

Smart Waste Management System

Employing IoT, AI, and Real-Time Control- because Smarter Cities Begin with Smarter Waste

Powered by:





Agenda

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- ☐ Background challenges
- ☐ Vision for a smarter municipality

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- ☐ Key features

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- ☐ Benefits for each stakeholders

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- ☐ Case Studies with real success

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- ☐ Implementation plan
- ☐ Certifications



Chapter 1

Introduction

- ☐ Background challenges
- ☐ Vision for a smarter municipality

The Ground Reality of Waste Collection

Let's admit it — current practices struggle with inefficiencies like missed pickups, unplanned routes, and poor operational visibility. These gaps don't just affect city cleanliness, but also impact citizen satisfaction, fuel usage, and workforce efficiency.



No Route Planning

Random pickups lead to missed spots, fuel waste, and confused drivers.



Bin Overflows

Overflowing bins = public eyesores + hygiene risks + citizen outrage.



Missed Pickups

Without tracking, there's no guarantee all bins were actually emptied.



No Vehicle Tracking

Once the truck leaves the depot, it's anyone's guess where it goes.

Every bin, every trip, every day — do you know what's really happening on the ground?



Poor Worker Safety & Hygiene

Random Field workers operate without protective insights or health safeguards.



Manual Data Reporting

Paper logs and verbal updates = delays, errors, and zero transparency.



Citizen Complaints

When garbage stays, complaints pile up. So do social media posts.



Night Collection? No Visibility!

After dark, there's no visibility of actual operations—only guesswork.

The Bongo IoT Vision

**"We don't just digitize
— we optimize."**

**We equip governments, contractors, and citizens
with real-time control**

- 1** End-to-End Visibility
- 2** Optimize Resources, Maximize Efficiency
- 3** Lead the Clean City Rankings
- 4** Turn Waste into Revenue
- 5** Build Public Trust Through Transparency

The background of the slide is a photograph of a city street scene. A white waste management truck is parked on the street, with its rear compartment open. A worker in a high-visibility vest is walking towards the truck. In the foreground, there are several blue recycling bins. The background features a modern building with large windows and a sign that reads "MUNICIPALITY". The scene is set in a city with other buildings visible in the distance.

Chapter 2

Solution Details

- ❑ System overview
- ❑ Key features

An All-in-One Smart Waste Ecosystem – Built for Every Stakeholder



Role-Based Intelligence – One Platform + 3 Applications

A smart dashboard and mobile app for every role – empowering admins, field workers, surveyors, and citizens with real-time control and clarity.



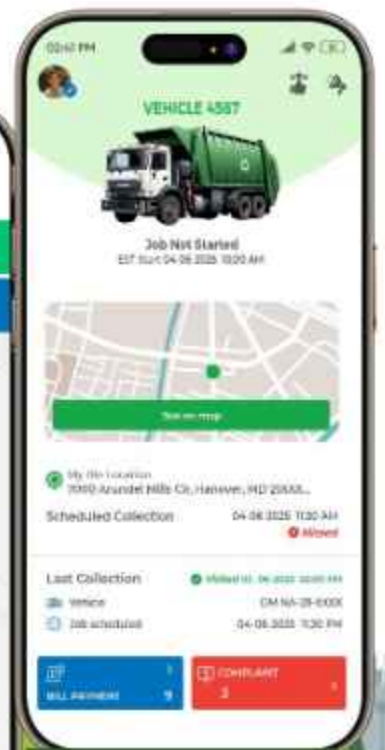
Intelligent Dashboard



Surveyor App



Collector App



Citizen App



The Smart Waste Collection Workflow

01



Job				
13	2	7	9	31
Assuming	In progress	Completed	Needs	Time
Search				
Job				Vehicle
Job 1	Completed - Manual	23	2	UPN 1573200
Job 2	Completed - Manual	15	0	6271555 2300
Job 3	Running - On line	18	0	6271555 2300
Job 4	Running - On line	16	2	6271555 1304
Job 5	Failed - On line	22	0	UPN 5574200

