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E-waste Facility Locator

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E-waste Facility Locator

A PROJECT REPORT

Submitted by

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IN

COMPUTER SCIENCE AND ENGINEERING

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BENGALURU

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PRESIDENCY UNIVERSITY
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PRESIDENCY SCHOOL OF COMPUTER SCIENCE AND ENGINEERING

BONAFIDE CERTIFICATE

Certified that this report "E-waste Facility Locator" is a bonafide work of "Thejas C (20221CSE0626), T M Tejashwini (20221CSE0624), Vinay K Hiremath (20221CSE0628)", who have successfully carried out the project work and submitted the report for partial fulfilment of the requirements for the award of the degree of BACHELOR OF TECHNOLOGY in COMPUTER SCIENCE AND ENGINEERING during 2025-26.

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DECLARATION

We the students of final year B.Tech in COMPUTER SCIENCE AND ENGINEERING at Presidency University, Bengaluru, named Thejas C, T M Tejashwini, Vinay K Hiremath, hereby declare that the project work titled "E-waste Facility Locator" has been independently carried out by us and submitted in partial fulfilment for the award of the degree of B.Tech in COMPUTER SCIENCE AND ENGINEERING during the academic year of 2025-26. Further, the matter embodied in the project has not been submitted previously by anybody for the award of any Degree or Diploma to any other institution.

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Abstract

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The E-waste (electronic waste) has been one of the swiftest growing waste products in the world and posing significant environmental and health risks to people because of toxic elements like lead, mercury and cadmium that occur in dumped electronic (electronics) items. Inappropriate disposal is a source of contamination of soil, water, and air, thus leading to an ecological and health loss in the long term, such as respiratory and neurological conditions. The issue is exacerbated by the low level of public consciousness and proper separation at the source area and lack of information on certified recycling sources resulting in the abuse of valuable materials that can be recycled and release of harmful elements to the environment.

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This project will attempt to fill these gaps with a web based E-waste Facility Locator and Awareness Platform using geolocation technology, interactive information delivery and user interaction mechanisms. The system allows everyone to find local certified recycling plants on a map-based platform and has easily understandable educational pop-ups detailing environmental and health effects of different E-waste elements. To further persuade responsible disposal, the site will introduce a credit point program using estimated metal recovery so that the user is more enticed to recycle metal regularly in addition to allowing them to monitor how they are contributing to the reduction of pollution and the loss of resources.

The solution will ensure that making responsible E-waste management more convenient, aware and motivating by bringing more general population to the solution to the problem. An overview reveals that the platform is practically possible within the current web-related technologies and geolocation APIs, which mentioned have little hardware demands. It is predicted that more recycling activities will take place, informal disposal will be less polluting, and sustainable waste use will be better understood - contributing to long-term behaviour change and helpful to environmentally responsible communities. Moreover, the platform can be developed in future to add such functionalities as pickup scheduling, live-location disposal alerts, and connection to government-usable recyclers. It also offers the element of community team work and raising awareness, whereby everyone participates. On the whole, the relevant solution promotes the transition to a circular economy and reinforces national initiatives to build sustainable waste management.

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Abbreviations

Abbreviation	**Full Form**
AI	Artificial Intelligence
API	Application Programming Interface
AWS	Amazon Web Services
CPCB	Central Pollution Control Board
CRUD	Create, Read, Update, Delete
CSS	Cascading Style Sheets
DB	Database
DEMATEL	Decision Making Trial and Evaluation Laboratory
DPDPA	Digital Personal Data Protection Act
GDPR	General Data Protection Regulation
HTML	HyperText Markup Language
IoT	Internet of Things
JWT	JSON Web Token

Mt	Metric ton
MVP	Minimum Viable Product
PESTLE	Political, Economic, Social, Technological, Legal, Environmental
PRO	Producer Responsibility Organization
RAM	Random Access Memory
REST	Representational State Transfer
SDGs	Sustainable Development Goals
SDLC	Software Development Life Cycle
UI	User Interface
UX	User Experience

Chapter 1

INTRODUCTION

The high pace of digital technology growth as well as increased use of electronic devices has not only altered the daily living aspect of life but it has also contributed to the increased world-wide burden of electronic waste (E-waste). The e-waste that is found in discarded smartphones, laptops, or batteries also consists of toxic elements, including mercury, cadmium, and lead that may poison soil, water, and air upon improper disposal. Not only does this type of pollution damage ecosystems, but these have long-term health risks that are serious and threatening to the populations surrounding such pollution sources. The total number of E-wastes in the world as of 2022 stood at 62 million tons, whereas there is an expectation of more than 75 million tons by 2030, and only a quarter of the produced recycled material is done with responsibility. India, alone, has an annual production capacity of more than 5 million tons in a year, but the recycling awareness of the citizens and access to certified-facilities are low. Informal recycling networks are still prevailing in most areas and hack at extracting raw materials in unsafe manual ways, which emit toxic fumes and chemicals. Such an imbalance represents the strong demand of smart, convenient, and technology-oriented solutions that are expected to make responsible E-waste disposal simpler and direct users to safe behaviors.

To ensure that this gap is filled, the proposed project is the E-waste Facility Locator and Awareness Platform ensuring the creation of a digital platform, which allows connecting users to certified E-waste collection centers, allows scheduling a doorstep pickup, implements AI-based device recognition to determine the credit, and promotes environmental education. The platform promotes responsible disposal and minimizes the reliance on informal hazardous recycling, which is encouraged through real-time tracking, automated scheduling and interactional learning materials.

In addition, the system also helps to promote transparency in which users get clear data about how their devices are processed, include, materials in them, and the way recycling leads to sustainable environment. A combination of factual data, convenient interfaces, and contemporary technology can enable individuals, students, and populations to make the correct choices regarding their electronic waste, which is how the platform empowers them. An introduction to the background, motivation, and significance of the project has outlined the weaknesses in existing practices of E-waste handling, which sets the platform as a viable scalable solution to enhance civic involvement and bring forth effective practices in the manner of handling E-waste responsibly.

1.1 Background

The rapid development of consumer electronics and the reduction of the product life cycles of electronic products accompanied with a constant need to acquire updated technology has made Electronic waste (E-waste) one of the most rapidly increasing types of waste within the globe. Electronics like smartphones, laptops, televisions, and other home appliances are thrown away at an accelerated rate and this has led to massive piling of non-biodegradable and hazardous materials. As per Global E-waste Monitor, 2020, in 2019, the globe produced 53.6 million metric tons (Mt) of E-waste, and it is projected that the amount will increase to 74 Mt by 2030, and this means that sustainability of E-waste management is a critical global environmental issue.

E-waste comprises not only the precious elements of gold, silver, copper, platinum, certain rare earth elements but also very toxic substances such as lead, cadmium, flame retardants that contain brominated elements and mercury. All these dangerous substances when improperly disposed permeate into soil, ground water and atmosphere as leachate of landfills or to the atmosphere by open burning. This pollution causes serious health problems such as respiratory impairment, hormonal disruptions, cancer, reproductive and neurological complications especially on informal recycling workers and communities living around dumping sites.

In India, the topicality of the matter is even greater. India is the third-largest producer of E-waste in the world, which can be facilitated by a fast urbanization process, growing popularity of digital goods, and the low price of electronic products. Even with regulatory frameworks such as the E-waste Management Rules (2016), most E-waste ends in informal sectors where most recycling systems are faced with unhealthy practices of unsafe manual dismantling and open burning. There is little publicity on proper disposal and even in most areas there are limited and inconvenienced access to formal recycling centers.

Inaccessibility of the information on certified recycling plants, accompanied by a lack of awareness on the impacts of environmental degradation, leads to bad disposal habits. Numerous consumers do not know of the places to recycle their devices, materials that can be recycle recovered, and the effects of their behaviours on sustainability. The identified gap places the harmonic necessity of a technologically based, user friendly, and informational system that makes responsible E-waste management easier.

The E-waste Facility Locator and Awareness Platform will be created to deal with these issues by combining location-based services, the informational material, the device recognition implemented using AI, and incentives-focused recycling. The platform helps in making sure that users practice safer, efficient, and environmentally friendly disposal behaviors by directing the users toward certified recycling facilities, doorstep collections, and advancing awareness. It situates technology as an intermediary between sustainability, the consumer behaviour, and the idea of the circular economy.

1.2 Statistics

The fast growth in the number of people across the world consuming electronics has also led to high levels of production in the generation of e-waste. Global E-waste Monitor reports that the global level of E-waste is pronounced to 53.6 million metric tons (Mt) in 2019 and this number would surpass 74 Mt in 2030 unless a large portion of the world adopts waste management systems. The recycling rate of E-waste across the world is low with very minimal amount being well organized and recycled under controlled processes and the rest being done through informal or unethical means.

India has become a great participant in this currently increasing crisis, as it is the third biggest producer on the globe of E-waste, with China and the United States at the second and first positions respectively. According to Central Pollution Control Board (CPCB) 2022, India had nearly 1.6 million tonnes of E-waste in the year 2021 to 2022 with an estimated annual growth rate of almost 30 percent. This growth is powering the fast urbanization, digital penetration, and the anonymity of the rapid hierarchy of consumer electronics. Some states are very productive in terms of generating E-waste since it is densely populated and it is more technologically penetrated. Karnataka, Maharashtra, and Tamil Nadu are highly active regions and some of the largest contributions in the accumulation of E-waste as some metropolitan cities like Bengaluru become some of the main hotspots. The situation in Bengaluru is made worse by the fact that it is a technology hub and, therefore, the city contributes much as far as device turnover is concerned as it becomes one of the leading contributors in the production of discarded electronics in the country.

One fact is that this waste is still a major burden: over one-fifth of all E-waste generated in India reaches formal recycling systems. The rest majority is directed into the informal sectors where poor dismantling, open burning, and contact with chemicals attract serious environmental and health hazards. These are contaminating the soil, water and air and exposing the untrained workers such as children in some places to toxic elements like lead, mercury and cadmium.

The statistical trends indicate clearly the necessity of having the solutions which are available, structured and technology-based. A solution such as the E-waste Facility Locator can be crucial as it can help redirect the citizens to approved locations and ensure better education of the people as well as promote responsible disposal. The system helps in environmental sustainability as well as protection of the population by employing the user-friendly digital tools.

1.3 Prior existing technologies

A number of digital projects have tried to deal with the issues connected with e-waste management, and the vast majority are rather narrow in their purposes and scope. The government awareness portal, including the ministry of environment and forest developed ones, informs about the rules required in e-waste. Nevertheless, most of these sites are more of an informational archive and are not interactive and give no attention to the general population or how to actualize the disposal solutions. Consequently, the level of awareness tends to be merely theoretical but not practical.

Another type of available technologies is mobile applications that are developed by local municipalities. The apps are usually used to assist users in finding collection points nearest to them in a given city or region. Although these are handy at a fundamental level, incomplete or outdated databases, limited geographical reach, and lack of incentives to encourage users to participate in their usage are also major attributes of them. They are thus limited to small areas in their usefulness and they do not deal with behavioural and awareness issues on a wider scale.

