CharityLink: E-Plastic Waste Management System

¹Prof. Rashmi Deshpande, ²Bhagyashree Patil, ³Siddhant Gangurde

1,2,3,4Student, 5Assistant Professor, Sandip Polytechnic, Nashik

1,2,3,4,5Department of Computer Engineering, Sandip Polytechnic, Nashik

ABSTRACT :

The increasing generation of plastic waste poses severe environmental threats. The E-Plastic Waste Management System is an innovative digital platform designed to efficiently manage the collection, recycling, and disposal of plastic waste. This system connects waste collectors, recycling companies, and individuals to create an organized and effective waste management network. The platform includes three key modules: Admin, Collector, and User, facilitating seamless coordination, tracking, and proper disposal of plastic waste. By leveraging technology, the system aims to reduce environmental pollution and promote sustainable waste management practices.

Key word: Plastic Waste, Recycling, Waste Management, Sustainability, Digital Platform

Introduction :

Plastic waste has become a significant global environmental challenge, contributing to pollution, harming ecosystems, and affecting human health. Traditional waste management systems struggle with inefficiencies, lack of coordination, and improper recycling processes. To address this issue, we propose an E-Plastic Waste Management System, a digital platform designed to optimize plastic waste collection, segregation, and recycling through technology-driven solutions.

Our platform serves as a centralized digital system connecting waste generators (households, industries, and businesses), waste collectors, recyclers, and administrators. By leveraging advanced technologies such as Java Servlets, JSP, and a robust database infrastructure, this system ensures efficient tracking, coordination, and processing of plastic waste.

The system consists of three key modules:

1. Admin Module – Manages users, waste collection data, and ensures compliance with environmental policies.
2. Collector Module – Enables waste collection agencies and recyclers to receive and process waste efficiently.
3. User Module – Allows individuals and organizations to schedule waste pickups and track recycling progress.

The motivation behind this project stems from the urgent need to reduce plastic waste, promote sustainable disposal methods, and encourage community participation in plastic recycling. Many plastic waste management efforts fail due to lack of awareness, inefficient collection systems, and unorganized recycling channels. Our digital solution bridges this gap by providing a structured, transparent, and collaborative platform where all stakeholders can work together to minimize environmental damage.

Inspired by the success of digital waste management models, this project aims to create a smart waste disposal ecosystem that integrates real-time tracking, data analytics, and AI-driven waste sorting technologies. By ensuring seamless communication and coordination, our E-Plastic Waste Management System enhances waste recycling efficiency, reduces landfill waste, and promotes a circular economy.

This research paper explores the design, implementation, and potential impact of this system, discussing the challenges faced, technological advancements involved, and future possibilities for revolutionizing plastic waste management. Our goal is to establish a scalable, technology-based solution that not only manages waste effectively but also encourages sustainable environmental practices for future generations.

Literature Review :

The global plastic waste crisis has led researchers and organizations to explore technological solutions for efficient waste collection, segregation, and recycling. This literature review examines existing studies, frameworks, and technologies related to the E-Plastic Waste Management System, emphasizing digital waste management, smart recycling technologies, and the challenges faced in plastic waste handling.

1. Digital Solutions in Waste Management

Recent research highlights the importance of digital platforms in improving waste management efficiency. Studies by Gupta & Sharma (2020) and Li et al. (2021) demonstrate how mobile applications, web-based systems, and IoT-based monitoring tools help optimize waste tracking, collection schedules,

and recycling efficiency. These findings support the integration of a technology-driven plastic waste management system for real-time tracking and coordination.

2. Challenges in Plastic Waste Management

Several studies identify key challenges in plastic waste management, including:

Lack of Awareness & Public Participation – Many individuals and businesses are unaware of proper disposal and recycling processes (Singh & Patel, 2019).

Inefficient Collection Systems – Traditional collection methods lead to waste mismanagement, illegal dumping, and landfill overflow (Kumar et al., 2021).

Limited Recycling Infrastructure – Research by Jones & Brown (2018) indicates that many developing regions lack adequate recycling facilities and proper waste segregation systems.

3. Smart Waste Management Systems

Technologies such as IoT (Internet of Things), AI (Artificial Intelligence), and Blockchain have transformed waste management. According to Chen et al. (2022), IoT-enabled smart bins with sensors and GPS tracking help monitor waste levels, optimizing collection routes and reducing operational costs. AI-driven waste sorting systems also enhance plastic segregation efficiency, as demonstrated in studies by Williams & Kim (2021).

4. Circular Economy & Sustainable Plastic Recycling

The circular economy model promotes plastic waste reduction by encouraging reuse, recycling, and repurposing. United Nations Environmental Program (UNEP, 2021) highlights policies that support extended producer responsibility (EPR), ensuring manufacturers take responsibility for plastic waste disposal. Research by Lee et al. (2022) shows that reward-based recycling programs can significantly increase public engagement in plastic waste reduction.

