



NAI-SWAMS: Nigeria AI-Powered Smart Waste Management System

By: ODT Labs



Dominion Akinrotimi
Olusegun Agagu University of
Science and Technology
081481090693
akinrotimioyin@gmail.com

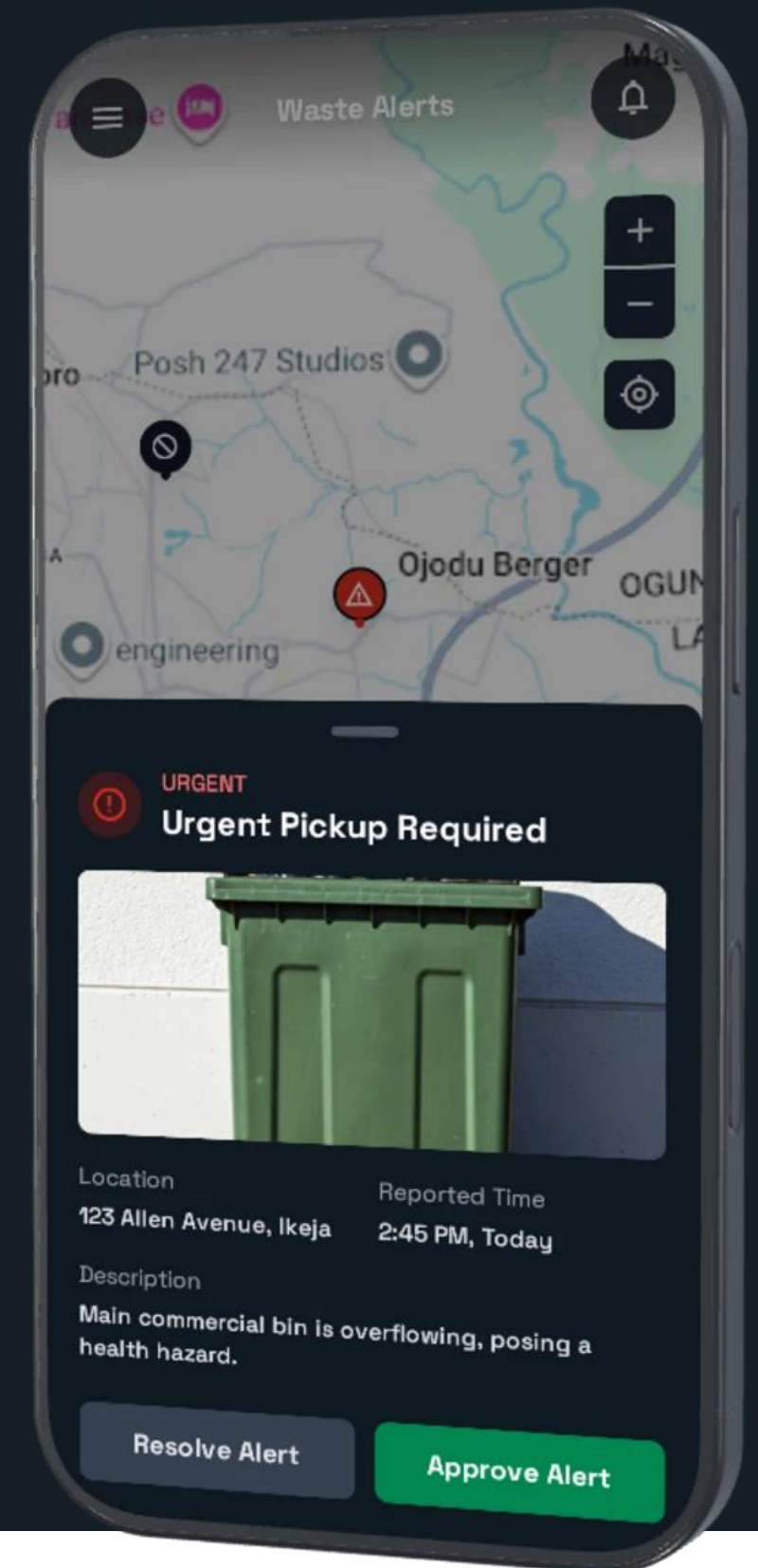


Faluyi Testimony Oluwaduyilemi
Federal University of Technology,
Akure (FUTA)
09033298560
Faluyito@futa.edu.ng