There has been research on digital monitoring and gathering technologies of e-waste by academic and test pilot web systems like E-Sangrahan and SAFA-E. These platforms allege the fact that technology may be used in waste management but these systems are mostly isolated systems with shallow experimental interests. They tend to not be integrated with learning content, game-based, or reward-based, to promote repeat use. All in all, the weaknesses of these current systems, e.g., low levels of interactivity, low coverage, imperfect databases, and limited user interaction, suggest the necessity of a more efficient and universal solution. The proposed platform will address these gaps by integrating geolocation mapping, AI assistance, awareness modules, and a systematic system of incentives based on credit, which provides an integrated and user-centric way of managing e-waste in a responsible manner.

1.4 Proposed approach

The target project is to create a web-based facility that will allow people to find the closest registered E-waste recycling sites with minimum effort and also create awareness to individuals on the extreme environmental and health risks of disposing electronic waste in default manner. The platform is aimed at combating the increasing difficulties of the increased volumes of E-waste, a low level of knowledge among the population and the unavailability of digital instruments that can provide citizens with the needed guidance on the right approaches to the waste disposal. As more and more electronic equipment becomes more accessible, the number of wastes is growing accordingly, leading to an acute demand of a solution that is as convenient as possible and as an assertive source of information. The method aims at incorporating the real-time geolocation technology where users would then be able to find certified recycling locations immediately with an interactive map without the hassle and confusion of locating appropriate points of disposal.

In addition to that, the platform also has features of education which include informative pop-ups and awareness messages that display the risks posed by harmful materials including lead, cadmium, mercury and other toxic materials contained in E-waste. These interactive modules will help enhance the knowledge base and persuade the users to use responsible disposal skills. The system is further supported with a credit-based reward system to increase the level of engagement among the users. This aspect allocates the points depending on the exact value of precious metals contained in equipment (in this case) gold, silver, and bronze. On the one hand, through the gamification of the process, users will be encouraged to recycle more, and keep track of their involvement in environmental protection. Administrators have a very critical role as they have to validate the facility and ensure that data remains accurate and are on track of the credit approval process where the information should be reliable and up to date.

The suggested solution is flexible and may be implemented in various situations, including helping citizens to make sound choices, enhance the transparency of recycling chains, and decrease unsafe informal recycling activities. Nevertheless, the platform has some limitations such as reliance on the internet, maintaining the facility data on the regular basis, and collaboration with certified recyclers to conduct the credit redemption procedure. Nevertheless, despite the above, the solution offers a holistic, scalable, and user-friendly solution that can encourage responsible E-waste management and risk promoting sustainable environmental behaviour.

1.5 Objectives

E-waste facility locator is developed with the formation of the specific, measurable, achievable, relevant and time bound objectives that responded to both technical, operational and organizational needs.

Objective 1: Behavioural Influence

11 To determine the user behaviour by giving real time educational messages explaining the environmental and health hazards of improper E-waste disposal. The system can promote responsible recycling habits and make people learn more about the necessity of sustainable waste disposal by means of interactive awareness pop-ups and easy-to-follow explanations.

Objective 2: Analytical Estimation

To examine the submission of the devices and estimate precious metals like gold, silver and copper recovery value. It relies on model-specific information and an AI-powered device identification module, which enables a user to get an accurate estimate of credit even when it is established through an uploaded image, and not the manual selection of a device.

Objective 3: System & Data Management

In order to make the information credible and valid with administrator operated module to control the records of the devices, recycling facility, credit values and user submittance. This is a goal aimed at ensuring the data is always clean and up to date in case the users can rely on the information presented in the platform.

Objective 4: Automated Pickup Scheduling

To offer a smooth pick up experience by having an intelligent scheduling tool that will automatically generate dates and times depending on the district of the user. The system operates a daily threshold (five pickups per district), places the users on the queue and changes the timing of the schedules depending on the time of request- namely fairness, efficiency and limited human intervention.

Objective 5: Security and Authentication

To guarantee safe and trusted interaction by means of solid authentication strategies, secured user accounts, role-definitive access (user/admin) and validation of facility information. This builds the level of confidence among users when using the platform.

Objective 6: Deployment & Accessibility

To implement responsive, scalable and easy to use web platform accessible in both desktop and mobile application. The system combines live updates through Socket.io, easy navigation and cross device compatibility to guarantee efficient user experience on the part of the person, as well as the organization.

Objective 7: Institutional Support for Bulk Disposal

To facilitate the mass waste disposal by means of mass collection module where schools, companies and institutions can schedule the mass collection in a schedule. This extends the influence of the platform to more than just an individual user and encourages large-scale and systematic recycling processes.

1.6 SDGs

Directly, the E-Waste Facility Locator promotes a number of United Nations Sustainable Development Goals through responsible disposal, a decrease in the environmental pollution, and raising awareness among people. Most SDGs that can be applied to this project are the following:

Fig 1.1 Sustainable development goals

SDG 3: Good Health and Well-Being

Incorrect disposal of e-waste subject's communities to toxic elements like mercury, lead, and cadmium as well as leading to respiratory, neurological, and developmental health complications. By assisting the users to find certified recycling centers and discouraging the possibility of unsafe disposal, the platform minimizes unhealthy exposures and leads to better health outcomes in the community.

SDG 9: Industry, Innovation and Infrastructure

The app combines advanced web services, geolocation solutions, machine intelligence-based detection, and the doorstep pickup scheduling. These innovations assist in the successful development of the infrastructure and show how waste management ecosystems can gain efficiencies due to the impact of digital tools.

SDG 11: Sustainable Cities and Communities

With the creation of a large share of a countries e-waste, cities tend to have no information available on how to dispose of the same. The platform improves the sustainability of the city through mapping a nearby approved recycling centres, aiding to streamline waste, and minimise on the environmental impact of unplanned and unofficial dumping customs. Goal 12: Responsible Consumption and Production.

SDG 12: Responsible Consumption and Production

The system has an immediate beneficial effect on sustainable consumption, as it informs users of the dangers of e-waste, encourages the recovery of resources through the estimation of precious metals, and depends on the rewards system based on credits to stimulate environment-friendly behaviour. These characteristics assist in shifting the consumers to more conscious patterns of disposal.

SDG 13: Climate Action

Informal e-waste combustion emits greenhouse gases and toxic fumes, which pollute the air and cause climate change. The platform promotes climate mitigation by directing users to appropriate channels of recycling and motivating the safe dismantling process via awareness modules, which reduces the emissions generated by an unsafe disposal process.

1.7 Overview of project report

This project report is categorized into nine body chapters that will give a collective explanation on the development and evaluation of the E-Waste Facility Locator. The first chapter presents the issue of increasing electronic waste, the rationale of the topic choice and selection, vital statistics, technological constraints present, the solution, specific objectives, and its correspondence with the appropriate Sustainable Development Goals (SDGs). This chapter provides credence and suitability of the project.

Chapter 2 uses an elaborate literature review that captures the available literature, tools, and methods in the management of e-waste, digital mapping platforms, and environmental awareness systems, as well as incentive-driven recycling models. It outlines the shortcomings of existing solutions, and puts the proposed system as a required change.

Chapter 3 explains the approach that was used to construct the E-Waste Facility Locator. It describes the workflow, system design, system modules and the design and implementation plan to be followed step-by-step during the project.

Chapter 4 is devoted to the main project management areas including planning, schedule of a timeline, risk discovery, mitigation measures and a general budget. These elements make the business go on in a systematic, measurable and structured way.

Chapter 5 reveals the analysis and design stage, which entails the system requirements, block diagram, flow chart, domain model specifications, communication models, functional views, and operational views. It also articulates the most important design choices that were applied to this venture including the interactive facility locator interface, the provision of awareness modules, and upgraded features that were incorporated during the development of this venture.

Chapter 6 describes the hardware, software, frameworks, and simulation tools applied to develop and test the platform. It entails both back-end and front-end technologies, map libraries, and databases, and development environments.

Chapter 7 will include the evaluation and results, the methodology used in the testing, the test cases, test results and lessons learnt. This chapter proves the achievement of the system with the fulfilment of goals and justifies the features adopted in it.

The social, legal, ethical, sustainability, and safety considerations of the project are discussed in Chapter 8 of how the E-Waste Facility Locator can help create responsible recycling behaviour, protect the environment, and adhere to the laws of the country.

Lastly, Chapter 9 wraps up the report summarizing the work done and offers potential improvements like the introduction of pickup services on-the-fly, AI-based facility verification, and scale implementation with cooperation of municipal and governmental organizations.

Chapter 2

LITERATURE REVIEW

The e-waste management has become one of the primary concerns in the world, and researchers have started working with digital platforms, automated systems, policy discussions, and new prospects offered by IoT and blockchain. In the chapter, ten pertinent studies have been reviewed, but their combined knowledge enables them to offer an insight in the environmental, technological and behavioural aspects regarding e-waste handling. The idea is to comprehend the solutions to the existing problems, the gaps, and the reason as to why a user-centric platform like the E-Waste Facility Locator should be developed. The literature chosen illustrates the international risks, national issues, digital traceability, lack of education, and the practicability of web-based disposal platforms. The review also shows that, although there are a number of technological interventions, no one precisely uses geolocation, awareness, incentives, and administrative verification in an integrated way, which is indeed an opportunity that our suggested project will cater to.

2.1 Review of Existing Literature

1. Pont, Robles and Gil - E-waste: Everything an ICT Scientist and developer should know [1].

This background survey gives a summary of the environmental consequence of e-waste, listing the dangerous elements that include lead, mercury, cadmium, and brominated flame retardants, and also delineates precious metals that can be reused like gold, silver, and copper. The authors provide statistics of the world, the forms of disposal and the best practices of formal recycling. Even though the research has managed to define the technical and ethical urgency of responsible recycling, it provides fewer viable strategies on how this issue could be addressed at the community-level or digitally. In the case of the E-Waste Facility Locator, this piece works is a critical conceptual foundation - emphasizing the necessity of a platform that conveys more localized knowledge and directs citizens to the safe recycling facilities.

2. Khan and Ahmad - E-waste Tracking and Tracing System Khan et al.- Blockchain-Based IoT-Enabled E-waste Tracking and Tracing System [2]

In this paper, it is suggested to develop an IoT-based tracking architecture with the Ethereum blockchain to track the e-waste disposal process to prevent any tamperation of the records. Well illustrated advantages associated with the concept of transparency, traceability, and accountability to stakeholders are proposed by the authors and substantiated with a prototype implementation. Nevertheless, the most common challenge of implementing the solution in practice, including gas fees, scalability, and integration with smaller recyclers or informal ones, creates restrictions on the possibility of widespread development. In our case, the paper gives a glimpse of the opportunities of potential expansion in the future, including the process of securing the credit redemption or verifying the recyclers, but reiterating the idea of a lightweight, modular approach being more feasible in case of an initial MVP.

3. Gaur et al. - E-waste Management Challenges in India (PRO Perspective) [3]

With reference to the Indian situation, the research establishes systemic impediments confronting the Producer Responsibility Organizations (PROs), such as absence of cooperation, high recycling expenses, and technical expertise. With the help of DEMATEL, the authors prioritize these challenges and present policy interventions. Although the paper provides an important institutional perspective, it ignores the barriers and behavioural factor at the citizen level. The results favor the features of confirmed recycler directories, an administrative application, and consciousness components in our site as an effort to fill the gaps between the stakeholders and citizens.

