

Smart Waste Management **System For Metropolitan** **Cities**

INTRODUCTION

- This project automates the task of waste segregation in public dustbins by classifying waste as either recyclable or non-recyclable . We use a Raspberry Pi along with a servo motor , IR , Ultra-Sonic Sensor ,Pi Cam and a server to accomplish the project
- The project has been implemented as an IoT system which capture images through the Pi and sends, it to the server for processing. On the server , we use CNNs for the Machine learning/Image processing algorithms, which are used to identify type of waste that was dumped. The server communicates back to the Pi and the Pi actuates accordingly by turning the servo motor and thus dumping the garbage to either the recycle or non-cyclable side . We use an ultrasonic sensor to detect the level of garbage accumulated in the bin.

The aim of this project is as follows:

Smart waste management is a idea where we can control lots of problems which disturbs the society in pollution and diseases. The waste management has to be done instantly else it leads to irregular management which will have adverse

effect on nature. The Smart waste management is compatible mainly with concept of smart cities. The main objectives of our proposed system are as follows:

1. Monitoring the waste management.
2. Providing a smart technology for waste system.
3. Avoiding human intervention.
4. Reducing human time and effort
5. Resulting in healthy and waste ridden environment.

LITERATURE REVIEW

1. Solid waste management in Abuja, Nigeria

The new city of Abuja provided an opportunity to avoid some of the environmental problems associated with other major cities in Africa. The current status of solid waste management in Abuja has been reviewed and recommendations for improvements are made. The existing solid waste management system is affected by unfavourable economic, institutional, legislative, technical and operational constraints. A reliable waste collection service is needed and waste collection vehicles need to be appropriate to local conditions. More vehicles are required to cope with increasing waste generation. Wastes need to be sorted at source as much as possible, to reduce the amount requiring disposal. Co-operation among communities, the informal sector, the formal waste collectors and the authorities is necessary if recycling rates are to increase. Markets for recycled materials need to be encouraged. Despite recent improvements in the operation of the existing dumpsite, a properly sited engineered landfill should be constructed with operation contracted to the private sector. Wastes dumped along roads, underneath bridges, in culverts and in drainage channels need to be cleared. Small-scale waste composting plants could promote employment, income generation and poverty alleviation. Enforcement of waste management legislation and a proper policy and planning framework for waste management are required. Unauthorized use of land must be controlled by enforcing relevant clauses in development guidelines. Accurate

population data is necessary so that waste management systems and infrastructure can be properly planned. Funding and affordability remain major constraints and challenges.

ADVANTAGE:

It saves time and money by using smart waste collection bins and systems equipped with fill level sensors. As smart transport vehicles go only to the filled containers or bins. It reduces infrastructure, operating and maintenance costs by upto 30%.

DISADVANTAGE:

System requires more number of waste bins for separate waste collection as per population in the city. This results into high initial cost due to expensive smart dustbins compare to other methods.

2.Municipal solid waste management in Indian cities

Municipal solid waste management (MSWM) is one of the major environmental problems of Indian cities. Improper management of municipal solid waste (MSW) causes hazards to inhabitants. Various studies reveal that about 90% of MSW is disposed of unscientifically in open dumps and landfills, creating problems to public health and the environment. In the present study, an attempt has been made to provide a comprehensive review of the characteristics, generation, collection and transportation, disposal and treatment technologies of MSW practiced in India. The study pertaining to MSWM for Indian cities has been carried out to evaluate the current status and identify the major problems. Various adopted treatment technologies for MSW are critically reviewed, along with their advantages and limitations. The study is concluded with a few fruitful suggestions, which may be beneficial to encourage the competent

authorities/researchers to work towards further improvement of the present system.

ADVANTAGE:

It decreases traffic flow and consecutively noise due to less air pollution as result of less waste collection vehicles on the roads. This become possible due to two way communication between smart dustbins and service operators.