Assign waste collection points using SMARTWaste app

02



Get notified when your crew Misses or Delays a collection

03



A task is said to be complete only when all collection points along a route have been visited

04



Get proof of task completion using photos, QR codes, & RFID

05



Keep track of collected waste & easily Know when quantities are lesser than usual

06



Connect with residents & be the first to react to their complaints

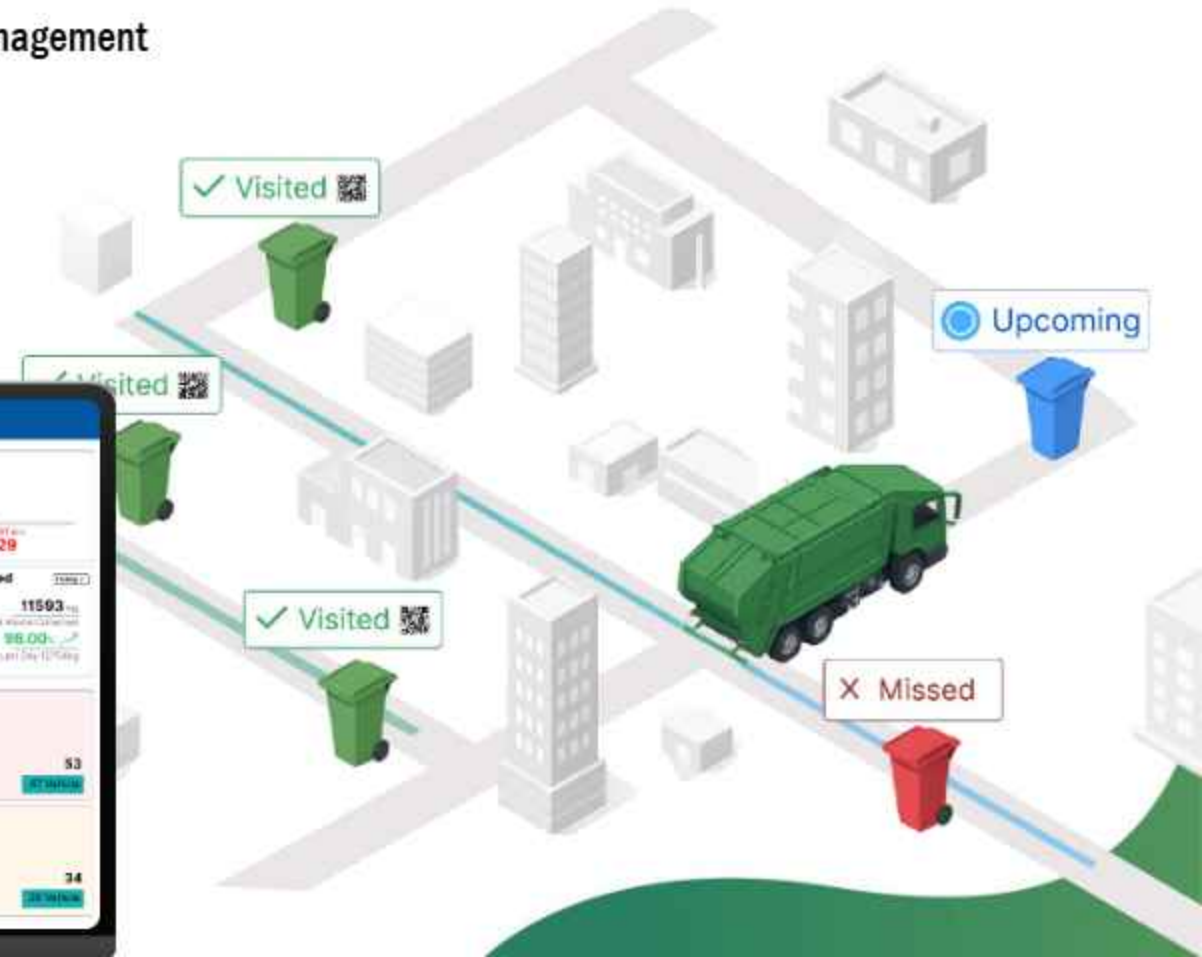
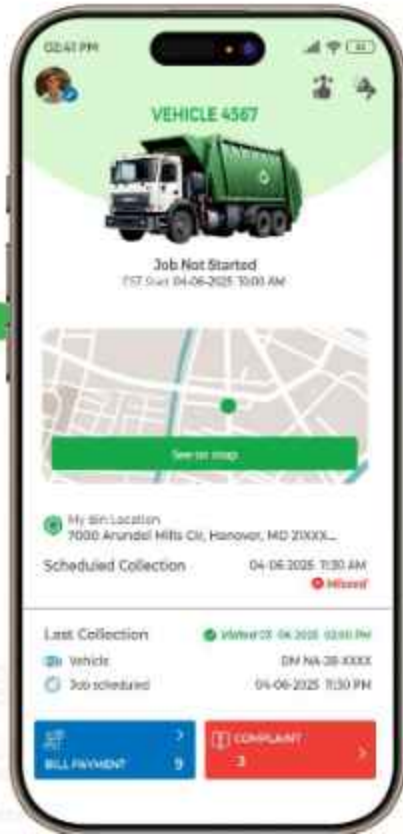