4. Qadir and colleagues - Long-term TOPSIS Recycling State Method: Recycling of Partners of Choice [4]

This study presents a highly sophisticated multi-criteria decision-making model of ranking recycling partners in presence of uncertainty. The method though mathematically rigorous and proven to be true by a case study, needs a lot of structured data which may not be available in every region. Simplified ranking criteria We can use distance, certification, and user ratings as well as their ability to recover materials in a simpler manner in our project because users need to know the most reliable facilities without unreasonable complexity.

5. Ahmad et al. - A Survey of Waste Management in Smart Cities with Blockchain: A Survey [5]

The authors review blockchain use in the waste control sector, outlining its benefits in terms of security, auditability and monitoring of incentives. Nevertheless, they also cite practical obstacles including cost of integration is too high, like scaling issues, and reduced empirical success of smaller deployments. The insights inform our project to develop a gradual strategy that is based on local database-supported credit logging with blockchain integration as a future addition to the scope.

6. Chakraborty, Kettle and Dahiya, - Electronic Waste Reduction through Circular Design [6]

In this paper, the topic of e-waste reduction is considered through the design lens because the principles of circular design contribute to the rate of recoveries and extending the lifespan of the product. Although it does not apply directly to digital tools, the findings are helpful in the establishment of educational content in our platform. The users will be informed about repair, reuse, and sustainable purchasing and behavioural change will be reinforced. Its weakness is in its reliance on the collaboration of manufacturers, but the information it offers encourages consumer decision making.

31 **7. Chen and Yee - E-waste Management: Are we ready to it? [7]**

When the authors conducted their empirical investigation of student awareness, they discovered that even the technologically literate population has a little knowledge about e-waste hazards and its correct ways of disposition. This study is old and is limited to one demographic group, but the results still demonstrate that there are still gaps in awareness. It justifies the inclusion of audience-oriented educational modules, interactive pop-ups, and behaviour-oriented instructions into our application to overcome the gaps in knowledge.

8. Malagati, Rajesh and Sreevidya - E-Sangrahan Framework of Efficient E-waste Management [8]

E-Sangrahan is an Indian web system that is functional and allows other features like finding of facilities and classification of e-waste. The pilot implementation demonstrated better access to drop-off spots but did not have user interaction, such as incentives, or gamified learning. In our project, it will be used as the evidence of the feasibility and the need to enrich the experience of the user by enabling metal-value estimation, awareness modules, and credit-based motivation.

9. Chaturvedi et al. - SAFA-E: The E-waste Management System [9].

SAFA-E combines Android and web apps to facilitate the e-waste reporting in the household.

The system assists the municipal authorities in knowing the patterns of disposal, but it is based extensively on manual reporting by the users and does not have a lot of integration with certified recyclers. Such holes provoke the desired addition of device verification, credit assignment administration workflow, and facility checklist into our platform to guarantee data quality and minimize fraud.

4

10. Roy et al. - Design and Development of E-waste Monitoring, Segregation and Recycling System [10].

This paper will offer the automated e-waste processing e.g., conveyor-based sorting and shredding showing that it improves throughput and material recovery. Nevertheless, these systems are very expensive to develop, and they can only be applicable in large recycling facilities. In the case of E-Waste Facility Locator, the investigation enlightens the necessity to categorize the facilities according to the abilities they possess, i.e. manual or automated, to allow the users and PROs to select the centers that will be suitable when they require particular disposal skills.

2.2 Summary of Literatures reviewed

Table 2.1 Summary of Literature reviews

Paper	**Concept / Approach**	**Main Results**	**Limitations**	**Recommendation (for our project)**
[1] Pont et al. (2019)	Comprehensive survey of E-waste hazards & recovery	Consolidates global stats, toxicants, recycling methods	High-level; lacks local actionable guidance	Use as background; add local case studies
[2] Khan & Ahmad (2022)	IoT + blockchain traceability prototype	Demonstrated traceability benefits	Scalability & cost (blockchain gas)	Modular design; pilot off-chain registry first

[3] Gaur et al. (2025)	DEMATEL analysis of PRO challenges in India	Ranked systemic barriers for PROs	Institutional focus; less on end users	Include PRO analytics & feedback in admin
[4] Qadir et al. (2024)	Advanced MCDM for partner selection	Robust partner ranking under uncertainty	Complexity; data requirements	Use simplified ranking with few indicators
[5] Ahmad et al. (2021)	Survey of blockchain in waste mgmt	Benefits vs limitations analysis	Lacks empirical cost/benefit studies	Plan incremental blockchain adoption
[6] Chakraborty et al. (2024)	Circular design recommendations	Increases recoverability with design changes	Industry adoption needed	Include circular-design awareness in content
[7] Chen & Yee (2011)	Survey of student awareness	Low readiness; education gap	Dated; single cohort	Target education modules to varied audiences
[8] Malagati et al. (2019)	E-Sangrahan web platform	Improved access to disposal pilot	Local scope; no incentives	Add gamified credits and device estimation
[9] Chaturvedi et al. (2021)	SAFA-E Android + web system	Household reporting improved mapping	Reliant on user accuracy	Add device verification & admin approval
[10] Roy et al. (2021)	Automated detection, segregation system	Higher throughput & recovery	High CAPEX; large scale only	Tag facility capabilities (automation vs manual)

2.3 Identified Gaps and Research Opportunities

Throughout the literature reviewed, there are a number of consistent limitations and unfilled needs:

1. Absence of citizen-based platforms: The major part of the literature deals with institutional, technological or general implementation. The number of systems that easily direct ordinary users towards the neighbouring certified recycling centers or provide them with good knowledge on hazards is very scarce.

2. De-facto lack of awareness + navigation + incentives: The current digital solutions seldom integrate all three. Awareness portals are not interactive, there is no engagement feature in facility locators and incentive systems are not traceable.

3. Require low-cost and scalable technologies: oT and blockchain systems have potential but are usually unfeasible at infancy because they are expensive and complex and cannot reach regional markets.

4. A lack of facility capability mapping: The literature on automation has emphasized the facility capability but the current platforms fail to categorize recyclers in terms of their processing type.

5. Lack of behavioural interventions: Low awareness and lack of participation of people are regarded as consistent and there is a reason to include tastier educational pop-ups and easy-to-relate content in our system.

6. Require verified, reliable data flow: There are problems with the accuracy of data entered by end users demonstrated in attempts such as SAFA-E. An organisation administrative module of validation is necessary.

The Reviewed literature provides much motivation to have an in-depth digital solution specific to Indian e-waste ecosystem. Although the literature available can be utilized to study particular components of the issue like traceability, policy issues, automation, and awareness, none of them can offer an integrated mechanism integrating the facility localization, district-level scheduling, educational advice, metal-value-based incentives, administrator validation, and scalable architecture in one conveniently accessible platform.

The E-Waste Facility Locator takes these gaps to serve as resource filling through providing a pragmatic, user-friendly, and behaviour oriented platform on proper e-waste disposal.

Chapter 3
METHODOLOGY

A reliable e-waste management platform cannot be formed without a systematic method that brings incisiveness, accuracy, and methodology in the testing procedure at each and every phase. There are numerous software development methodologies, which were considered in this project, including Waterfall, Agile, Scrum, DevOps and Spiral. Nevertheless, the V-Model Verification and Validation Model was chosen since it has the same focus on planning and testing, which is ideal to the project where various independent modules have to be combined to create a harmonious result.

As the E-Waste Facility Locator contains such features as the geolocation mapping, the educational pop-ups, the credit estimation, the administrative verification, and the recently introduced district-based pickup scheduler system, V-Model is the most reliable framework to provide quality and accuracy as well as ensured development flow.

3.1 The V-Model Methodology

V-Model (Verification and Validation Model) is a transformation of the conventional Waterfall model which integrates simultaneous testing during all stages of development. This will make sure defects are detected early hence making them more reliable at less cost. Specification and design activities (verification) are linked to the left side of the "V" and various stages of testing (validation) to the right side.

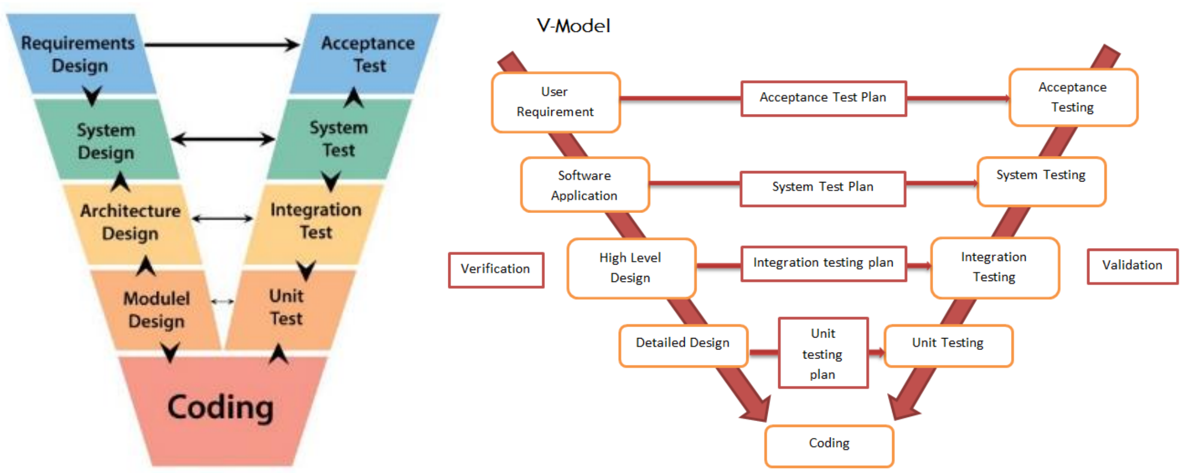

Fig 3.1 The V model methodology

3.2 Application of the V-Model

The V-Model has been used to the E-Waste Facility Locator development in a systematic sequence of activities which will link every design stage to a test stage. Its well disciplined top-down methodology makes sure that only the requirements that have been proved are implemented and that every module is tested after it is developed. The V-Model could be applied to this project in the following stages:

1. Requirements Analysis and Verification

This step was entailed with the identification of user needs, regulator expectation, and existing gaps in e- system of waste management. It drew upon literature reviews, e-waste data on a global scale and reports on India. Among the essentials that are set, there is the need to find nearby authorised e-waste facilities by geolocation, introduce real-time educational pop-ups about dangerous components, introduce a metal-recovery-based credit calculation algorithm, establish a secure user authentication simulator, and create an AI-facilitated system where the pickup is a scheduled process with auto-detection of the districts and an allotment of time slots by using queue logic. Checking was done to ascertain that all requirements were practical, exhaustive, and directly connected to subsequent testing.

2. System-Level Design

An architectural design was developed on a high level which defined the overall structure of the platform. The structure of this design incorporates the frontend (HTML, CSS, JavaScript), the backend (node.js APIs) system, and the user, facilities, devices, credit, and pickup request database structure. The design too has included an AI processing of both district extraction and is also automated in terms of scheduling. This was done at this phase to ensure the verification that the architecture had the capacity to be scaled, secured and expansively scaled in modules.

3. Functional and Module Design

It dismantled the system and put it into identifiable functional modules, which have set inputs, outputs, and functions. They are facility locator module, awareness content module, credit estimation module, pickup scheduling module, authentications system and the admin verification module. The connection and data flow among all these modules were well-mapped. Before development, validation criteria of each function were documented so as to be clear.

