# A Road Map on Waste Disposal and Recyclable Management System for Smart Cities of Rajasthan

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*Abstract*— In this paper, we aim to propose a guidance and development of Environment protection and enhancement in INDIA by focusing on waste management. We start by presenting the importance of smart city and current state of the waste management technology in INDIA and continue by proposing a line of smart government development for environmental cleanliness enhancement that could positively impact the everyday life of its citizens. Moreover, we will talk about the efficient solutions for environmental waste management enhancement using automation as our major project focusing on cleanliness of the city, where the proposal deal with an underground garbage disposal system where different types of waste can be disposed underground and can be dragged through step type escalators. It is a very simple, and fundamentally sound, waste management solution for the private and public sector, allowing the collected mixed waste, paper, cardboard, organic waste, glass, metal, biodegradable, nonbiodegradable and hospital waste. It is ecofriendly, as well as economical way to dispose and recycle your waste. These solutions however require integrated approaches, both at the level of research and development of advanced technological solutions, as well as at the level of deployment.

***Key words:*** Environment Protection, Waste Management, Cleanliness Enhancement, Escalators, Garbage Disposal System

## I. INTRODUCTION

Smart cities mission is an urban renewal and retrofitting program by the Government of India with an aim to develop 100 cities (the target has been revised to 109 cities) all over the country making them citizen friendly and sustainable. The Union Ministry of Urban Development is responsible for implementing the mission in collaboration with the state governments of the respective cities. The Government has a vision of developing 100 smart cities as satellite towns of larger cities by modernizing the existing mid-sized cities it envisions a world where digital technology and intelligent design have been harnessed to create smart, sustainable cities with high-quality living and high quality jobs. Smart Cities Mission is an urban renewal and retrofitting program by the Government of India with an aim to develop 100 cities (the target has been revised to 109 cities) all over the country making them citizen friendly and sustainable. The Union Ministry of Urban Development is responsible for implementing the mission in collaboration with the state governments of the respective cities. The Government has a vision of developing 100 smart cities as satellite towns of larger cities by modernizing the existing mid-sized cities it envisions a world where digital technology and intelligent design have been harnessed to create smart, sustainable cities with high-quality living and high quality jobs.

Cities in the developing world have undergone a rapid urbanization during the past 50 years. India, being the world' s second most populous country, the level of urbanization in India has increased from 27.81 % in 2001 to 31.16 % in 2011. Urbanization in developing countries like India implies the expansion of existing slum areas and the creation of new ones. Future need for waste collection in slums, therefore, is likely to put additional strain on municipalities already unable to provide the service to their current residents. The ever-rising population is putting immense pressure on demand for food, shelter and other natural resources.

## II. LITERATURE REVIEW

Smart Cities Awas Yojna Mission was launched by Prime Minister Shri. Narendra Modi in June 2015. A total of ₹980 billion (US$15 billion) has been approved by the Indian Cabinet for development of 100 smart cities and rejuvenation of 500 others [1]. ₹48,000 crore (US$7.1 billion) for the Smart Cities mission and a total funding of ₹50,000 crore (US$7.4 billion) for the Atal Mission for Rejuvenation and Urban Transformation (AMRUT) was been approved by the Cabinet [1].

In the 2014 Union budget of India, Finance Minister Mr. Arun Jaitley allocated ₹7,016 crores (US$1.0 billion) for the 150 smart cities. However, only ₹9.24 billion (US$140 million) could be spent out of the allocated amount till February 2015. Hence, the 2015 Union budget of India allocated only ₹1.43 billion (US$21 million) for the project [2].

First batch of 20 cities selected in the second stage of competition will be provided with central assistance of ₹2 billion (US$30 million) each during this financial year followed by ₹1 billion (US$15 million) per year during the next three years [4]. The remaining money is to come from the states, urban bodies and the consortium that they form with corporate entities. Also [5], 10 per cent of budget allocation will be given to states / union territories as incentive based on achievement of reforms during the previous year [6].

## III. OBJECTIVE

We aim to propose an underground garbage disposal system that will bring a revolutionary change in terms of ancient hygienic trends we follow. This proposal is a step forward to Shri Narendra Modi's Swach Bharat Yojna, which will help us to uplift a better smart society as well as it will be beneficial for future generations upliftment.

The core values kept in mind while objectifying this paper

To implement the idea of smart ecofriendly digitized city certain core values are considered to be as the major aspect. There are three major values through which the analysis of 100 top smart cities will be done. These are-

- Livability- Those cities that provide clean and healthy living conditions without pollution and congestion. With a digital infrastructure that makes city services instantly and conveniently available anytime, anywhere.
- Workability- Cities that provide the enabling infrastructure like energy, connectivity, computing and other essential services, to compete globally for high quality jobs.
- Sustainability- Cities that provide services without stealing from future generations.