Olorintoba Oluwatoyin Praise
Olusegun Agagu University of Science
and Technology
09047418454
toyin.oloruntoba.work@gmail.com

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The Problem: Inefficient Waste Management

Operational Inefficiencies

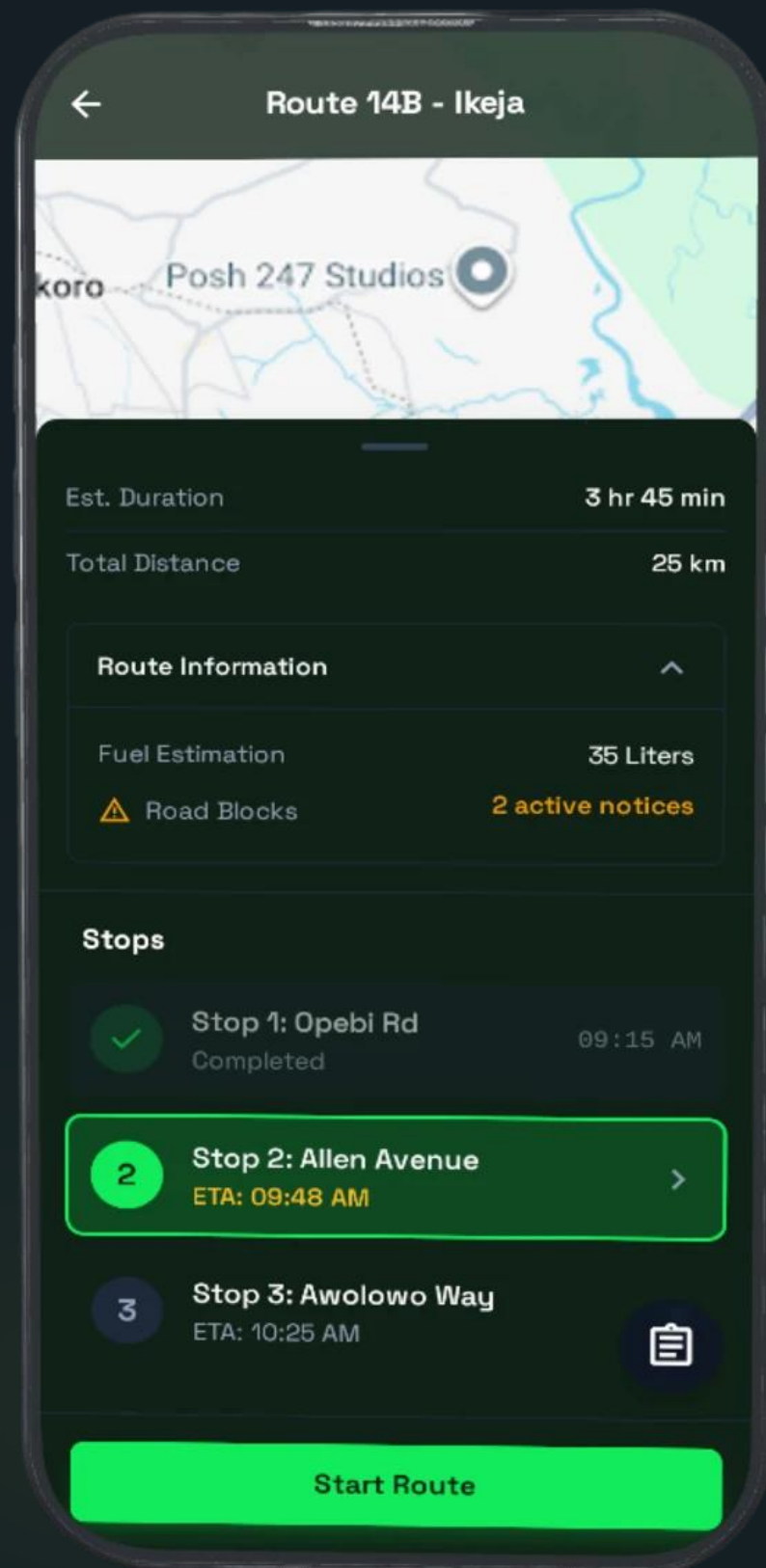
- Waste collection coverage: 40-60% in urban areas [1]
- - Manual planning and route inefficiencies documented in Nigerian municipal systems [2]
- High operational costs affecting service sustainability [3]

