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Domestic Waste Management: Future of Waste Segregation and Management

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ABSTRACT: This research study has the added advantage of suggesting and exploring an integrated household waste management program for the provision of sustainable household behaviour. The deployment is facilitated by a high level of advanced elements like AI-based waste segmentation system,public participation portal, waste trend for places and individuals, and incentive system through coupon codes.The app suggested not only encourages active user participation at individual level towards proper waste segregation but also allows the community to engage in collective monitoring and optimization of the environmental dimension.The app provides actionable intelligence and real value,thereby transforming conventional trash dumping behaviour.The app will encourage more people to adopt waste segregation,reduce environmental impact, and enhance community-recycling and sustainability.

I. INTRODUCTION

Due to increased urbanization and accelerated consumption patterns, the generation of domestic waste has been growing drastically, which poses extreme environmental issues to be addressed at the earliest. Inadequate disposal and insufficient segregation contribute to water, air, and land pollution, thereby adding to public health problems and deteriorating natural ecosystems. Effective segregation and dumping of waste are essential to avoiding maximum environmental degradation, but consumers remain ignorant or lack proper apparatus to adjust to sustainable practice. The conventional mechanisms are typically generic and backward and therefore do not include specific behaviour. This project establishes an online mechanism to close the gap on the basis of an easy-to-use cell phone application with artificial intelligence and reward mechanisms. By delivering education, inspiration, and comments through technology, the application provides a complete system that makes users able to control their garbage more efficiently.

The current work is led by the author, Mr. Eshaan Khurana , with Charan Kumar, Gagana Sindhu and Hisham as co-authors who helped in conducting the project. They were guided by Dr. Chandra Sekhar M, Professor, School of CSE, Presidency University, it's, therefore, an example of a collaborative effort.

II. METHODOLOGY

The platform is made up of several modules that together form an integrated platform for smart waste management:AI Waste Categorization Module: Employs convolutional neural networks (CNNs) trained on labeled images of waste categories to recognize and classify items as organic, recyclable, hazardous, or general waste. This minimizes user error during segregation.Incentive Mechanism: The users are incentivized with coupon codes for segregation and disposal of waste that they have confirmed. These codes can be utilized with partner vendors, providing the user with a tangible incentive to engage in sustainable action.Community Platform: Members can belong to local groups where they can exchange tips, engage in green challenges, and gain social points.

This fosters peer pressure and motivation for regular use.Trend Analyzer: Follows regional and individual figures through a graphical representation of trends with respect to time in segregation and waste production. This offers users and governments the ability to track improvements and make appropriate choices.Data is gathered from user input, such as photos and disposal records. AI processing occurs in a secure cloud environment, where it can scale, be

consistent, and have real-time feedback. The modularity of the system also permits it to be customized for different geographic and demographic settings.

III. RESULTS

Since the application remains in its initial stages, no large-sample group testing has been done as yet. But the expected results are premised on the consolidation of tested models and proven methodologies of behavioral science. The expected advantage is a tangible improvement in the practice of good waste segregation habits owing to immediate visual feedback and learning triggers. The community engagement module will induce long-term engagement through the application of forums, contests, and rewards. The coupon incentive model based on coupons is aimed at attracting a large population with material incentives, pushing motivation beyond that of intrinsic environmental interest. The AI categorization module is aiming for higher than 85% accuracy, with ongoing tuning via user-provided images and frequent model training. By integrating these modules into a unified single user experience, the app tries to mold individual action and group environmental footprint.

IV. CONCLUSION

The suggested application for smart waste management illustrates the viability and usefulness of technology-led, community-engaged domestic waste management. Based on real-time AI sorting, gamification-led motivation, and community options in peer-to-peer mode, the application is one-stop-shop offering that incentivizes users to live sustainably through day-to-day practices. In contrast to traditional systems running on rigid schedules and command-and-control attitudes, the model frees people with self-optimizing tools, analytics, and motivators tied to their behavior. It fostered ownership and accountability required for long-term adoption. Future research will concentrate on enriching the AI model with even more varied datasets, increasing accessibility through multilingual interfaces and universal design, and integration with real-time municipal collection systems for a smart urban infrastructure. The ultimate vision is to integrate this system with national and international sustainability targets so that it becomes a global model for sustainable urban living.

V. FUTURE WORK

Future Improvements of Domestic Waste Management. The following are the future improvements that should be associated with the Domestic Waste Management.
• Government and Municipal Integration
• Multi-Language and Accessibility Features
•Enhanced Gamification Features (eg. Add team-based challenges (e.g., community vs. community))

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