSW, the Belagavi City Corporation has established scientific landfill site for treatment and disposal of MSW as per the Supreme Court guidelines. Biomedical facility is being run by Indian Medical Association (IMA) in an area provided by the Corporation. The lifting and disposal of biomedical waste is based on mutual agreement between the facility managers and the medical institutions. To give legal backing for SWM activities, bye-laws have been passed which provide for penal provisions for non-co-operation in SWM activities.

Solid Waste Management Programmes

Following Government directives, the Corporation is in the process of putting in place City Sanitation Plan with the help of Administrative Staff College of India (ASCI), Hyderabad. At present the entire waste is transported to MSW site situated 14km away from the city at Turmuri village in an area of 67 acres. The processing and disposal of MSW has been accorded to a waste management company, Ramky Enviro Engineers Ltd, for 100 tonnes for a period of 20 years. The operator has adopted aerobic composting process for bioconversion of organic waste into organic manure. The MSW is received on the windrow platform and formed into windrows after treating with a specially developed biological innoculam. This innoculam contains active microbes (bacteria, fungi) effective in fast decomposition of organic matter. The Corporation is also in the process of implementing waste to energy technology including bio-methanisation plants.

There are a few industries in the City Corporation limits, majority of which are iron based or crank shaft industries and recycle waste in-house.

Mechanized cleaning of roads

The Corporation has outsourced street sweeping in 43 wards and rest of the 15 wards are being taken care of by the Corporation employees. The Corporation has procured tractor mounted sweeping machine for main roads and one back hoe loader for cleaning of big drains. To prevent manual cleaning of Under Ground Drainage (UGD) lines, the Corporation has procured jetting cum suction machine and the same is being used for flushing of UGD blockages other than the two suction machines for cleaning of septic tanks.

Eco friendly initiatives

As part of our commitment towards a greener economy, we are procuring two units of 10 seater mobile bio-toilets to discourage open defecation within city limits. We have passed a resolution making it compulsory for every building design to integrate rain water harvesting technology for which the building permission will be issued. We are in the final stage of passing plastic byelaws in accordance with Plastic Waste Handling Rules 2011. With the aim of reusing the plastic waste for construction of roads and other industrial purposes, the Corporation has started procurement of plastic pelletiser and shredder.

V. CONCLUSION

The success of waste management planning either for short term (daily municipal management) or long-term (design of processing facilities), lies in the knowledge of the problem as well as in the accuracy and reliability of the used data. If some effective measure can taken lots of things should be done for the growth and development of the society such as proper recycling of waste, making goods from solid waste by proper treatment, which rises employment for unemployed peoples. No new plan of any residential, commercial area should be passed until and unless it has proper place for disposal and treatment of its waste.

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H-INDEX	i10-INDEX	IJEAST CITATIONS	PEER-REVIEWED & OPEN ACCESS
33	154	9,647 (IJEAST CITATIONS)	PUBLISHED MONTHLY

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2455-2143