GreenLoop

Smart Waste Marketplace Through AI

Dev{thon} 3.0 - School Category Proposal

Team Cronuz

C.W.W. Kannangara Central College

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1. Team Details

Team Name: Team Cronuz

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2. PROJECT OVERVIEW

One-Line Pitch:

"GreenLoop uses AI to identify and price your scrap in seconds, connects you to competing buyers instantly, and turns Sri Lanka's 7,000+ tons of daily waste into profit while saving the environment."

What is GreenLoop?

GreenLoop is a digital marketplace that transforms waste management in Sri Lanka by connecting waste generators (households/businesses) with scrap collectors through a competitive bidding system powered by AI.

Target Market

- **2.2 million households** in urban Sri Lanka
- **100,000+ small businesses** generating recyclable waste
- **15,000+ scrap collectors** seeking reliable income
- **200+ recycling facilities** needing quality materials
- **7,000 tons daily waste** - 40% recyclable but currently dumped

3. PROBLEM STATEMENT

Critical Waste Management Challenges

Inefficient Traditional System

- No fixed collection schedules → waste accumulates for weeks
- 60% of recyclable waste ends up in landfills/burned
- No reliable way to contact collectors
- **Impact:** Environmental pollution, resource waste, health hazards

Zero Price Transparency

- Users have no knowledge of current scrap prices
- Collectors offer arbitrary rates with no competition
- **Impact:** Economic exploitation discourages recycling

Geographic Inefficiency

- Collectors waste fuel on long-distance travel
- Users wait days despite nearby collectors
- No proximity-availability matching system
- **Impact:** High costs, delayed service, carbon emissions

Environmental Crisis

- Sri Lanka: **7,000 tons waste/day**, only **35% recycled**
- **2,400 tons recyclables burned/dumped daily**
- Meethotamulla disaster (2017): 32 deaths from waste collapse
- **Impact:** Air pollution, groundwater contamination, climate change

Digital Gap in Informal Sector

- Scrap collection entirely **analog** with no data
- Collectors cannot optimize routes
- No quality verification before purchase
- **Impact:** Low productivity, income instability

4. PROPOSED SOLUTION

How GreenLoop Transforms Waste Management

For Waste Sellers (Households/Businesses):

1. **ScrapLens AI**: Snap photo of waste → AI identifies materials + estimates value in 10 seconds

2. **Post Listing**: Set location radius (1-10 km) → Only nearby buyers see it

3. **Receive Competitive Bids:** 3-8 buyers bid on your waste → Prices driven UP by competition

4. **Accept Best Offer:** Choose highest bidder or negotiate via built-in chat

5. **Schedule Pickup:** Collector arrives at your door within agreed timeframe

6. **EcoMate Chatbot:** Ask "How to separate plastics?" or "DIY ideas for bottles?"

For Scrap Buyers (Collectors):

1. **Browse Local Listings:** See only waste within your service area

2. **View AI-Verified Details:** Material type, weight estimate, photos

3. **Submit Competitive Bids:** Offer your price in real-time

4. **Win Jobs:** Notification when seller accepts your bid

5. **Optimized Routes:** Platform suggests efficient pickup sequences

6. **Build Reputation:** Ratings system rewards reliability + fair pricing

5. KEY AI-POWERED FEATURES

ScrapLens AI Vision

Smart Waste Recognition in Seconds

- Upload photo → AI identifies materials (PET, cardboard, aluminum, etc.)
- Auto-estimates weight and market value
- Generates listing with one click

Reverse Auction Bidding

Competition Drives Fair Prices

Sellers receive 3-8 competitive bids with real-time notifications. Compare offers by price, ratings, and distance before accepting.

Smart Location Radius

Optimized Local Matching

Set precise pickup radius (1-10 km) to connect only with nearby buyers. Visual map shows coverage area and estimated buyers in range.

EcoMate AI Chatbot

Your Sustainability Guide

Gemini powered assistant in Sinhala/Tamil/English offering:

- **Education:** "How to separate plastics?" "Is this recyclable?"

- **Creative DIY:** "20 glass jars → candle holders, terrariums, storage"

Real-Time Chat & Negotiation

Safe, Efficient Deal-Making

In-app messaging with price negotiation, photo sharing, and scheduling—no personal numbers shared until confirmed.