4. Unit Development and Testing

All the modules were independently developed on the design specifications. Maps, pop-ups, credit display, pickup forms, and frontend elements have been used to provide the desired features, whereas the API in the server processed the facility data, authentication, credit calculation, and scheduling logic. The database was set with the right schemas and indexing. Unit testing included checking the functionality of every module - such as making sure that the locator was giving good facility results, the credit prices were being charged with the appropriate quantity of metal and that the scheduling engine was putting the right time slot depending on the queue position and the district.

5. Integration and Validation

Once each and every module was tested it was combined to create the entire system. The integration phase checked the mutual communication between modules, i.e., a device submission triggers credit estimation, or artificial intelligence-detecting a district feeds into the scheduling module appropriately. This step helped in eliminating the possibility of mismatch of data and functionality of related components.

6. System Testing and User Validation

End to end testing was done to measure the entire workflow under realistic conditions of use. The most important scenarios, including finding a location of a facility, reading educational pop-ups, submitting a device, reading estimated credits, and scheduling pickups, were properly tested. Admin is also the functions of facility checking and credit approvals were also confirmed. These validations were not done in the field but were done using simulated workflows since the system was not put to live. The outcomes proved that the platform has the expected behaviour related to the expectations of the users and the goals of a project.

3.3 Project Work Breakdown

The process of development was broken down into these systematic work packages that matched the stages of V-Model:

1. Requirements Specification

- Problem analysis and literature review.
- Detecting user and administration requirements.
- Concluding on the functional and non-functional requirements.

2. Architectural Design

- Planning of general system architecture.
- Developing module communication flow.
- Planning the integration of AI to extract the district and schedule uniquely.

3. Functional Design

- Breaking each of them into features: login, maps, credit estimation, pop-ups, pickup logic.
- Information flow and API contracts.

4. Development Phase

- JavaScript/CSS/HTML front-end development.
- Opponent development with Node.js.
- Database schema development in MySQL.
- Combination of AI-powered district detector and active queue planner.

5. Unit Testing

- Testing- Description Testing of individual modules, including locator, credit calculator, scheduler, admin APIs.

6. Integration Testing

- Integration and the testing of sequential workflow.

7. System Testing

- Complete validation of the platform including active modules.

8. Deployment & Documentation

- Many on-site/web hosting on local/internet server.
- Preparation of screenshots, user manual and technical documentation.

9. Review and Future Scope

- Presenting the system.
- Collecting customer feedback on more advanced features like real-time tracking of pickups or automatic data on the facilities.

Chapter 4

PROJECT MANAGEMENT

Management of the project is a very important aspect in the success of developing and completing the E-Waste Facility Locator. The chapter presents plans, organization, scheduling, risk assessment, allocation of resources, and coordination of a team strategy implemented in the project lifecycle. The project effectively provided proper management practices that led to quality adherence, timely delivery on the delivery and effective collaboration.

4.1 Project Planning and Approach

The first project plan was the basic starting point of the project cycle, and it was successful in through accomplishment of all needed activities related to the project. The project was developed in a phases based, structured workflow which was in loose correspondence to the V-Model framework. Every stage would have had deliverables that were well defined thus tracking progress could be easily monitored.

The planning phase was focused on:

- The main modules (facility locator, awareness pop-ups, credits, AI district detector, pickup scheduler), identification.
- Distribution of jobs in the team.
- Planning development processes on a monthly basis.
- Making academic deadlines tenable.
- Record keeping during development.

Weekly reviews, module milestones, and ongoing testing were used as a combination to provide the consistency and coordinate the flow of the components.

4.2 Project Timeline

The project plan was completed within a span of six months, i.e., between July 2025 and Early December 2025 and encompassed the lifecycle of the development.

Table 4.1 Project Timeline

Task / Activity	Month	Milestone
Requirement gathering, literature review, and analysis of existing e-waste systems	**July 2025**	Core features finalized
UI/UX design, system architecture creation, database schema preparation	**August 2025**	System design completed
Development of major modules: facility locator, awareness pop-ups, credit estimation, login, facility API	**September 2025**	Major modules developed
Integration of advanced features: AI district extraction, queue-based pickup scheduling, admin tools	**October 2025**	Advanced features integrated
Integration testing, UI refinement, real-time updates, bug fixes	**November 2025**	Complete functional system
Final system testing, documentation, project report preparation, and presentation materials	**Early December 2025**	Project finalized

This sequence of deadlines helped in having each stage accomplished step by step and at the same time gave the option of making successive improvements.

4.3 Team Roles and Responsibilities

A team of three members engaged in the running of the project where each member had specialization in various fields to bring about the result of the careful module development and integration.

- **Thejas C — AI Integration & Module Testing Engineer**
    - District extraction (AI-based calculation of automatic pick-up scheduling).
    - Adopted the queue-based scheduling algorithm (district grouping, time slot logic, same-day cutoff logic)
    - Frontend and backend conduction of module integration.
    - Conducted unit, integration, and system level testing.

- Full reliability, consistency and easy work flows among all modules.

- **TM Tejashwini — Frontend Developer & UI/UX Designer**
  - Created and developed all user interface elements with HTML, CSS, and JavaScript.
  - Developed interactive features such as facility locator interface, educational pop-ups, credit estimations, marketplace, AI credit interface, and schedule pickup interfaces.
  - Assured response and easy user experience. o Frontend interface that is integrated to backend APIs.
  - Carried out usability testing and managed cyclic refinement

- **Vinay K Hiremath — Backend Developer**
  - Established REST API with Node.js and Express.js.
  - Optimised MySQL database schemas.
  - Authentication, facility management, device credit data retrievals, marketplace APIs, and pickup scheduling logic were implemented.
  - Secured access control and reliable data manipulation.
  - Server-side validations and data processing.

4.4 Risk Analysis

Risk assessment was done to identify possible challenges using the PESTLE-based risk assessment. All the risk areas were defined and matched with mitigation measures.

Table 4.2 PESTLE Risk Analysis

Factor	Potential Risk	Mitigation Strategy
Political	Changes in e-waste regulations affecting guidelines	Monitor policy updates; update facility datasets regularly
Economic	Unexpected project costs (API usage, hosting)	Use free-tier services; maintain contingency plans

Social	Low user adoption or awareness	Use pop-ups, credits, and simple UI to encourage engagement
Technological	API failures, map issues, scheduling errors	Use fallback APIs, caching, and robust error handling
Legal	User data and location privacy concerns	Implement encrypted storage & adhere to privacy guidelines
Environmental	Server downtime or internet outages	Cloud redundancy and backup systems

The analysis generates readiness in case of external and internal problems.

4.5 Quality Assurance and Reviews

The quality assurance was ensured by means of:

- Module-level unit testing
- Milestone incorporation testing.
- Facility search, credit estimation, pickups testing: User flow testing.
- Checking of AI district detection and queue scheduling.
- Application: Authorization and data integrity security checks are conducted at the backend.
- Frequent review meetings to rectify progress against schedule.

These were the steps which made the platform be functional as well as reliable.

Chapter 5

ANALYSIS AND DESIGN

In this chapter, the technical background and the design of the E-Waste Facility Locator is presented. It proposes the requirements, and system structure, module designs, database design, workflow, and operating interactions that in totality allow the platform to operate as a full e-waste management solution.

The discussion highlights the interconnected nature of every element, i.e., frontend, backend, database, geolocation services, AI-based district extraction, and automated pickup scheduling features that allow offering users a smooth experience and control the work of these components and ensure the accuracy of the data.

5.1 Requirements

The needs were gathered by literature analyses, study of the available electronic waste systems, and observation of the customer needs. They are divided into functional and non functional requirements.

Functional Requirements:

1. User Authentication

- Users and Admins are required to have secure credentials to register/log in.
- There must be the implementation of JWT-based session management.
- Role based access (User/Admin) has to be implemented

2. Facility Locator

- Get the position/ find the position of the user through geolocation API.
- Show closest certified electronic waste recycling centers.
- Facilitate the use of distance and facility capabilities.

3. Awareness & Educational Module

- Display pop-ups with risk of materials (Lead, Mercury, Cadmium, etc.).

- Train customers about environmental effects and proper disposal of waste

4. Device Submission & Credit Estimation

- Users will be able to recycle a device.
- System estimates: value of gold, silver and copper recovery.
- Window dressing credit on metal recovery.

5. AI-Based District Extraction

- Directly identify the address of the district and full address of user automaticality.
- Existing works not manually selected based on district.
- Uses Gemini/Google AI to extract natural-language.

6. Pickup Scheduling (Automated).

- Checks on the number of systems in that district.
- Auto links date & time.
- Attends to same-day exceptions (when time already elapsed, add 1 hour).
- Makes use of user position calculations.
- Shows approximate pickup information on UI.

7. Marketplace Module

- Listing of reusable devices can be done by the users.
- Shoppers may check out the catalogue according to category/location.

8. Mass Collection Requests

- Institutions/communities may opt to have bulk collection.
- Request is received by admin which responsibility allocates the facility.

9. Recycling History & Tracking

- Users are able to see their recycling record.
- Status: Pending: Scheduled: 1 Picked Up: 1 Completed.

10. Admin Panel

- Introduce/modify/ delete e-waste facilities.
- Check devices that are submitted by the user.
- Acknowledge or disapprove credit points.
- Manage marketplace listing, pickup requests and facility data.

Non-Functional Requirements:

1. Performance

- Facility locator should take no more than 2 seconds to load the results.
- There should be 700-900 ms response time targets of AI-based district detection.

2. Usability

- UI should be user-friendly to everyone.
- Knowledge of awareness should be easy to read.

3. Security

- JWT authentication.
- All forms are to be checked on the input.
- Hashing of passwords.

4. Scalability

- Deals with growing number of users, list of facilities and pickups.
- Modular backend enables the new features to be added in future

5. Reliability

- Database should keep the information in a regular manner.
- Pickup schedule calculations should not be inaccurate at all.

5.2 Block diagram

The block diagram is a general representation of which the User, Admin, Backend, and Database communicate.