The Technology Gap

- Limited data-driven decision making in municipal waste management [4]
- Reactive collection systems prevalent across Nigerian cities [5]

User Challenges

- Waste collection frequency issues reported by Lagos residents [6]
- Operational inefficiencies acknowledged by waste management operators [7]



NAI-SWAMS: **Our Solution**

Key Features (Prototype)

- **AI Waste Prediction**
Forecasts zones needing collection
- **Route Optimization**
Efficient collection path calculation
- **Voice Assistant (Local languages)**
Pidgin, Yoruba, Hausa, Igbo,... for field ops
- **Real-time Dashboard**
Live monitoring & predictions



Accuracy

99.3%



System

Fully functional, testable prototype



Architecture

Complete working AI pipeline

Novel Approaches

- **No Hardware Required**
Uses urban patterns, not sensors
- **Smart AI Decision Making**
Prevents costly errors
- **Human-in-the-Loop**
AI suggests, operators decide
- **Built for Nigeria**
End-to-end functional prototype

Our Vision: From Prototype to Production

1

Current State

- Working AI prototype
- Synthetic data validation
- Solid technical foundation

2

Phase 1 : Real Deployment

(Months 1-3)

- Deploy in Lagos
- Collect real operational data
- Validate AI performance

3

Phase 2: Localization

(Months 4-6)

- Yoruba & Pidgin support
- Mobile-friendly interfaces
- Offline capabilities

4

Phase 3: Decentralization

(Months 7-9)

- Blockchain integration for transparent operations
- Federated learning for privacy
- Token based incentive system

5

Phase 4: Ecosystem Integration

(Months 10-12)

- AI-DSL compatibility
- Multi city management platform
- Regional expansion preparation

Competitive Advantage

Dataset

- 720 records across 8 zones
- Simulated features: traffic, rainfall, day of week, zone types
- Realistic urban patterns for Lagos

Algorithms Implemented

- Random Forest Classifier: Waste prediction
- Nearest Neighbor: Route optimization
- Confidence Band System: Risk management

Architecture

- Backend: FastAPI + SQLite + Scikit-learn
- Frontend: React with leaflet mapping
- Voice: SpeechRecognition + pyttsx3
- APIs: RESTful endpoints