DISADVANTAGE:

It reduces man power requirements which results into increases in unemployment for unskilled people

3.Sustainable metropolitan areas perspectives through assessment of the existing waste management strategies

Human activities are considered among the main producers of any kind of pollution. This paper, through a Driver-Pressure-State-Impact-Response (DPSIR) model analyses, focuses on the evaluation and assessment of the existing practices, procedures, and results obtained in order to determine whether the municipal solid waste (MSW) management implemented in three major Greek municipalities in the greater urban area of Attica, namely the municipalities of Nea Smirni, Vyronas, and Piraeus, could be considered viable and sustainable. The evaluation indicated that MSW in Greek cities have reduced over the last years, also suggesting a steady downward trend, which could be considered consistent with that of the per capita incomes in Greece due to the extended economic austerity, while at the same time the recycling indicator seems to optimize. The results are very useful for policymakers and local authorities towards taking actions related to the targets set from the circular

economy strategies as well as the targets set from United Nation Development Program and the European Green Deal Strategy.

ADVANTAGE:

As explained above, waste management if done in a proper manner not only eliminates the surrounding waste but also will reduce the intensity of the greenhouse gasses like methane, carbon monoxide which is emitted from the wastes accumulated.

The depth of the existing landfills and incineration will be curbed, thereby cutting down the harmful factors that affect the environment.

DISADVANTAGE:

Still, a large scale of these waste management practices are done only as a small scale process and is mostly confined to residential homes, schools, and colleges and is not practiced in a uniform manner in large industries and conglomerates.

It is not even practiced globally, as the global level consists of curbing oil spills, ocean disposals and decreasing the tree felling.

4.IOT based Smart Bin Waste Management

Many times, in our city we see that the garbage bins or dustbins placed at public places are overloaded. It creates unhygienic conditions for people as well as ugliness to that place leaving bad smell. To avoid such situations the proposed project will be implemented for efficient waste management using IOT. These dustbins are interfaced with arduino based system having ultrasonic wireless systems along with central system showing current status of garbage, on mobile web application with Android app by Wi-Fi. Hence the status will be updated on to the App. Major part of the proposed project depends upon the

working of the Wi-Fi module; essential for its implementation. The main aim of this project is to reduce human resources and efforts along with the enhancement of a smart city vision.

ADVANTAGE:

1. The garbage will be collected on time-to-time basis.
2. There would not be any bad smell around the bin.

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DISADVANTAGE:

It requires a well structured hardware.

5.Critical Analysis of Intelligent IoT in Creating Better Smart Waste Management and Recycling for Sustainable Development

The Internet of Things (IoT) has found extensive use in areas such as water management, waste management, and sustainable development. With its broad connectivity, the Internet of Things is a new and promising technology that has the potential to positively transform human existence globally. IoT allows low-energy devices to exchange information and interact with one another. Waste management is a daily chore that necessitates a huge number of labor resources and has an impact on natural, fiscal, efficient, and social elements. The rate of garbage generation has been magnified at an alarming rate as a result of fast urbanization and expanding population. As a result, as the world faces global environmental problems, it is necessary to develop changes in waste management systems and technology to address issues that have never been

addressed in such innovative ways. Many applications throughout the world have been using IoT to conduct various activities to provide unique services for wastage handling and maximize energy efficiency. These improvements allow IoT technologies to serve as a bridge between basic network-based systems and technologies that scan and gather data from the real environment, as well as deliver new services and applications that help people in a variety of ways. As a result, this research conducts a study of existing IoT-enabled waste management solutions and sustainable development. The goal is to get an understanding of the strengths and weaknesses so that changes and innovations may be made to effectively and efficiently manage waste while also maintaining a healthy environment in the communities. The impact of waste management on long-term economic, social, and environmental sustainability is also depicted in the literature review. The secondary data has been used in the research to gain a reliable conclusion of the study.

ADVANTAGE:

1. Real time notification to collect the garbage.
2. Saving on fuel consumption, thus reducing the threat to the environment

DISADVANTAGE:

The onetime cost of installation will be higher than the present technique.

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