What's For Municipality Waste Admin?

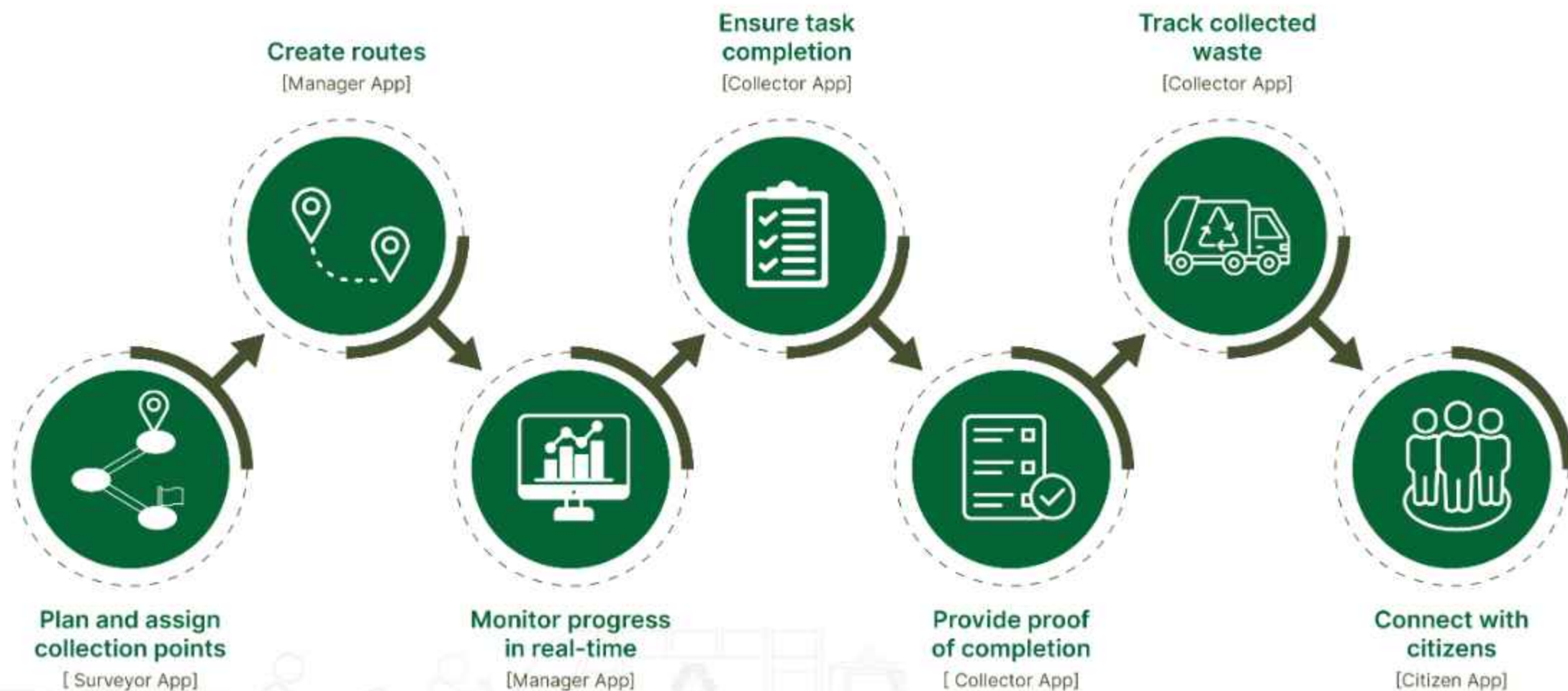


End-to-End Visibility. Total Control.

- Live Operational Dashboard
- Field Force Tracking
- Zone & Route Management
- Bins & Dumping Site Monitoring
- Contractor Monitoring
- Citizen Complaint Management
- + And More...



Municipality Admin Guide – Step-by-Step



See what "more than just simple tracking" feels like!

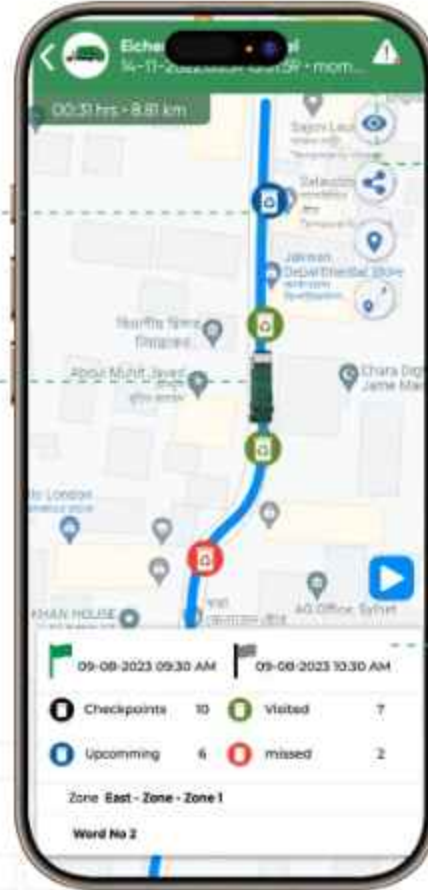
We put ourselves in your shoes and wondered: "What do admins want?" We know staying up-to-date with waste collection jobs is important. We also know you'd like to see how well your employees & fleets are working. So, we got it all on a single screen!



Red, Blue, & Green dustbin icons indicate missed, in-progress, & completed jobs



Stay updated with live vehicle status and location
You can also playback past collection routes