Performance

Prediction accuracy: 99.3%

Response time: <2 seconds

- System: Fully operational E2E



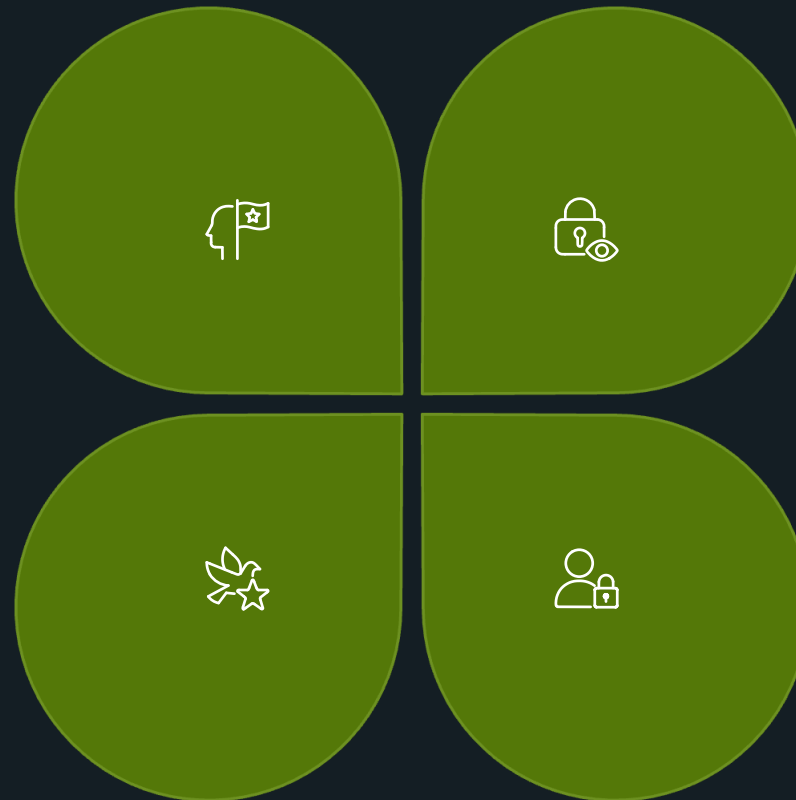
Responsible AI Approach

Bias Mitigation

- Transparent feature importance
- Human oversight
- Confidence bands

Ethical Foundation

- Human-centered design
- Transparency in AI
- Continuous feedback



Data Privacy

- Local processing
- No PII collected
- Future: Decentralized storage

User Adoption

- Voice interface
- Gradual implementation
- Decision support

Technical Reality & Next Steps

1

Current Assets

- Working AI prototype
- Real-time dashboard
- Feedback data collection system
- Route optimization engine
- Task management system
- API documentation

2

Immediate Needs

- Real customer deployment
- Local language integration
- Mobile application
- Production infrastructure

"Deep Funding can help us transform this working prototype into a production-ready decentralized service for Nigerian businesses."

←

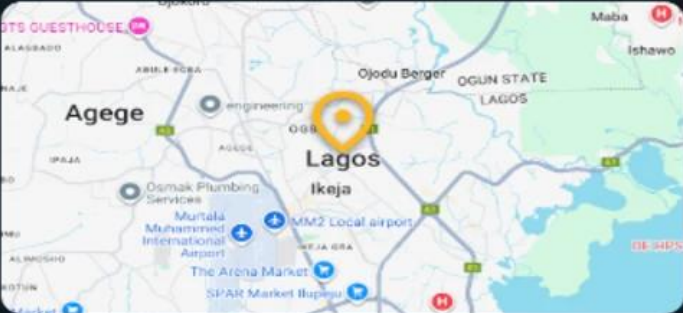
Report a Waste Issue

Issue Type

Overflowing Bin

Location / Zone

Tap the map to pinpoint the location



Description

Provide details about the issue...

Attach Photo(s)

A photo helps us resolve the issue faster.



Contact Information (Optional)

Email or Phone Number

Submit Report



Market Context

Nigerian Waste Management Landscape

Nigeria's rapid urbanization creates unprecedented opportunities for waste management innovation. With 213 million[8] people and a 52% urban population rate[9], the country faces mounting pressure on municipal services.

Lagos, home to 15.4 million residents[10], represents the epicenter of this challenge and our primary market opportunity.

Industry Structure

The Lagos waste ecosystem comprises over 350 registered operators[11] licensed by LAWMA, creating a fragmented but addressable market.

Current collection systems face significant operational inefficiencies, as documented across multiple urban service delivery studies[12]. These challenges create clear opportunities for technology-driven solutions.

Business Model Framework



Software Subscription

Tiered pricing model scaled to fleet size, ensuring accessibility for operators of all sizes while maximizing revenue potential.



Route Optimization Services

Performance-based pricing tied to measurable efficiency gains, aligning our success with customer outcomes.



API Integration

Enterprise-grade connectivity for municipal departments and large operators requiring system-wide coordination.

Addressable Market

Primary focus: Licensed waste operators across Nigerian urban centers, with Lagos as the anchor market.

Secondary opportunity: Municipal waste management departments seeking to modernize service delivery and improve oversight capabilities.



Competitive Differentiation

Technical Approach: Engineered for Nigeria

- Optimized for Nigerian urban patterns
- Native language support
- Hardware-minimal, low CAPEX

Market Positioning: Unrivalled Value

- Cost-effective vs sensor systems
- Built for Nigerian challenges
- Incremental adoption pathway

Funding Requirements

Investment to to accelerate growth and market capture.



Development Resources

Investment in advanced routing algorithms, AI/ML, and platform scalability.



Testing & Validation

Funding for comprehensive pilot programs, data collection, and user feedback.



Deployment & Support

Resources for onboarding, training, and building a robust customer success team.



Operational Costs

Allocation for key team hires, marketing, legal, and administrative overhead.