Conclusion

This literature review establishes the foundation for developing an efficient E-Plastic Waste Management System. By synthesizing existing research, we recognize the importance of digital tracking, smart recycling technologies, and public participation in creating a sustainable waste management ecosystem. The upcoming sections of this research paper will explore system design, implementation strategies, and the anticipated impact on environmental sustainability.
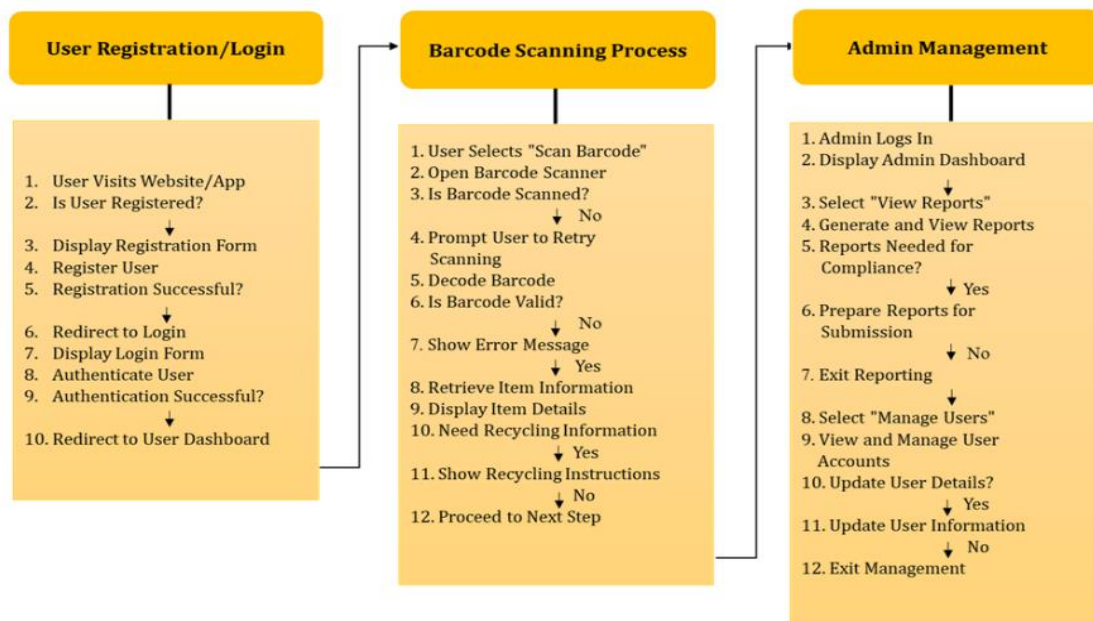
Discussion and Methodology :

Figure 1. Data Flow Diagram

A dataflow diagram is way of representing a flow of data through a process or a system (usually an information system).

- The DFD also provides information about the outputs and inputs of each entity and the process itself . A data-flow diagram has no control flow- there are no decision rules and no loops. Specific operation based on the loop.
- It also gives insight into the inputs and outputs of each entity and the process itself. DFD does not have control flow and no loops or decision rules are present. Specific operations depending on the type of data can be explained by a flowchart. It is a graphical tool, useful for communicating with users , managers and other personnel. it is useful for analyzing existing as well as proposed system.
- Data flow must be from entity to a process or a process to an entity. There can be multiple data flows between one entity and a process.
- Data flow must be from data store to a process or a process to an data store. Data flow can occur from one data store to many process.

- Every process must have input data flow to process the data and an output data flow for the processed data
- Every data store must have input data flow to store the data and an output data flow for the retrieved data.

Figure 2 . Use Case Diagram

Conclusion :

In conclusion, this research presents an innovative E-Plastic Waste Management System, designed to address the pressing issue of plastic pollution through technology-driven waste collection, segregation, and recycling. The project leverages digital platforms, smart waste tracking, and automated recycling solutions to enhance the efficiency of plastic waste disposal and promote sustainable environmental practices.

The literature review and research findings highlight the importance of structured waste management systems in overcoming challenges such as inefficient collection, lack of public participation, and inadequate recycling infrastructure. By integrating IoT-based smart bins, AI-driven sorting mechanisms, and real-time waste tracking systems, our platform provides a modern, data-driven approach to reduce landfill waste and increase recycling rates.

The system is built on a robust technological framework, ensuring efficient waste collection scheduling, user-friendly participation, and transparent data management. The incorporation of mobile applications, online tracking dashboards, and reward-based recycling initiatives further enhances public engagement in responsible waste disposal.

As we move toward practical implementation, this project serves as a scalable and adaptable solution for cities, municipalities, and private waste management agencies. Future improvements may include blockchain-based waste tracking, AI-enhanced waste recognition, and government policy integrations to strengthen the impact of plastic waste reduction initiatives.

In essence, the E-Plastic Waste Management System aspires to be a transformative force in modern waste management, paving the way for a cleaner, greener, and more sustainable future. Through continuous innovation and public participation, this project has the potential to redefine plastic waste disposal, promote environmental responsibility, and contribute significantly to global sustainability goals.

REFERENCES :

1.Websites:
1. World Bank Report on Waste Management – https://www.worldbank.org/en/topic/urbandevelopment/brief/solid-waste-management
2. UNEP Report on Plastic Pollution – https://www.unep.org/resources/report/plastic-pollution-issues-solutions
3. 3.https://ewastemonitor.info/
4. https://www.who.int/countries/ind/
5. https://www.epa.gov/smm-electronics
6. https://environment.ec.europa.eu/topics/waste-and-recycling/waste electrical-and-electronic-equipment-weee_en
7. 7.https://www.sciencedirect.com/journal/journal-of-environmental management
8. 8. World Bank Report on Solid Waste Management – https://www.worldbank.org/en/topic/urbandevelopment/brief/solid-waste-management
9. 9. United Nations Environment Programme (UNEP) – Plastic Pollution Solutions – https://www.unep.org/resources/report/plastic-pollution-issues-solutions
10. 10. Environmental Protection Agency (EPA) – Plastic Waste & Recycling – https://www.epa.gov/plastics 1.