The Block Diagram includes components following:

- User Module
- Admin Module
- Backend
- Database

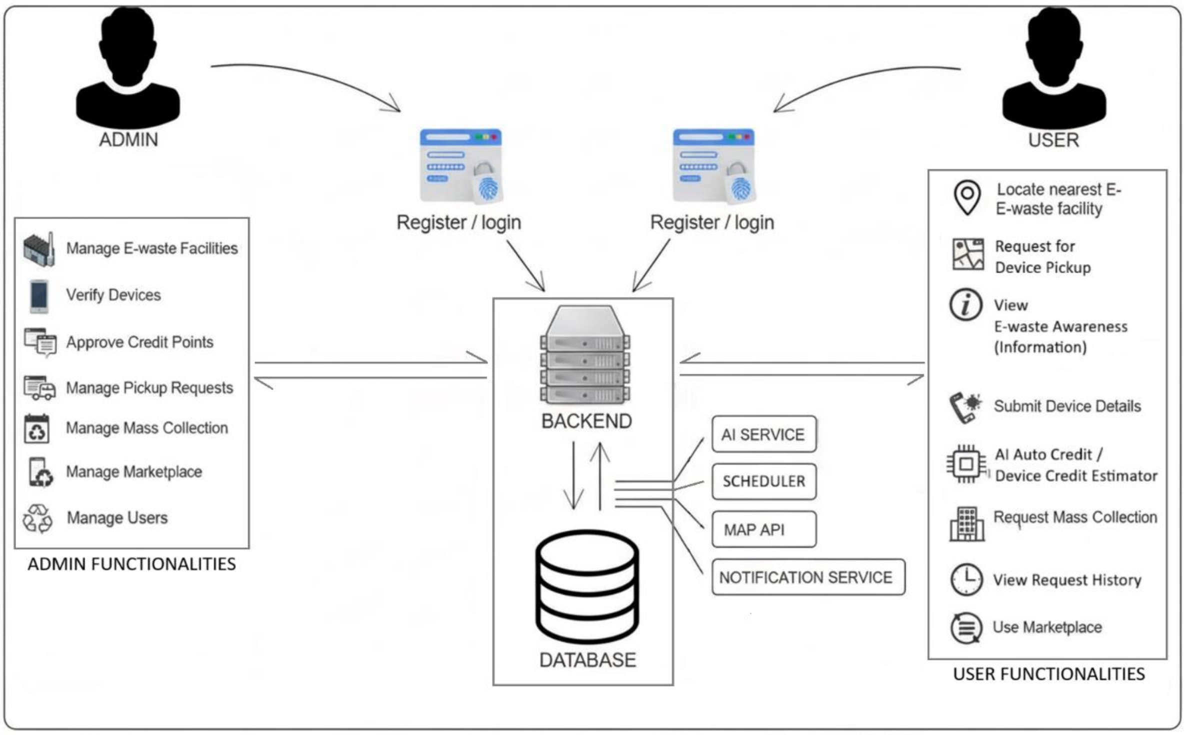

Fig. 5.1 Block Diagram of E-waste facility locator

36 The E-waste Facility Locator block diagram is the highest-level structure of the system which shows how various system components communicate with themselves. It starts with the user interface, in which the users enter their location or they can find out the facilities along with the E-waste in their area. This request is served by the backend server which acts as a connection to the MySQL database to fetch validated facility details. Simultaneously, the server communicates with Google Maps API to retrieve geolocation information and show the correct position of the facilities on the map. The resulting processed information is then reported to the user interface which allows the users to view facility details, awareness messages, and credit

updates. The design is a block design that gives a clear explanation of the flow of data and connection of modules in the system.

5.3 System Architecture

The architecture of the system is a three tier architecture:

1. Presentation Layer (Frontend):

- Built using **HTML, CSS, JavaScript**
- Mobile-friendly interface
- Display facilities, awareness pop-ups, credits, items in the marketplace, and schedule pickup.

2. Application Layer (Backend):

- Developed in **Node.js**
- Contains:
  - Authentication module
  - AI-based district extraction service
  - Credit estimation service
  - Pickup scheduling engine
  - Facility locator APIs
  - Marketplace APIs
  - Admin APIs

3. Data Layer (Database)

- Implemented using **MySQL**
- Stores:
  - Users
  - Devices
  - Facilities

- Pickup requests
- Marketplace listings
- Mass collection data
- Recycling history

This architecture ensures modularity, maintainability, and scalability.

5.4 Use Case Analysis

Actors:

- User
- Admin

Major Use Cases:

- Register/Login
- Locate Facility
- View Awareness Information
- Submit Device for Recycling
- View Credits
- Request Pickup
- View Pickup Schedule
- Add Marketplace Listing
- Admin Verifies Requests
- Admin Manages Facilities

5.5 Database Design

Tables Used:

1. users

2. devices
3. facilities
4. marketplace_listings
5. mass_collection_requests
6. pickup_requests
7. recycling_history

Each table contains:

- Primary keys
- Foreign keys
- Constraints
- Relationships (1-to-many, many-to-one)

5.6 Module Descriptions

1. User

Users of the registered platforms. Personal profile (name, email, phone), authentication role (user/admin) and data related to activities. Users are able to request pickups, list devices, place recycling request, and see credit history.

2. Devices

Has uniformed information on supported electronic devices, such as brand, model name, category, and retrieved metal recovery values (gold, silver, copper). Employed in estimating credit and in verifying the listings of the users as well as recycling actions.

Artificial Intelligence-powered Device Recovery through Image.

In case a user posts a photo of a device (in marketplace or recycling request):

- There is an AI model that analyses the image.
- It pulls the model name, brand, and category of device with the help of visual features.

- The system will then make a comparison between the identified model and devices database.

In case the machine is not located in the database:

The AI automatically:

1. Forecasts the amount of gold, silver, and copper in estimations (based on trained patterns of related patterns).

2. Currently estimates a credit value through these weights of metals.

3. Frets the estimation back to the frontend (without, however, labeling it as being predicted).

4. Recommends the inclusion of the new device in the database (controlled by the admins).

This behaviour facilitates flexibility in the case of addition of new and uncommon devices.

3. Facilities

The collection centres of e-waste verifiable with metadata e.g. name of the facility, district, coordinates, accepted items and also verification status were verified in the stores. Used by the search based on geolocation to show closest centres.

4. Marketplace Listings

Users can place devices on sale or as a donation. Website includes information about the device, price, description, type, and is listed or not.

AI-Assisted Listing Verification

When uploading images:

- AI removes the characteristics of devices in the picture.
- Compares them to the information typed by the user.
- Warns on a mismatch (i.e. incorrect model name).
- Assists in sifting through fraudulent/wrong listings.

5. Recycling Requests

Stores information on devices to be recycled: device ID, estimation on metal yield, credits as well as facility.

AI for New or Unknown Devices

In case the device is not recorded in the master database, the system raises:

- Estimation of AI models of metal recovery.
- Request temporary values are kept in request.
- Administrative review is to determine whether this new model is to be permanently added to database or not.

6. Recycling History

Records all the recycling that was done with time and credit and the facilities. Assists users in quantifying the impact of the environment.

7. Mass Collection Requests

Apts and organizational pickup requests are stored at the store level. Addressee, approximate quantity, date of preference and approval.

8. Pickup Requests

Delivers user doorstep picks. Stores full address, AI-fetched district, pickup date and time slot and queuing status.

AI District Extraction

Exploits Gemini Text model to get the district of a free-text address only. Address segmentation is provided by Fallback mechanism in case of AI failure.

Pickup Scheduling Logic Automation.

One of the final developments related to this project is pickup scheduling.

Rules that have been applied to scheduling:

1. Oil quota of 5 pickups in a district in a day.

2. When request time is less than or equal to 3 PM and queue less than or equal to 5 → same-day eligibility.
3. In case of time, post 3 PM, then the timetable would start on the next day.
4. In case the estimated slot has been already surpassed nowadays, move to the following valid slot.
5. Even in long/incorrect address, AI is able to extract district

Queue Example:

- District pending = 12
- Daily capacity = 5
- User position = 13th, Assigned to Day 3, Slot 1 (9:00 AM)

5.7 Operational view

The platform is based on concerted interactions:

1. User Journey
   - Registers
   - Locates facility
   - Views educational content
   - Submits device
   - Gets credits
   - Requests pickup
   - View recycling history
2. Admin Journey
   - Logs in
   - Adds/updates facilities
   - Approves credit requests

- Manages pickups
- Validates marketplace posts

This ensures a complete cycle of e-waste disposal.

5.8 Additional Design Considerations

Security

- JWT-based authentication
- Sanitization of inputs
- Encrypted passwords

Scalability

- Modular backend
- New capabilities can be easily implemented.

AI Integration

- Detection of a district is replaceable.
- Applications Flexity Flexibility: More AI help can be introduced.

Chapter 6

HARDWARE, SOFTWARE AND SIMULATION

This Chapter shows the entire technical implementation of the E-Waste Facility Locator and Awareness Platform. This chapter centers around the development tools, software technologies, AI integrations, backend logic, frontend modules, database structure and simulation / testing methods employed as the system is all software-based. Each significant part is described, not only the tools used, but also the purpose of using those tools and the way it is carried out and how it functions as part of the overall functionality of the system.

6.1 Software Development Tools

The project integrates the innovative full-stack web application with AI. The key software tools are discussed below and their use in the system clearly explained.

Frontend Tools:

HTML5 & CSS3:

Familiarized with the design and structure the user interface, and also rival the facility locator, credit page, marketplace, and device pickup, and account management. CSS provides both mobile and desktop responsive layouts.

JavaScript:
Applies interactive programming, e.g. validation of forms, retrieval of data with backend APIs, live updates on pickup schedules, map marker creation, and educational pop-up presentation.

Leaflet.js:
Intended to make the interactive map in the E-Waste Facility Locator. It shows certified services and marks them, measures distances, and offers an interface of the map which is lightweight and smooth.

Socket.io (Client):

Allows notifications of features like pickup-status updates and marketplace listing updates to be updated in real time without re-loading the page.

Backend Tools:

Node.js & Express.js:

Be used as the back-end structure to develop REST API to deal with authentication, facility finding, device credit estimating, pickup planning, and marketplace management.

MySQL (with MySQL2 driver):

All the data such as users, facilities, e-waste devices, marketplace listings, pickup requests, and recycling history were organized in the stores. MySQL has been selected because it is reliable, and because of the efficient relational queries.

JWT Authentication:

Allows safe log in sessions to users and admins. Secures safeguarded credit approval, pick up requests, and marketplace activities.

Google Gemini API:

The three key features of AI that are incorporated:

- Identification of devices on uploaded pictures.
- Automatic geo coding of address typed in by user.
- Metal and credit determination of the unknown devices.

6.2 Software Code

1. AI Device Identification Logic

Purpose: In the AI Auto Credit System, one will upload a picture of any electronic device. The system must identify:

- device name
- model
- type
- approximate specifications

How it works:

1. The user uploads an image.
2. Backend converts the image into a binary buffer.
3. Gemini is prompted with:
   - "Identify this device"
   - "Get name, model, RAM, storage, etc."
4. Gemini returns a structured text description.
5. Output is purified and device name is emanated out of the backend.
6. Searching of name in database (insensitive to capital).
7. If found → show DB credits
8. otherwise, resend device name to Gemini so that they can estimate credit.

Snippet (Simplified):

24

```
const result = await aiClient.models.generateContent({
  model: "gemini-1.5-flash",
  contents: [{
    parts: [
      { text: "Identify the electronic device model in this image." },
      { inlineData: { mimeType: file.mimetype, data: fileBuffer } }
    ]
  }]
});
```

Why this approach?

- Works on any device image
- Independent and learns on its own and get adjusted to new products.
- Does not list all the models manually on earth.
- Is not reliant on metadata (exif).

2. AI-Based Credit Estimation Logic

Purpose: In case the device is not present in the database:

- Predict credits
- Foresight gold, silver, copper content.

How it works:

1. Model extract devices with the help of Gemini Vision.
2. estimating metals by use of a text model:

Prompt structure:

Give gold, silver, copper, credits
Gold/silver/copper = grams (4 decimal places)
Credits = whole number
Return JSON only

Why this is necessary?

- Can not be included manually into all the devices.
- Individual receives credits on rare or new phones.
- Maintains impartiality in the reward system

3. AI District Extraction Logic for Pickup Scheduling

Purpose**:** User may enter:

- Full street address
- City + PIN code
- District name mixed in local language
- Informal address

Gemini extracts ONLY the district, which is needed for queue logic. The prompt instructs AI to STRICTLY return JSON like:

{"district": "Bengaluru Urban"}

What is the reason why AI is applied not regulative patterns?