See the timing and type of alert occurrences along the route



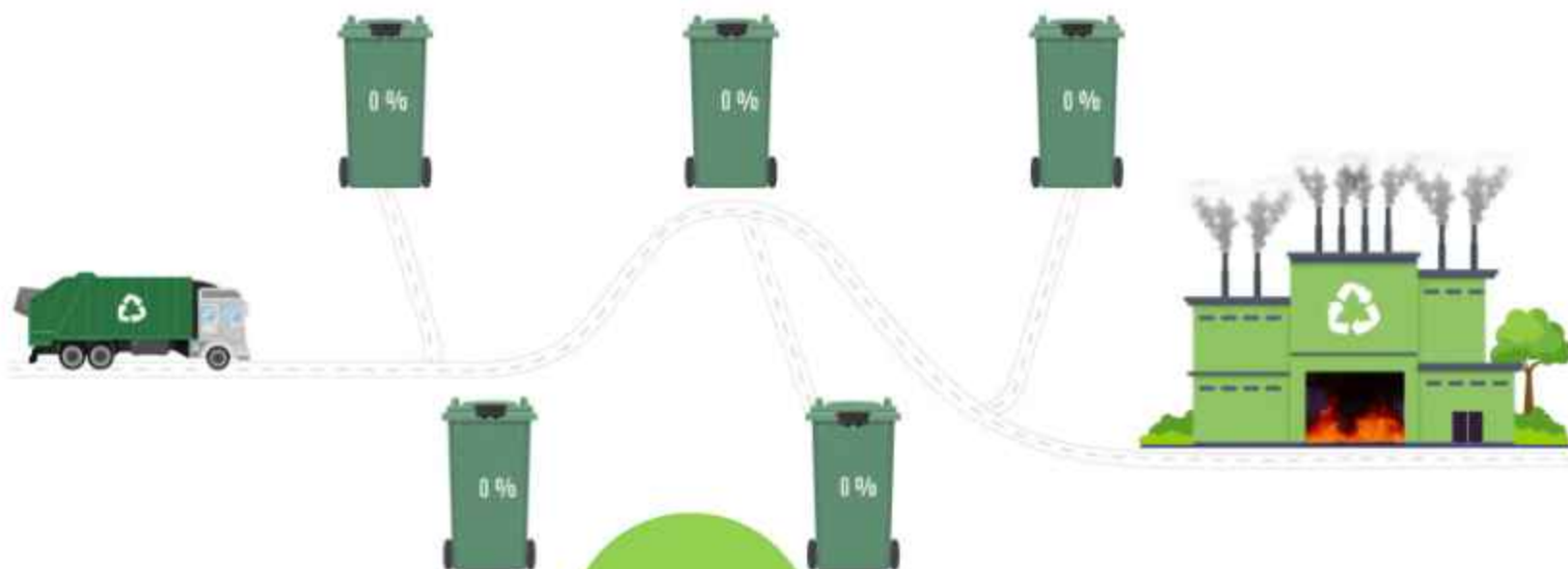
Review the time of collection. Compare permissible halt times with actual ones



Every Bin. Every Route. Fully Tracked.

No more guesswork. Our system ensures every waste pickup job follows an optimized, sensor-driven route — saving time, fuel, and effort. Municipality admins can track every bin, every vehicle, and every move — in real time.

- Dynamic Route Optimization
- Live Job Tracking
- Real-Time Updates
- Missed Bins & Route Deviation Alerts
- Trip Reports & Job Logs



