

AI-Based Smart Waste Segregation & Disposal Assistant

Primary SDG:

SDG 12 – Responsible Consumption and Production

Secondary SDG (Optional):

SDG 11 – Sustainable Cities and Communities

Problem Description:

Improper waste segregation is a major challenge in households and institutions due to lack of clear, accessible guidance. This leads to recycling failure, landfill overflow, and environmental pollution.

Problem Statement:

How might we use AI to guide people in correctly segregating everyday waste so that waste management becomes more sustainable and efficient?

Target Users:

- ☐ Households
- ☐ College students and hostels
- ☐ Urban residents

ROLE OF AI:

Manual waste segregation guidelines are difficult to remember and do not scale. AI enables instant classification, guidance, and impact explanation.

AI Functions:

- Waste classification
- Disposal guidance retrieval
- Environmental impact explanation

Prototype / Conceptual Demonstration:

A personalized AI chatbot named EcoSort AI was developed using the Lovable platform. The chatbot allows users to input household waste items and uses AI to classify the waste, provide correct disposal guidance, and explain environmental impact. The prototype demonstrates practical problem-solving using AI aligned with SDG 12.

Prototype link: <https://greencollect.lovable.app>

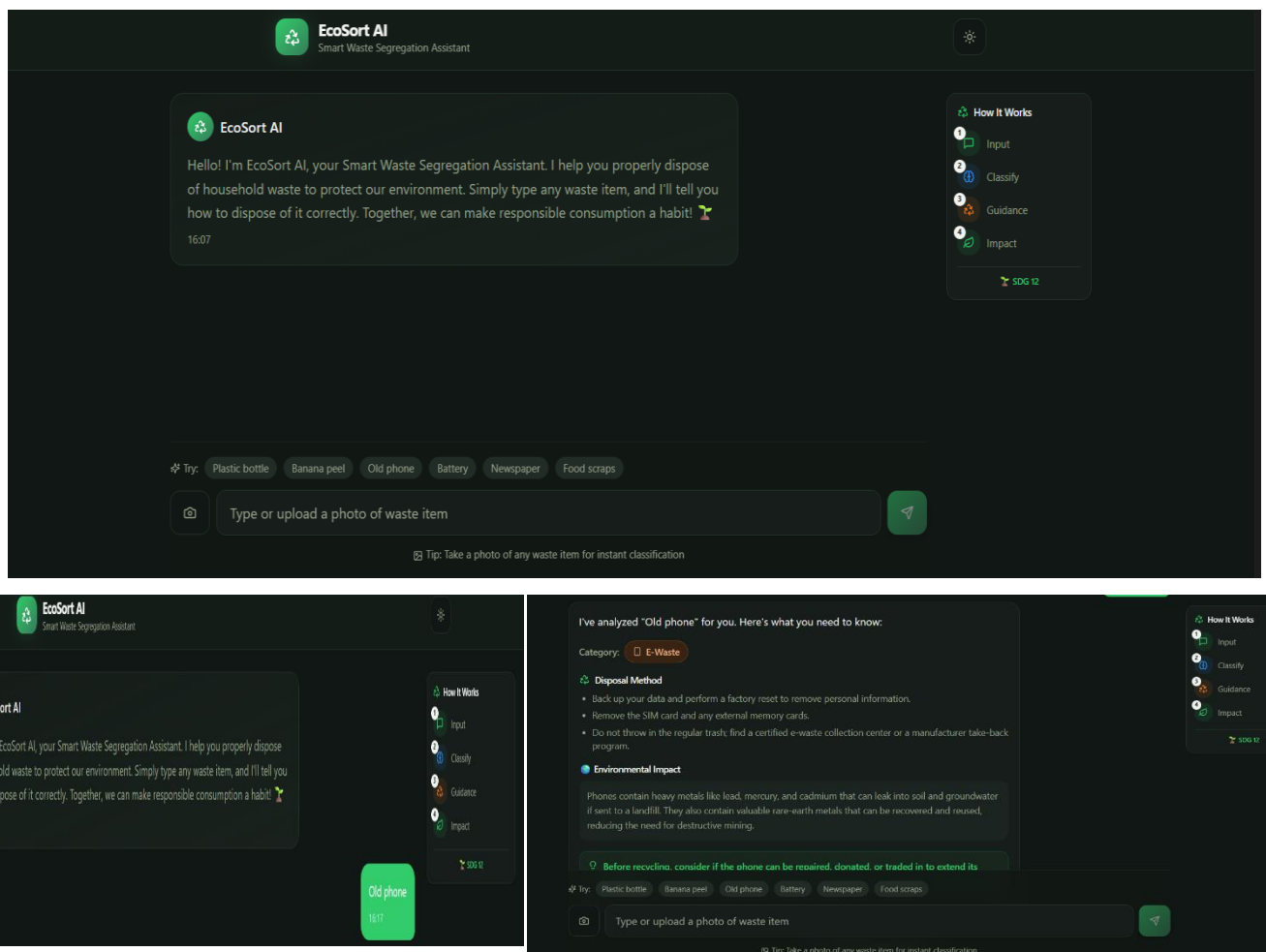


Figure 1: EcoSort AI chatbot interface showing user interaction and AI workflow explanation.

