SMART WASTE MANAGEMENT SYSTEM USING IoT

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With the increasing population and industrialization of nations throughout the globe, waste has become a great concern for all of us. Over years, researchers figured that only waste management is not enough for its proper treatment and disposal techniques to preserve our environment and keeping it clean in this era of globalization. With the help of technology researchers have, introduced IoT based Smart Waste Management solutions and initiatives that ensures reduced amount of time and energy required to provide waste management services and reduce the amount of waste generated. Unfortunately, developing countries are not being able to implement those existing solutions due to many factors like socio-economic environment. Therefore, in this research we have concentrated our thought on developing a smart IoT based waste management system for developing countries like **INDIA** that will ensure proper disposal, collection, transportation and recycling of household waste with the minimum amount of resources being available.

We are very thankful to our thesis **Sir Sandeep Doodigani**  for guiding us throughout our work. Due to his endless support and patience, we were able to achieve our goals. We will always be grateful to him, for his kind words, his belief in us, his immense support and guidance.

Finally, yet importantly, we would like to thank our parents, , for all their enduring support and always believing in us.

AUTHORS’ DECLARATION

We hereby declare that this thesis is a presentation of our original work. Materials of work found by other researchers are mentioned with due reference to the literature and acknowledgement of collaborative research and discussions.

This work done under the guidance of **Sir sandeep doodigani**  ,

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**CHAPTER-1**

## INTRODUCTION

Waste management is one of the core concerns of modern age. As nations around the world are developing, their concerns and accountability for a healthier and sustainable environment is also increasing. While developed countries are inventing and implementing smart solutions for waste management and bringing about huge positive impacts, waste management seems to be a play out of the league for the under developed or developing countries. There are numerous categories and each with different classifications of waste materials, like clinical to nuclear, biodegradable to non-bio-degradable and common household to industrial toxic waste. While developed countries are able to manage and treat these waste materials of different categories, developing countries like **INDIA** are still struggling with the collections and proper disposal of common household waste materials. Disorganized management and dumping of waste is a noticeable cause for ruining the environment in the major cities of these developing countries..

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## Motivation

Smart Waste Management Systems based on IoT is one of the core component of modern age hype Smart City. There are countless Smart IoT based Solutions for waste management systems which are being implemented throughout the globe, in the developed and first world countries to be specific. However, Waste management is also a great problem in poor developing countries as waste is scattered all over roads due to improper methods of collection and dumping thus polluting the environment.

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## Problem Statement

The greatest problem regarding waste management in developing countries begins at the very starting point of the process. Due to lack of proper systems for disposal and collections, wastes and garbage’s end up in the roads and surrounding. According to a report Zurburg 2002, the amount of waste generation in 2010 was around 20,000 tons per day, and it is estimated that by 2025 the amount will be no less than around 47000 tons per day. With the existing methods of collecting and disposal it is near impossible to manage such amount of waste in the future as around 30% of waste end up on the roads and public places due to ineffective disposing and collecting methods. Not only that, there is even no systematic methodology for the collected garbage for treating and recycling thus most of them end up in landfilling and river water, making the environment unhealthier. The prime impediment of implementing smart waste management system based on IoT in a developing country is the social and economic infrastructure of the country itself. The initial stage of this system comprises of proper disposal and collection, which is the biggest challenge. In addition, to motivate and influence people to follow proper waste disposal methods is also important.

## Solutions

Previously there were numerous initiatives on waste management and educating people to dispose waste properly, and as they failed to achieve significant results, we have figured out the scopes that could be develop. To solve this problem, we have designed a process that ensures proper disposal and efficient waste collection.

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# CHAPTER-2

## LITERATURE REVIEW

In this chapter we have discussed about all the main sequences of our model along with the background study and related works.

## Bio Degradable Oxy Bags

The first essential step to manage waste is packing garbage properly with bags so that it becomes easier to carry for further process. In that case, bio degradable oxy bags for household consumers would be the effective choice for packing garbage. Biodegradable bags that are fit for being deteriorated by bacteria or other living organisms.

Household consumers will pack waste with biodegradable bags and bags will be picked by the volunteers on right time. This packing system will make everything flexible for management as no stench will spread and waste will remain in ordered form.

## Using of Smart Bins

In this management system, smart bins will play the vital role to start the processing in an organized way. There will be several bins in areas under one large regional office. Sonar sensor will be used in every bin to detect the level of waste. If the wastes cross a certain predetermined level of bin, it will notify employees to collect the waste.

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## Smart Transport System

All wastes from smart bins will be collected by Regional Waste Collection Office. After collecting wastes, all information or data will be sent to Central Control Centre (CCC) in every 6 hours. Based on these data, CCC will assign trucks and employees. CCC will also have last 10 years data in its database to assign man power and transportation for every month as wastes amount depend on seasons.

## 2.2 Recycling Waste

Recycling is the process of converting waste materials into new materials and objects. If the recycling process is used properly on our waste, country will get benefited economically. Example can be given like based on the given data from Regional Office, Recycling Partners will differentiate and separate biodegrading, metal-plastic and glass from wastes. After separating wastes, they can send waste types to predetermined factories for further process or recovery. If waste type is metal and plastic, then above process can be used to recycle metal and plastic. For other types, digitalized recycling processes are now available to recycle waste.