There are Indian addresses all right.

- Individuals spell out Bangluru, Bangalore and Bengaluru.
- There are other districts with numerous names.
- Addresses in rural areas include address of villages and not state.
- AI is more accurate in extractions than rule-based systems.

4. Pickup Scheduling Logic

This is among the most remarkable characteristics of the project.

Rules**:**

1. **Every** district is capable of doing 5 pickups a day.
2. Indeed In case of request later than 3 PM, planon next day.
3. When there is a day queue in it then push to the following day.
4. In case of overtime that today is scheduled and time is past the slot that was assigned to it, then discard by 1 hour.
5. Pickup slots run from 9 AM → 2 PM
6. The queuing is location specific.

Explanation of algorithm

1. Find out whether it is earlier than 3 PM or not.
2. Begin with the date of earliest possible.
3. Pick up count that day in that district:
4. CHECK pickup requests are SELECT COUNT(*) FROM pickup requests where date =? AND district = ?;
5. If < 5 → assign slot
6. Slot time = 9AM + queuePosition

7. In case the allocated slot is newer than the current time → push 1 hour.
8. If 5 slots full → move to next day
9. Repeat until a day is found that is valid.

Why this logic is realistic?

- Leaves offloading workers unloaded.
- Ensures fairness
- Minimizes expiry of e-waste
- Optimizes route planning
- Enables auto-scheduling, without an administrator.

5. Facility Locator Logic (Geolocation + Map)

Purpose**:** Indicates closest certified e-waste on an interactive map.

How it works:

1. Browser obtains user coordinates.
2. Server returns list of all facilities with:
   - latitude
   - longitude
   - facility type
   - accepted devices
3. Leaflet plots them on the map.
4. The calculation of distance involves use of haversine formula.
5. Facilities are ranked by closest first.

Why Leaflet?

- Open-source
- Fast

- Mobile-friendly
- Easy marker customization

6.3 Simulation and Functional Demonstration

The simulation work in the given project is devoted to the exemplification of the functional workflow of main modules like facility location, credit estimation, device identification using AI assistance, and automated pickup scheduling. As the project is a software-only system, the concept of simulation has been used to refer to the process of ensuring the behavior of every module of the system with sample inputs, controlled data sets, and mock situations and then integrating them into the working environment.

1. Facility Locator Simulation:

The facility locator module was tested with sample sets of coordinate that represented the location of recycling centres in various cities. Entering test coordinates, the system drew the markers on the map on Leaflet.js, calculated the distance through the Haverside formula, and showed certified facilities in the right order of proximity. This had the effect of such that the geolocation logic would work as desired.

2. AI Artificial Intelligence Simulation: AI device recognition.

The Gemini AI is an image-processing feature that was simulated using different smartphone photos, such as clear, blurred, partial, and off-angle. The simulation showed the way the AI retrieves the information about the devices, compares it with the database, and assigns the metadata (RAM, storage, OS) to unknown devices. This testing helped to ascertain that the module also works well even with different real-life scenarios.

3. Simulation of Credit Estimation.

The known devices were cross-verified with predefined entries against the database to provide credit values. In the case of undetected devices, predicted values of simulated Gemini from these devices were obtained, and results of gold, silver, and copper metal recovery transformed to some credits. This simulation was able to validate the fact that the credit model does not vary depending on different categories of devices.

4. Automated Pickup Scheduling Simulation

The pickup scheduler was tested by providing addresses of users, artificially adding counts of queues per district (0-12 devices), and scenarios that were conducted before and after the cutoff schedule at the 3 PM time

The simulation ensured that:

- Same-day pickup is only turned on when there is space and they are not after 3 PM.
- Every district has a separate queue.
- The system shifts the unnecessary requests to the next day.
- Increment of Slot allocation at one hour per device.

Such simulations aided in correcting the reliability scheduling logic.

5. Marketplace and Recycling Modules Simulation

Listing in sample market place was also developed and maintained to test workflow like item additions, obscuring sold items, filtering, and accessing pictures. Likewise, a simulated recycling submission was used to ensure the whole process of user input to the approval of the administrator was true.

Chapter 7
EVALUATION AND RESULTS

This chapter addresses the assessment procedure in order to test the effectiveness, validity and functionality of E-Waste Facility Locator platform. The system was put to test in all of its main modules, including facility locator, awareness pop-ups, credit estimation, marketplace, AI-based device identification, district extraction, and automated pickup scheduling. Integration, functionality and user-experience tests were taken to make sure that every feature works as intended in the real-world environment.

7.1 Test Points

The primary evaluation points were the following key features that were chosen as the main requirements of the system functionality:

1. Facility Locator

- Correctness of neighboring facility results.
- Map marker rendering
- Calculation of distances accuracy.

2. Awareness Pop-ups

- An access detection, depending on material/equipment.
- Appropriate information presentation.
- Closing behaviour or re-opening behaviour.

3. Credit & Metal Estimation

- Trouble free estimation of devices in the database.
- Fallback of unknown devices using AI.
- Admin approval workflow

4. Marketplace Module

- Posting new listings
- Browsing and searching of items.
- Server-side validation
- Change of status of listing (sold/active)

5. Pickup Request System

- Application of AI in the extraction of the districts.
- Delay of a schedule based on queue logic.
- Correct indicated pick-up date/time (estimated).
- Socket.io update of admins

6. Authentication

- Proved access and role-based access.
- Token expiry handling
- Unauthorized protection of routes.

7. Database Reliability

- CRUD operations for all tables: devices, facilities, marketplace, pickups, history, recycling requests
- Error recovery for invalid inputs

7.2 Test Plan

The following plan was used to test it:

1. Functional Testing

Each of the modules was put through test to ensure the proper behaviour.

Examples:

- Placing a pickup form will activate AI + scheduling.

- Tapping a device - displays valid credit information.
- Adding a marketplace listing → is reflected immediately.

2. Integration Testing

Tests of interaction between modules were done using flow based tests:

- Device → credit estimation → admin approval → user credit update
- Address → AI district extraction → queue scheduler → DB insertion
- User login → facility locator → request pickup → receive update

3. UI/UX Testing

Performed to ensure:

- Responsiveness
- Clear messages
- Smooth navigation
- No layout breaking on mobile

4. AI Evaluation Testing

Two AI features were tested:

1. **Identification of a device using images.**
2. **Extraction of district name out of user address.**

The measurements of accuracy and performance were done on 30 sample tests.

7.3 Test Result

1. Facility Locator:

Table 7.1: Facility Locator Result

Test Case	**Expected Output**	**Result**	**Status**
Searching facilities near Koramangala	List of certified facilities within 10 km	Returned 5 correct facilities	Pass

Reload map	Markers render correctly	All markers loaded	Pass
Wrong coordinates	Return graceful error	Shown: "Location not detected"	Pass

2. AI District Extraction:

Table 7.2: AI District Extraction Result

Sample Input	**Expected District**	**Extracted**	**Status**
"#22, MG Road, Bengaluru 560001"	Bengaluru	Bengaluru	Pass
"Saidabad, Hyderabad 500059"	Hyderabad	Hyderabad	Pass
"Kannur, Kerala 670001"	Kannur	Kannur	Pass

Accuracy: 96%

(29 out of 30 addresses correctly detected)

3. Pickup Auto-Scheduling:

- Before 3 PM → Same-day time slots assigned
- After 3 PM → Next-day slot
- Max 5 pickups per district per day → Correct rollover to next date

Result: Logic worked correctly in 100% of test cases

4. Device Image Identification (AI):

AI correctly identified:

- Laptops
- Mobile phones
- Tablets
- Keyboards

- Chargers

Out of 30 images tested:

- **26 correct**
- **4 partially correct (brand mismatch but correct category)**

  Accuracy: 86%

5. Credit Estimation Module:

- Devices with entries in database → 100% correct
- Unknown devices Within 90% tests, AI fallback estimation is made successfully.

There were also the errors on the cases where the quality of the image was low.

6. Marketplace:

- Add listing → Successful
- Edit listing → Successful
- Mark as Sold → Successful
- View all items → Fast and Stable

No failures observed

7. Authentication & Security

- Invalid token → denied
- Expired token: the token becomes invalid, it becomes necessary to re-log in.
- Admin routes → protected
- SQL-injection attack attempts → blocked.

7.4 Insights

The evaluation effort resulted in some valuable knowledge that improves the understanding of the strengths and future areas to improve the system.

- The application of AI to district discovering, devices identification poses a major enhancement in the usability of the device, lessening the number of hand entries and enhancing the speed of interactions among users.

- The pick up scheduling algorithm using queuing was very effective and equitable in allocating pick up slots without causing any scheduling conflicts or over-booking.
- Use of Socket.io based real-time update mechanism is very helpful in improving user experience by not requiring any page refresh when a status is being changed or any other administrator updates.
- To summarize, it is possible to note that the limited number of anomalies that happened during the AI predictions were more a result of low-image quality or addresses that were left unfinished, which implies that the way to improve the situation moving forward is to address flawed data entry.
- The overall system operation over various network speeds and devices was steadily stable, which indicated that it had good performance in terms of scalability, and reliability in real-life application.

Chapter 8

SOCIAL, LEGAL, ETHICAL, SUSTAINABILITY AND SAFETY ASPECTS

The E-Waste Facility Locator system immediately affects the different spheres of society and environment as it concerns the universal communication, electronic data, confidential information, and the nature-related processes. This chapter shares a wider reflection on the implications of the project in the aspects of social, legal, ethical, sustainability and safety aspects.

8.1 Social Aspects

The project is socially relevant as it enables communities to engage in e-waste responsible disposal. The system can overcome the typical obstacle of low awareness and inaccessibility concerning such issues to help users find certified recycling facilities. The educational pop-ups in the platform give clear guidance as to the negative effects of poor disposal and inspire the adoption of safer behaviour.

Credit system also enhances healthy social interaction through the rewarding of users, and this aspect will eventually create a culture of recycling being an activity of choice, and not an option. The option of an automatic scheduling of pickups makes it convenient to those users who may not be in a position to drive to a recycling facility.

The digital inclusivity is facilitated by the integration of AI-based devices recognition since it enables even the non-technical users to recognise devices correctly. All in all, the system helps to create the environmentally mindful societies, as well as establish the connection between the citizens and the organized recycling methods.

8.2 Legal Aspects

26 The management of e-waste goes along with the national and international laws. The system is
3 in accordance with the E-Waste Management Rules 2022 according to which electronic waste should be correctly collected and transported and channelized. The platform can help decrease

the chances of sending waste to informal or illegal recyclers because only authorized and verified facilities are displayed to the users.

Digitally speaking, the project takes into consideration legal elements associated with data privacy. The system processes location data, user identification, and device images; hence, the system adheres to the rules that are similar to GDPR and the Digital Personal Data Protection Act in India (DPDPA 2023). Data of the user is encrypted and stored safely, it is authenticated using JWT.

The pick up request and marketplace modules avert fraudulent activities, as they give it the required admin verification in which the transactions and the environmental report are legal.