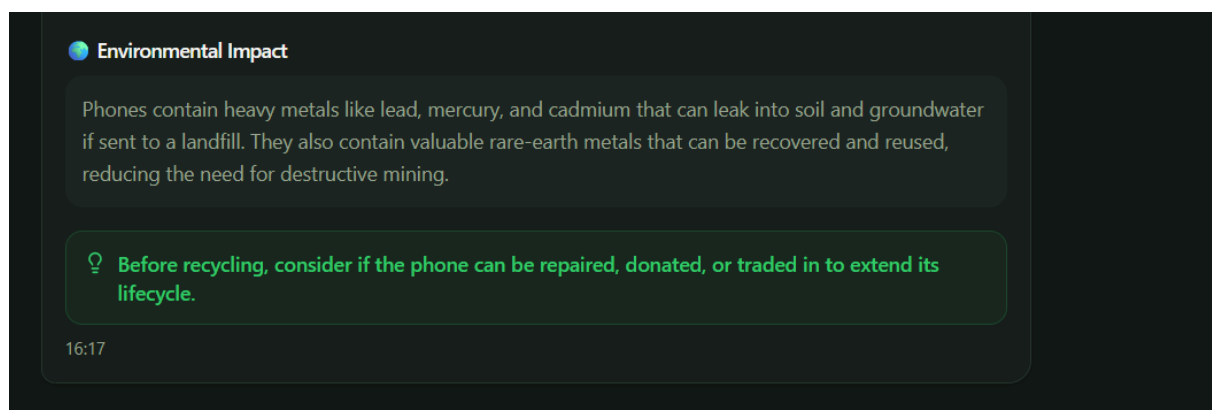


Figure 2: AI-based waste classification and disposal guidance generated by Eco Sort AI.

AI Workflow:

The AI workflow of EcoSort AI follows a simple, transparent, and explainable process. First, the user provides a household waste item as input through text or image. The AI system analyzes the input and classifies the waste into one of the predefined categories such as Wet Waste, Dry Waste, E-waste, or Hazardous Waste.

Once the classification is completed, the system generates appropriate disposal guidance based on standard waste management practices. Finally, EcoSort AI explains the potential environmental impact of improper disposal to encourage responsible behavior. This structured workflow ensures clarity, usability, and responsible application of AI in addressing sustainable waste management.

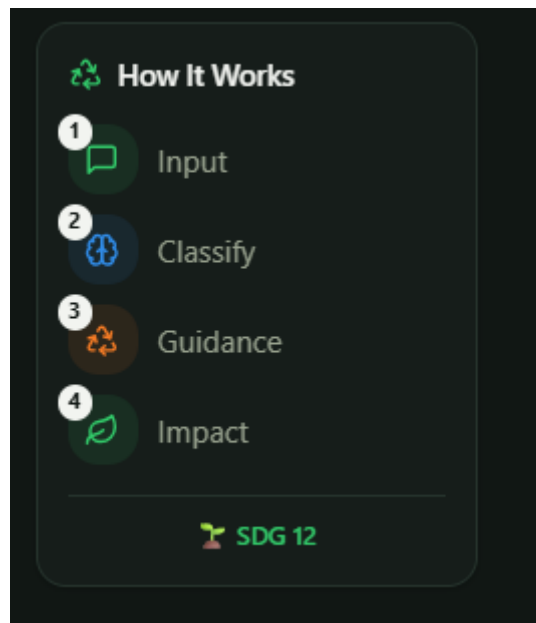


Figure 3: Explainable AI workflow of EcoSort AI illustrating input, classification, guidance, and impact.

Responsible AI Considerations:

EcoSort AI is designed with responsible AI principles in mind. The system does not collect, store, or process any personal user data, ensuring user privacy. The AI applies the same classification logic uniformly to all users, maintaining fairness and avoiding bias.

The chatbot provides transparent explanations for its recommendations and clearly communicates uncertainty when applicable to prevent misinformation. EcoSort AI functions strictly as a guidance and awareness tool and does not enforce decisions, ensuring ethical and responsible application of AI.

Expected Impact:

If implemented, EcoSort AI can improve waste segregation practices at the household and community level by providing instant and accurate disposal guidance. This can help reduce landfill waste, improve recycling efficiency, and increase public awareness about responsible consumption.

The solution benefits citizens by simplifying waste segregation, supports municipal waste management systems by reducing contamination in waste streams, and contributes to environmental protection by promoting sustainable practices aligned with SDG 12.

Conclusion:

This project demonstrates how AI can be responsibly applied to address real-world sustainability challenges. EcoSort AI combines conversational AI, explainable workflows, and ethical design to support responsible waste management. The project highlights the potential of AI-driven solutions to promote sustainable development in an accessible and impactful manner.