Play Video

Video Link: <https://tinyurl.com/Smart-RoutingX>

Smart Geo Fencing for Field Force & Vehicles

Custom Geofence Creation

Define zones by area, ward, or route

Real-Time Geofence Alerts

Get notified on entry, exit, or violation

Route Deviation Detection

Track missed bins or route diversion instantly

Field Force Movement Logs

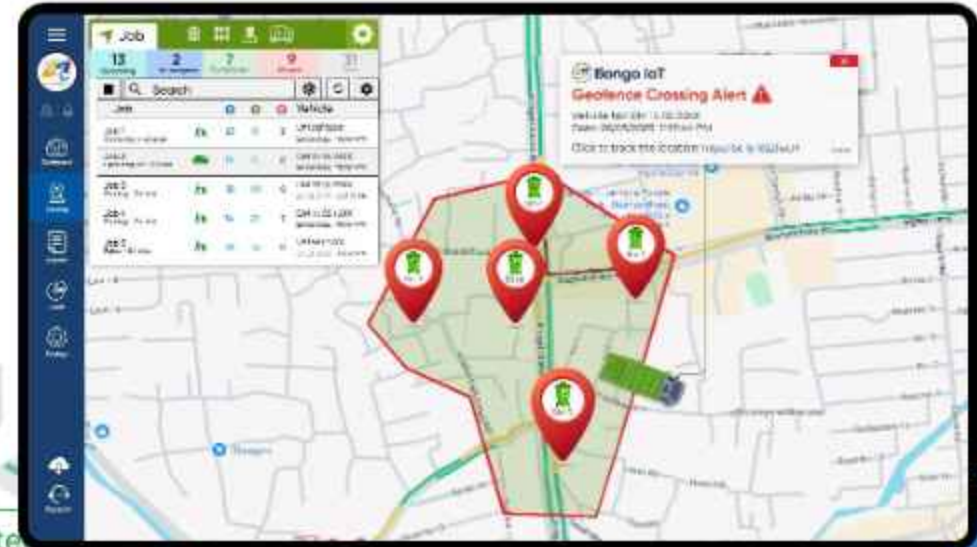
Monitor who entered which zone and when

Visit Verification with QR & RFID

Confirm bin visits with digital proof