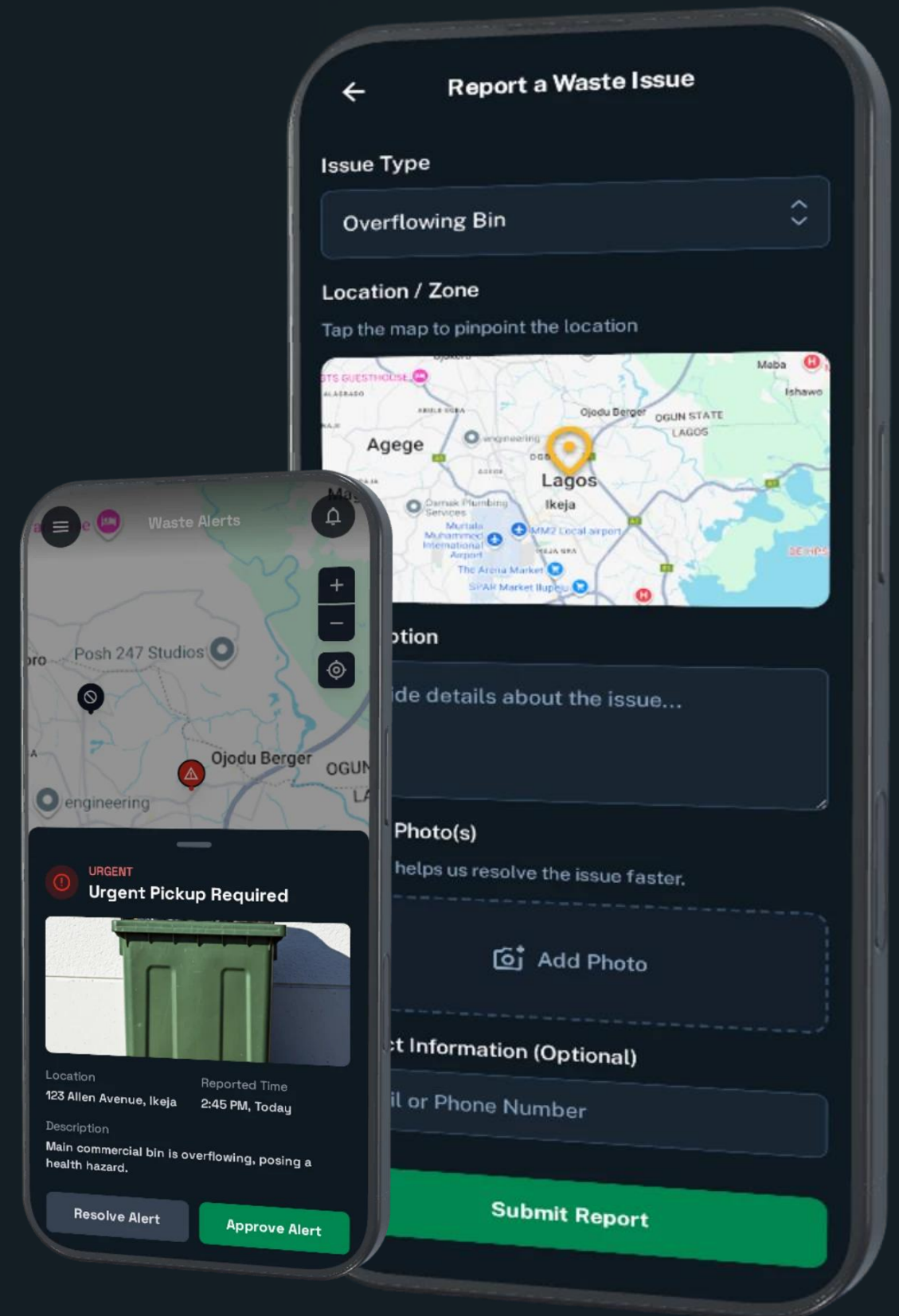
Expected ROI & Returns

Target: 5-7% of Nigeria's \$2B+ waste market within 3 years. Strong exit potential in 5-7 years.

Live Demo: See **NAI-SWAMS** in Action!