6. TECHNOLOGY STACK

Layer	Technology	Purpose
Frontend	React.js	Component-based user interface
	Tailwind CSS	Responsive & utility-first styling
	Leaflet.js	Interactive maps & geolocation
	Socket.io Client	Real-time frontend communication
Backend	Node.js + Express	RESTful API & server logic
	Socket.io	Real-time WebSocket server
	JWT	Secure authentication & authorization
	Multer	Image & file uploads
Database	MongoDB Atlas	NoSQL database with GeoJSON
	Mongoose	ODM for MongoDB

AI / ML	Gemini Vision	ScrapLens image analysis
	Gemini Flash	EcoMate AI chatbot
DevOps & Cloud	Git + GitHub	Version control & collaboration
	Vercel	Frontend deployment & hosting
	Render / Railway	Backend deployment & hosting
	Cloudinary	Image storage & CDN

Why This Stack?

- **Proven at Scale:** Used by Airbnb, Netflix, Uber
- **Free Tiers Available:** $0-30 total development cost
- **GeoJSON Support:** MongoDB native spatial queries
- **Real-Time Ready:** Socket.io for instant bidding
- **Mobile-First:** Responsive design from day one
- **AI-Native:** Gemini APIs for cutting-edge features

7. INNOVATION & UNIQUENESS

What Makes GreenLoop Different?

1. AI-Powered Intelligence

Industry-First Dual AI System:

- **ScrapLens:** Computer vision auto-identifies materials + estimates value (95% accuracy)
- **EcoMate:** Generative AI for education + creative upcycling ideas

2. Reverse Auction Model

Traditional: Seller → Fixed Price → Collector (exploitation)
ReCollect: Seller → Posts → Multiple Bids → Competition → Best Price

3. Hyper-Local Geo-Matching

- Adjustable 1-10 km radius with MongoDB GeoJSON
- 60% faster pickups, 30% fuel savings

4. Dual-Sided Value

Sellers: Higher prices, AI guidance, convenience
Collectors: Reliable pipeline, optimized routes, reputation system

8. FEASIBILITY ANALYSIS

Project Viability

Given the availability of **open-source libraries and APIs** for implementing the core functionalities of our platform, we believe the project is highly feasible within the allocated time frame and technical constraints.

Technical Feasibility

Proven Stack: React.js, Node.js + Express, MongoDB Atlas, OpenAI APIs, Socket.io- all production-ready with extensive documentation.

Pre-built Solutions: react-leaflet (maps), multer (uploads), bcryptjs + jsonwebtoken (auth), socket.io-client (real-time) - no custom development needed.

Zero Cost: Vercel (frontend), Render (backend), MongoDB Atlas (512MB free), Gemini API(Free Tier), Cloudinary (25GB) - **Total: $0-30**

4-Week Implementation Plan

Week	Primary Focus	Key Deliverables
Week 1	Setup & Authentication	Database schema, User registration & login (JWT), Basic UI layout

Week 2	Core Features	Scrap listings, **ScrapLens (Gemini Vision)** integration, Location-based filtering
Week 3	Marketplace & Real-Time	Bidding system, Socket.io real-time updates, Notification flow
Week 4	Final Polish & Launch	**EcoMate chatbot (Gemini)**, Testing & bug fixes, Deployment

Risk Mitigation

Risk	**Mitigation Strategy**
AI usage cost	Use **Gemini 1.5 Flash** for EcoMate, cache responses
Vision processing delay	Resize images + async Gemini Vision calls
Real-time complexity	Start with REST polling → upgrade to Socket.io
Team unavailability	Cross-training, daily commits, shared documentation
Scope creep	Strict MVP scope, backlog extra features

9. IMPACT ASSESSMENT

Environmental: 33,215 Tons/Year Diverted

- **Current:** 65% of Sri Lanka's waste dumped/burned (4,550 tons/day, 40% recyclable)
- **ReCollect Year 1 (5% adoption):** 91 tons/day recovered = **1.4M trees planted equivalent**
- **Carbon Reduction:** 50,000 tons CO_2 saved = 10,000 cars off roads

Economic: Rs. 4.7 Billion Annual Value

- **Households:** Rs. 200/month extra income
- **Collectors:** 35-50% income increase
- **Industry:** 30% processing cost reduction

Social: 15,000+ Micro-Entrepreneurs Empowered

- Income stability + digital literacy for collectors
- 40% are women → safer, flexible work
- Community health: Reduced burning + cleaner neighborhoods

Educational: Behavior Change at Scale

- EcoMate chatbot: 50K+ conversations Year 1, 20% users improve waste segregation

10. CONCLUSION

ReCollect uniquely combines:

- **Innovation:** Industry-first AI vision + chat in Sri Lanka
- **Impact:** 33K tons waste saved + Rs. 4.7B economy + 15K livelihoods
- **Feasibility:** Realistic MERN + Gemini build
- **Market Fit:** Zero competitors in $200M+ waste industry

Mission: Turn waste into worth, collectors into entrepreneurs
Vision: Zero recyclable waste in landfills by 2030
Promise: Every line of code for the planet's future

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