### *A. Current Status of Environmental Cleanliness and Sanitation in India*

MSWM (Municipal solid waste management) is one of the most overlooked basic services provided by the Government of India. Characteristic of MSW may vary at the level of country, state, city as well as various areas in of the same city. MSW generation rates range between 0.3 and 0.6 kg/ capita/day in Indian cities and annual increase in MSW generation (volume) is estimated as 1.33 % per capita. Half of the waste is collected of the total waste. Worldwide; over two thirds of human wastes are released into the environment with little or no treatment, which results into the various deterioration of the environment in the form of air, water that causes various health hazards. Concentration of intense economic processes and high level of consumption in urban areas increase total waste generation and more space is required for waste disposal. The cities only encompass two percent of the world‟ s land surface, yet they are responsible for consuming over 75% of the planet‟ s resources and produce 75% of the world' s waste (Siemens, Sustainable City). The most pressing problem faced by any urban center in India today is Municipal Solid Waste Management (MSW). Over the past few years, the handling this MSWM has become a major organizational, financial and environmental challenge. During the last century, urban population of India increased ten folds from 27 million to 270 million. India produces 48.0 MT of MSW annually at present which is why it has become a necessity for our generation to adapt and adequate system for disposal of waste

### *B. Expected Results If Similar Trends Are Practiced In Further Years*

Municipal solid waste quantities are directly linked to economic activity and resource consumption. If the lagging non- OECD (Organization for Economic Co-operation and Development) countries are able to do transition to a sustainable higher growth path, the global poverty ratio will fall from about 21 percent in 2005 to less than 2.5 percent in 2050. As the economy prospers, the overall Municipal solid waste generation rates will dramatically increase. Moreover,

- Per capita waste generation is increasing by 1.3% per annum
- With urban population is increasing annually between 3 – 3.5%
- Yearly increase in waste generation is around 5%.
- Per capita generation of waste varies from 200 gm. to 600 gm. Average generation rate at 0.4 kg per capita per day in 0.1 million plus towns.

The change in waste composition of Indian garbage between 2000 and 2025 are as follow -

- Organic Waste will go up from 40 percent to 60 percent.
- Plastic will rise from 4 percent to 6 percent.
- Metal will escalate from 1 percent to 4 percent.
- Glass will increase from 2 percent to 3 percent.
- Paper will climb from 5 percent to 15 percent.
- Others (ash, sand, grit) will decrease from 47 percent to 12 percent.
- 7.2 million tons of hazardous waste can be expected.
- One Sq. km of additional landfill area every-year.
- Rs 1600 core for treatment & disposal of these wastes.

In addition to this industry discharge about 150 million tons of high volume low hazard waste every year, which is mostly dumped on open low lying land

Hence after going through these points it will not be surprising to conclude that we have come to an arena where it has become a necessity to adopt certain system which not only create clean and healthy environment but also lower our dependencies on the ancient car collection method.

### *C. Proposed Underground Waste Disposal System*

The underground waste disposal system works on 6 major amenities that are: - over-ground inlets, underground pipeline system, sensors (smell detecting, weight detecting, and material detecting), underground step type escalators or graggers, waste decimating panel, Seebeak Generator. 2 over-ground inlets differentiated as biodegradable and non-biodegradable will be built inside or outside every house, playground, outskirts, Bus-stand, railway stations, and other public places. All the inlet will be interconnected with the docking point and network of internal underground pipes made of corrosion proof material.