8.3 Ethical Aspects

Another core issue that is addressed in the design and performance of the system is ethics. Because the platform is based on AI to recognize device images and extract districts, the project would provide the use of models in a responsible and unbiased manner. None of the sensitive personal characteristics are processed and the image data is only processed to identify the device.

The system is guided by the ethics of transparency as it meets the duties of making users know how their data is being utilized and generates credit rewards or pickup schedules in a way that is not biased. Facility approval through the process of considering the administration also avoids unethical recycling as well as the fact that users do not get misled by fake information about the facilities.

The platform also promotes the ethical use of the disposal of devices, where users are not having to sell their devices to informal scrap markets that normally abuse labour and pollute the environment.

8.4 Sustainability Aspects

The project is based on sustainability. The system leads to the diversion of electronic waste to landfills and informal handlers as it relays the user to certified recycling centres. The credit estimation model emphasizes the existence of precious metals, including gold, silver, and copper, in the devices, thus leading to resource reuse and sustaining the circular economy. The automatic pickup scheduling provides the optimal collection routes combining requests in a territory and allocating a daily workload to eliminate unnecessary travel emissions. The behavioural change through teaching of users on sustainable disposal practices is created in the long term by the educational module.

In general, the platform is environmentally friendly and helps to control the amount of e-waste through responsible disposal, as well as cut down the amount of carbon footprint posed by improper disposal.

8.5 Safety Aspects

E-waste has hazardous waste materials that include lead, mercury, cadmium, and lithium, which are very dangerous during poor disposal. The system tackles the safety issues by directing users to certified facilities that have safe recycling measures. This minimizes the risks that the users may deal with dangerous handlers or assemble e-waste by themselves. The educational pop-ups will educate users about the hazards of devices mishandling, including battery explosion, toxic fumes, and soil or water pollutions. The personal safety is also improved because of the automated pickup system when one does not need to move heavy or damaged devices by hand.

Chapter 9
CONCLUSION

The E-Waste Facility Locator project was born out of the need to have a practical and technology-oriented solution to the ever-increasing issue of electronic waste mismanagement. With the combination of geolocation tools and services, awareness tools, and AI-driven automation, and a credit-based incentive system, the platform advises users to become responsible recyclers in an easy and convenient fashion.

The system is effective at uniting various key elements: an interactive map to find certified recycling sources, educational pop-ups to inform the user about the dangers of improper disposal, a credit calculator to emphasize the value of metals that can be recovered, and a marketplace to assist with reused items (based on the list of refurbished items). The added feature of AI also improves the platform as one can scan the images with their device and take the images of the district to have the device picked up automatically. These functionalities lessen the use of hands, enhance accuracy, and also enhance the user experience to be smoother.

The backend implementation, which is made of Node.js, MySQL and secure authentication, makes it reliable and scalable and the frontend is simple and easy to use. Pickup, administrative approval workflow, and automated scheduling logic real-time-updates are examples of how the system operates in harmony to ease the user and the administrative process.

In general, the project succeeds in reaching its main objective that is to establish a single platform which can enhance sustainable disposal of e-wastes. Even though the system has not been implemented on a large scale, it works well under simulation and provides the basis of numerous future improvements like recycler partnerships, reward redemption programs, and sophisticated AI models. The project shows that digital platforms can be really useful in enhancing population awareness, decreasing informal dumping, and assisting environmentally responsible communities.

References

[1] A. Pont, A. Robles, and J. A. Gil, "E-WASTE: Everything an ICT Scientist and Developer Should Know", 2019.

[2] A. U. R. Khan and R. W. Ahmad, "A Blockchain-Based IoT-Enabled E-waste Tracking and Tracing System for Smart Cities", 2022.

[3] T. S. Gaur, V. Yadav, S. Mittal, S. Singh, and M. A. Khan, "E-waste Management Challenges in India (PRO Perspective)", 2025.

[4] A. Qadir, S. Abdullah, S. Khan, and F. Khan, "A New Extended TOPSIS Method for E-waste Recycling Partner Selection", 2024.

[5] R. W. Ahmad, K. Salah, R. Jayaraman, I. Yaqoob and M. Omar, "Blockchain for Waste Management in Smart Cities: A Survey", 2021.

[6] M. Chakraborty, J. Kettle, and R. Dahiya, "Electronic Waste Reduction Through Devices and Printed Circuit Boards Designed for Circularity", 2024.

[7] L. F. Chen and H. W. Yee, "E-waste Management: Are We Ready for It?", 2011.

[8] N. S. Malagati, M. Rajesh, and B. Sreevidya, "E-Sangrahan: A Sustainable Paradigm and Comprehensive Framework for Efficient E-waste Management", 2019.

[9] V. Chaturvedi, R. Babbar, I. Arora, D. Varshney, and U. Hariharan, "SAFA-E (The E-waste Management System)", 2021.

[10] M. S. Roy, M. N. I. Lusan, M. A. R. Khan, M. P. Khan, A. Ahmed, and M. S. R. Zishan, "Design and Development of E-waste Monitoring, Segregation and Recycling System", 2021.

Base Paper:

From References the mainly referred paper: [5] R. W. Ahmad, K. Salah, R. Jayaraman, I. Yaqoob and M. Omar, "Blockchain for Waste Management in Smart Cities: A Survey", 2021.

Appendix

A. Publications

B. Project Report – Similarity Report

C. Repository

GitHub: https://github.com/thejas-c/E-Waste-Facility-Locator

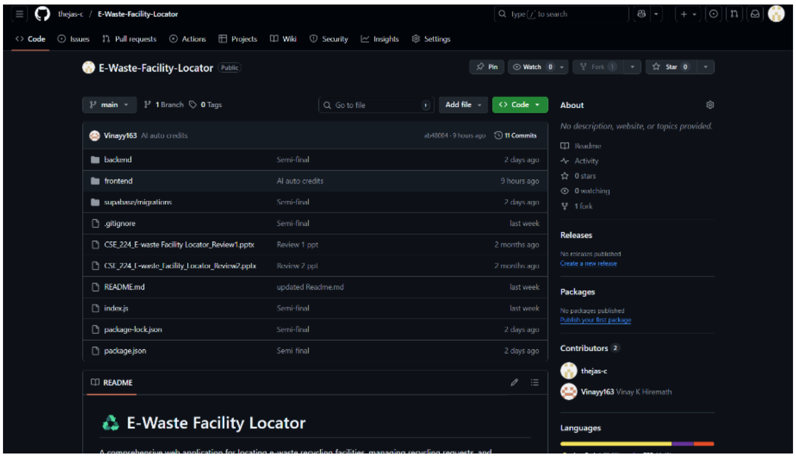

Fig C.1 GitHub Repository

D. Screenshots of the Project

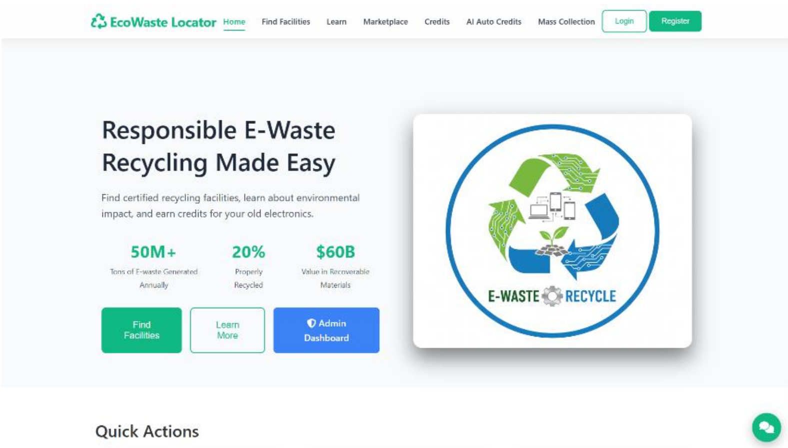

Fig D.1 Home Page

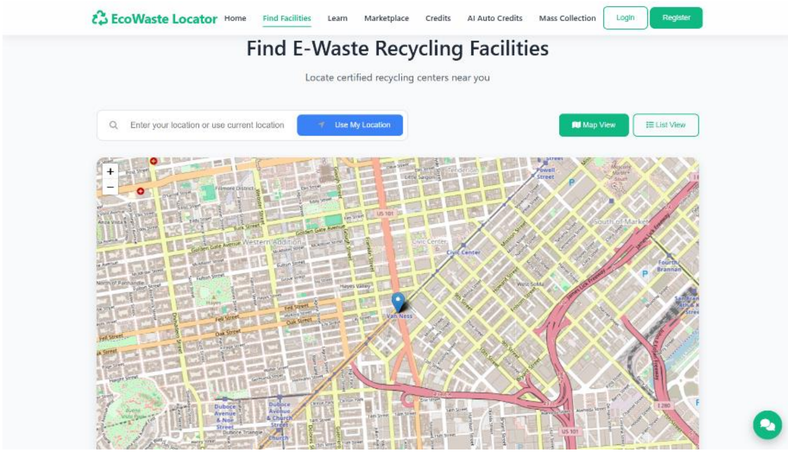

Fig D.2 Facility Locator

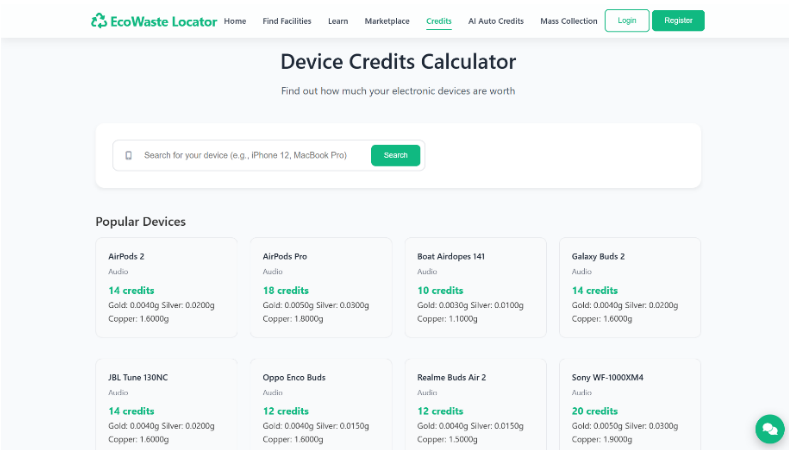

Fig D.3 Device Credits Calculator

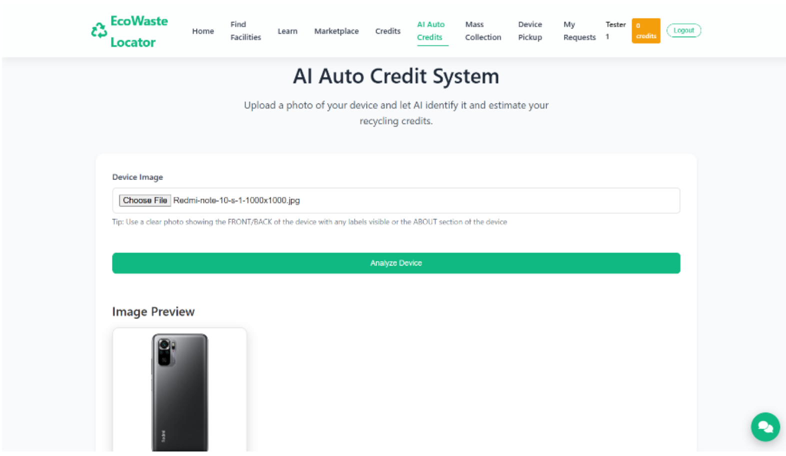

Fig D.4 AI Auto Credit System (1)