Get ready for a 5-minute real demo that showcases our fully functional prototype. We will demonstrate:

- AI Waste Prediction in action
- Optimized route generation
- Interactive dashboard features



Live Demo

NAI-SWAM

Smart Waste Management

Dashboard

Driver View

Assign Routes

Report Incident

Admin Dashboard

Learning Active

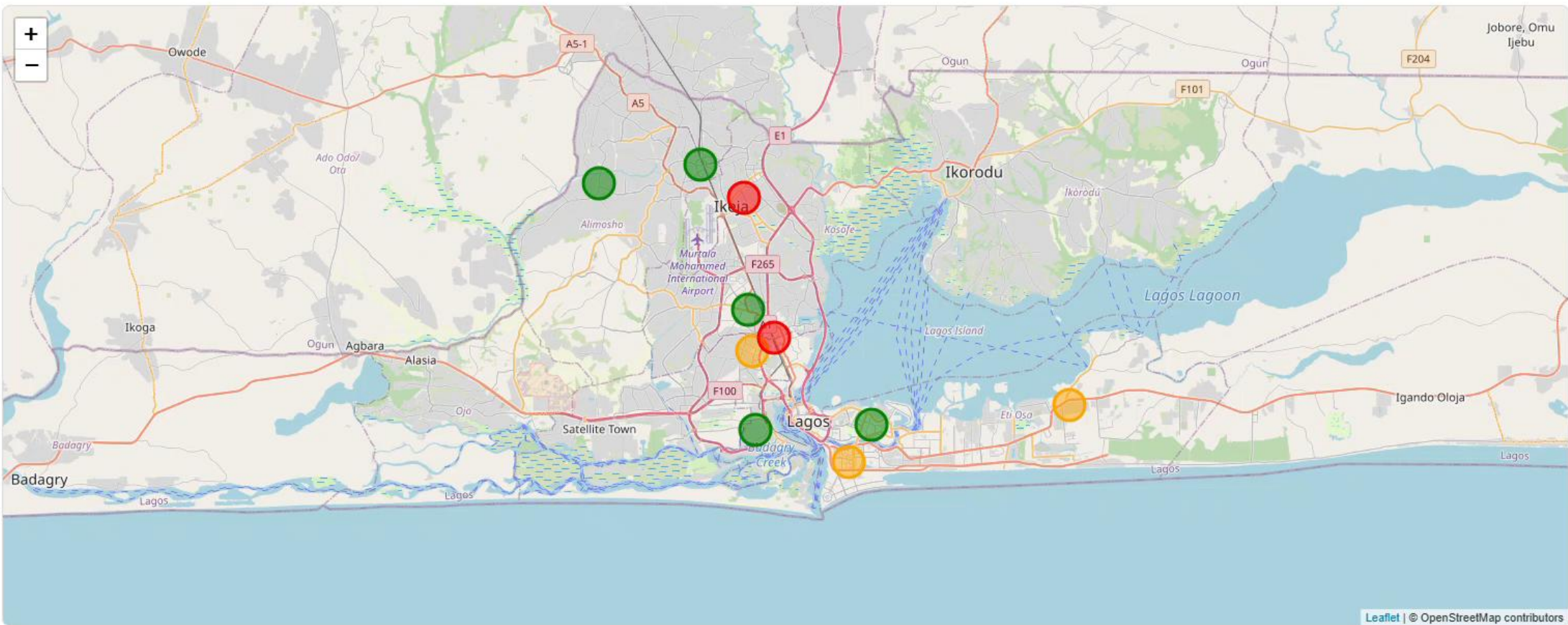
Lagos Waste Map & Route Optimization

Load Predictions

Select Start Location

Optimize Route

Clear Route



Zone Waste Predictions

References

- [1] World Bank (2021). "Solid Waste Management in Nigeria"
- [2] Ogwueleka, T. C. (2009). "Municipal solid waste characteristics and management in Nigeria"
- [3] Nnaji, C. C. (2015). "Status of waste management in Nigeria"
- [4] Adeolu, A. T. (2014). "Solid waste management in urban areas of Nigeria"
- [5] Babayemi, J. O. (2016). "Waste management towards sustainable development in Nigeria"
- [6] Lagos State Waste Management Authority (LAWMA) Annual Reports
- [7] Nigerian Federal Ministry of Environment waste management assessments
- [8] World Population Review (2023). "Nigeria Population 2023"
- [9] United Nations (2018). "World Urbanization Prospects"
- [10] Lagos State Government (2022). "Lagos Population Estimates"
- [11] Lagos State Waste Management Authority (2023). "Registered Operator Database"
- [12] African Development Bank (2020). "Urban Development in Nigeria"

Thank You!

Questions & Discussion

contact: **Dominion Alinrotimi**
Email: **akinrotimioyin@gmail.com**
Phone: **08148190693**

Transforming Nigeria's waste management through accessible
AI technology