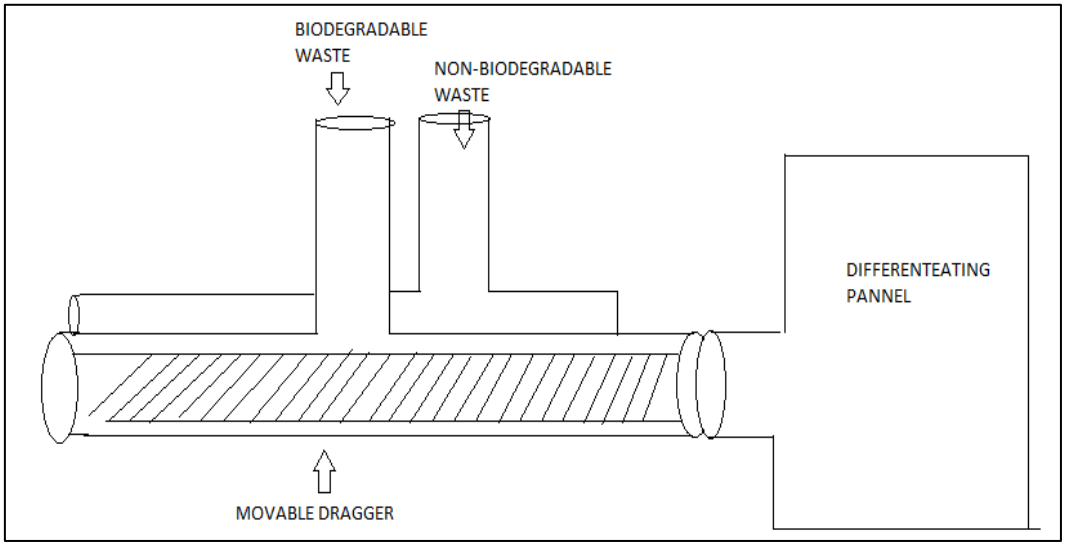


Fig. 1: Underground pipeline system

When the garbage will be dumped through the inlets, they will directly reach the inbuilt pipelines. These pipelines will be connected with the draggers or step type escalators that will work by Seebeck generator which will convert underground heat energy into electrical energy. These draggers will drag the garbage and will dump it into discriminating panel. The discriminating panel will be further divided into 3 major zones in which 1st panel will contain a smell detecting sensor which will extract those items which cannot be taken into further use, the second panel will consist of a material detector sensor which will divide the waste according to the lots keeping in mind how going to be recycled. And the last panel will contain weight detecting sensor or we can that all types of garbage in this panel will be put in a container where their weight will be measured. And a digitized report will be made according to the analysis done. After this these wastes will be send to their particular recycling centers through garbage trucks for example biodegradable wastes like leaves, mud cakes, animal shit, fruit peals etc. will be send to biodegradable waste management factories to produce fertilizers for harvest. The materials like thermoplastic/thermosetting plastic is send to plastic recycling factories so that they can be molded and reused in their convenient way. The broken glass trashes can be send back to glass factories so that they can be used as culets and be further utilized at the time of annealing.

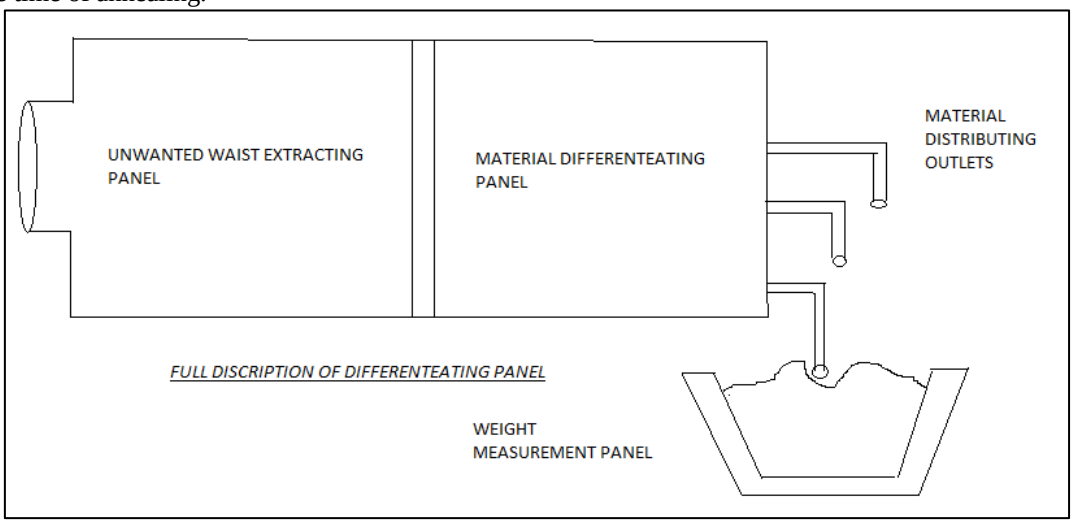


Fig. 2: Full Description of Three inlets of Differentiating Panel

Other than waste management system we can also extract drinkable water from our sewage waste water only by converting our sewage water to drinkable H2O by performing certain chemical operations on it.

The Waste That Can Be Managed Through This Proposal Are-

1) Residential waste: waste like food, plastic, cardboard, paper, textiles leather, yard waste, wood, glass, metal, ashes etc.
2) Industrial waste: Housekeeping wastes, packaging, food wastes, Construction and demolition materials, hazardous power and chemical wastes, ashes, special wastes.
3) Commercial: Paper, cardboard, plastics, wood, food wastes, glass, metals.
4) Institutional: Paper, cardboard, plastics, wood, food wastes, glass, metals, special wastes, hazardous wastes.
5) Municipal: Street sweepings, landscape and tree trimmings, general wastes from parks, beaches, and other recreational areas; sludge.
6) Construction and demolition: Wood, steel, concrete, dirt, etc.

## IV. CONCLUSION & FUTURE SCOPE

We would like to conclude this paper by by saying that, this underground waste disposal system is the invertor, developer and marketer of original deep collection system of solid waste. It will not only provide us with a clean society but also provide a smarter way to utilize the waste in such a way that fresh resources can be saved for the future generations.

There are several open issues that need to be further investigated in the current smart technical environment.

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