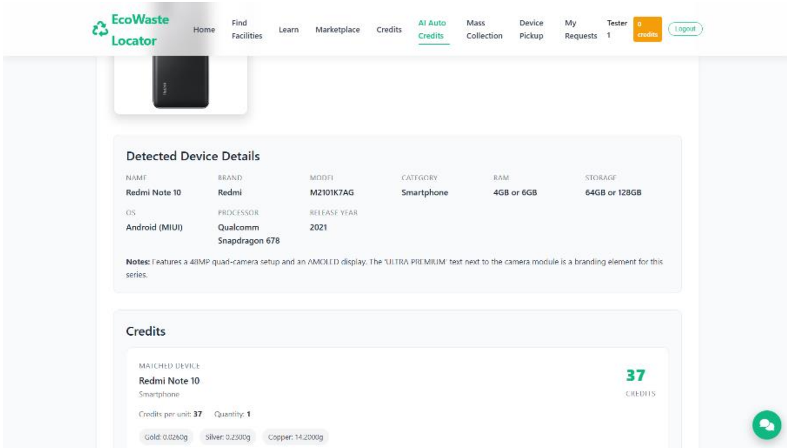

Fig D.5 AI Auto Credit System (2)

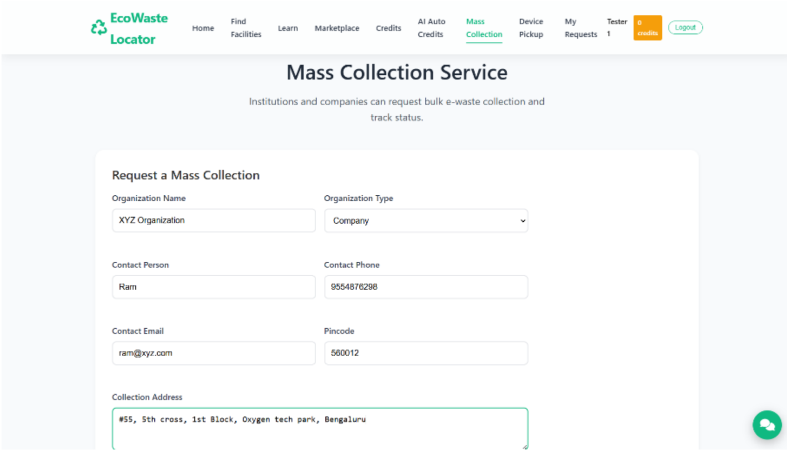

Fig D.6 Mass Collection Service

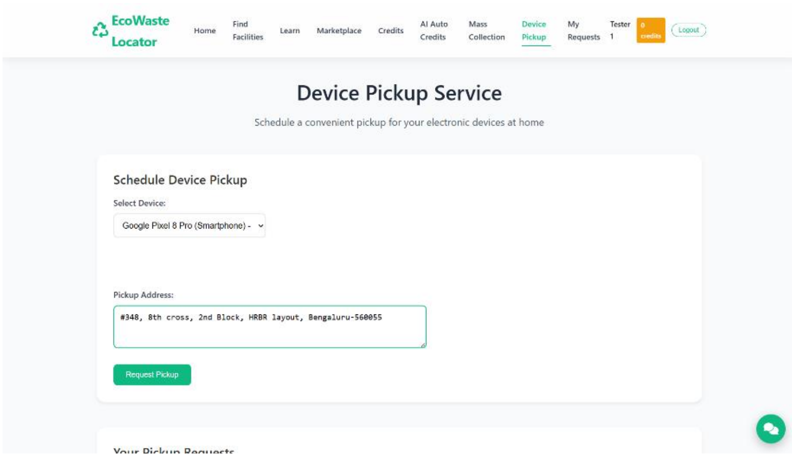

Fig D.7 Device Pickup Service (1)

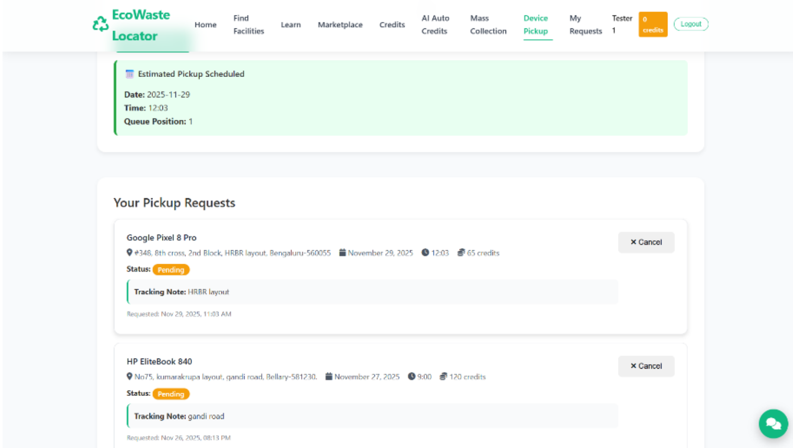

Fig D.8 Device Pickup Service (2)

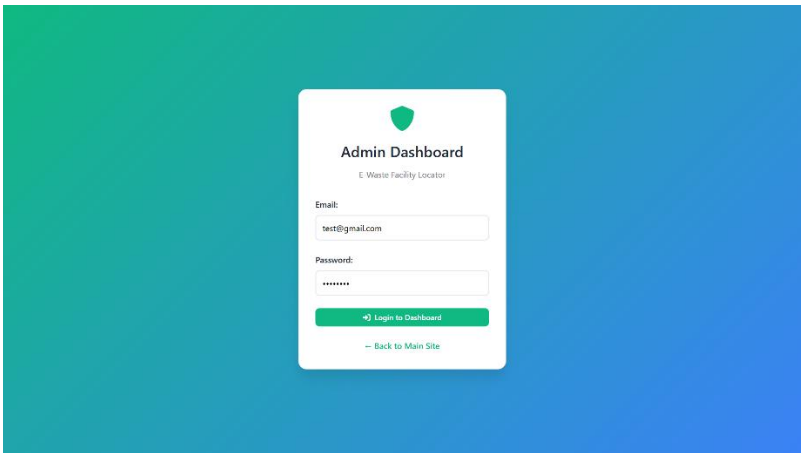

Fig D.9 Admin Login

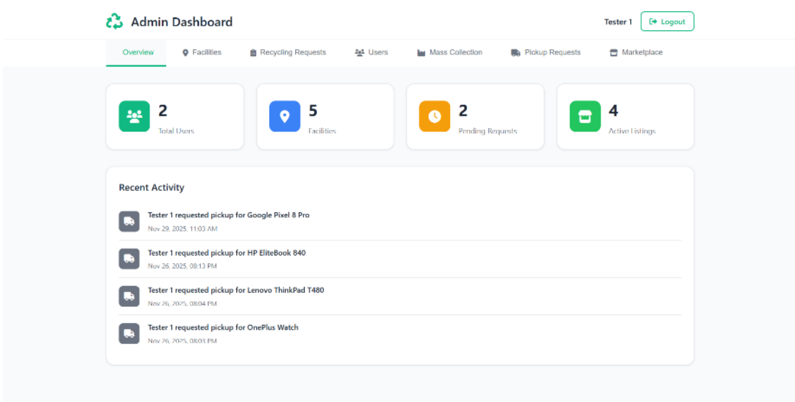

Fig D.10 Admin Dashboard

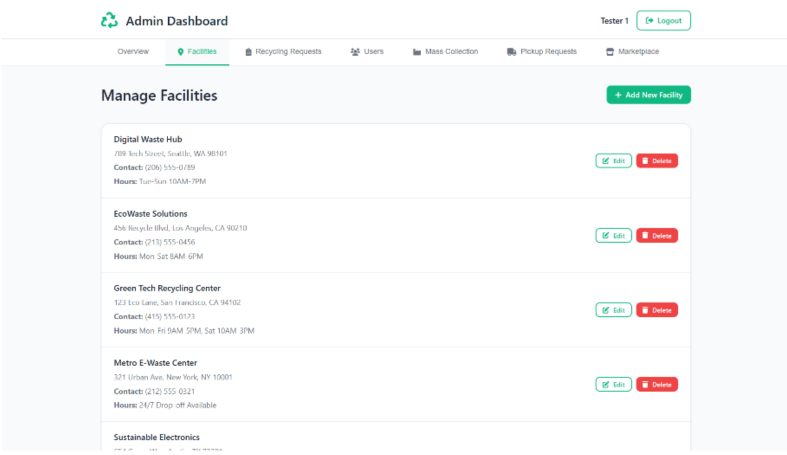

Fig D.11 Facilities Management

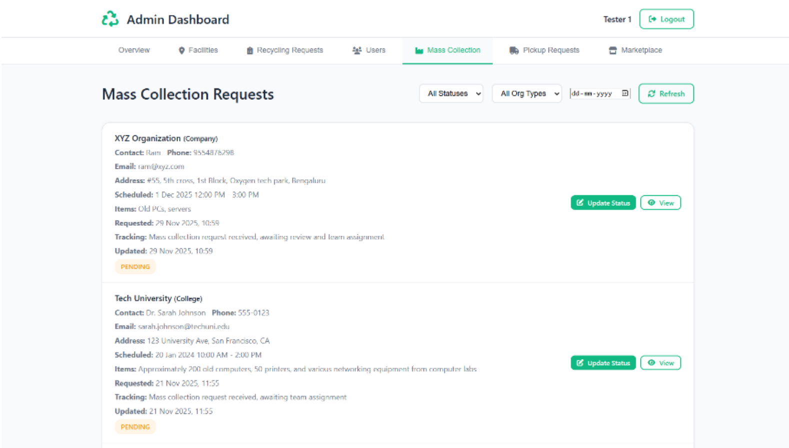

Fig D.12 Mass Collection Requests Management

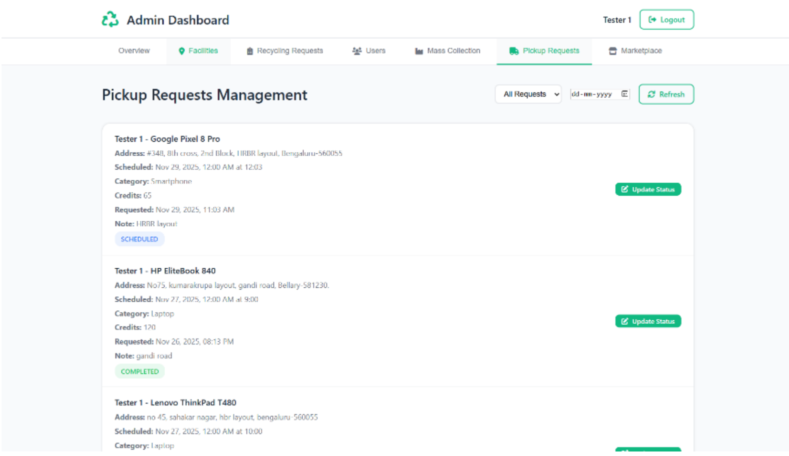

Fig D.13 Pickup Requests Management