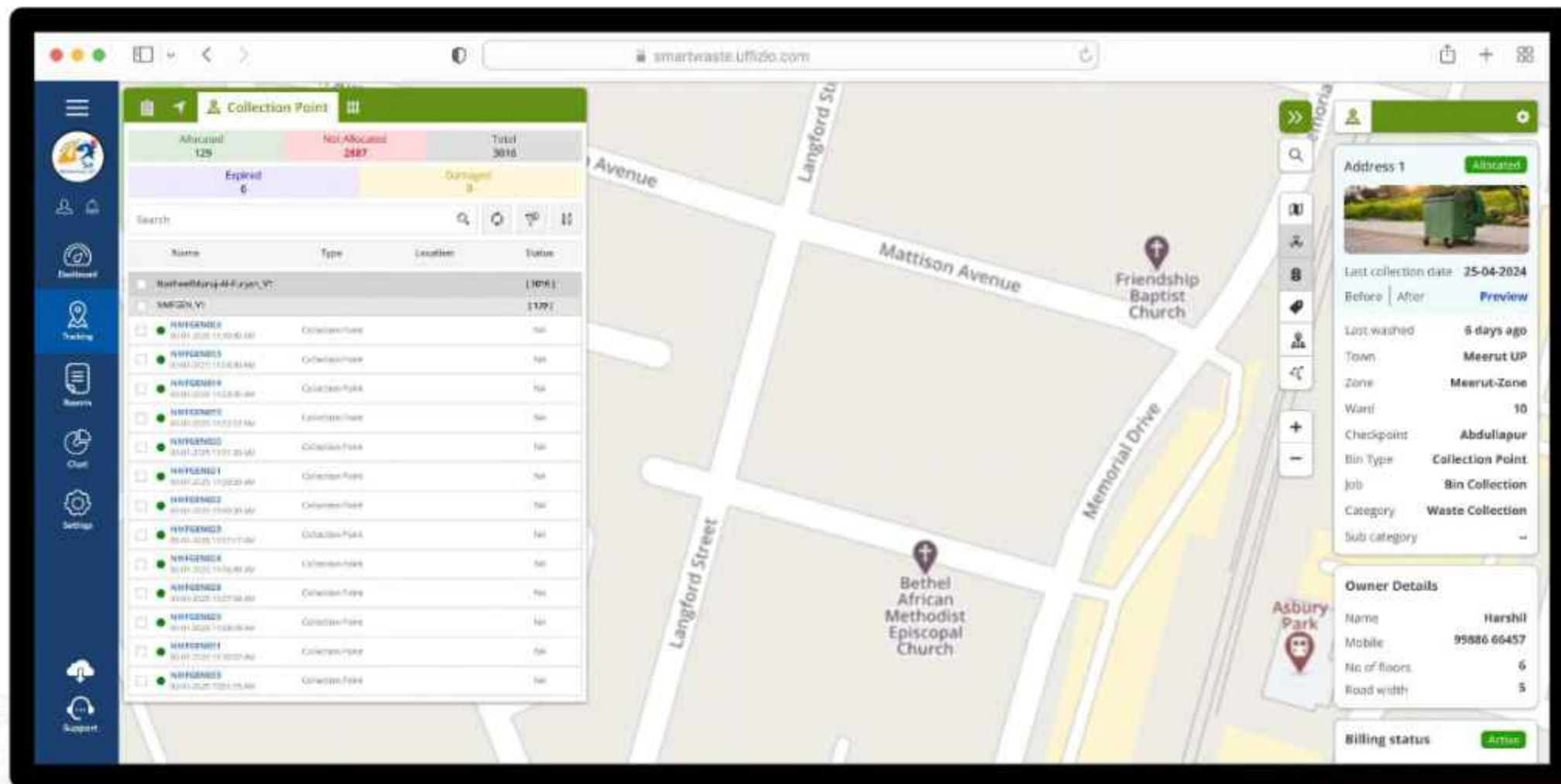
Zone-Wise Performance Reports

Analyze task completion by location



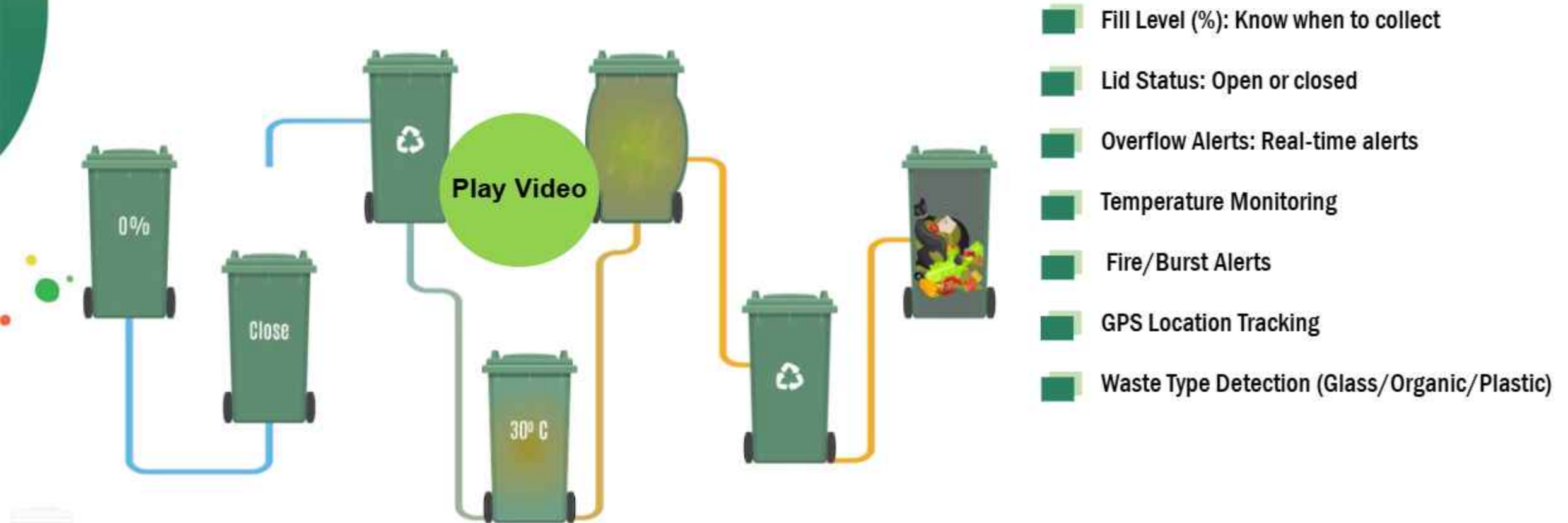
Smart Bin Module

Bin module provides managers with a detailed view of bin-related operations, offering insights into their lifecycle, condition, and usage. It ensures effective management of bins across different tasks.



Smart Bin Monitoring

Municipality-owned waste bins are valuable public assets. By integrating IoT sensors, admins can remotely monitor bin health, usage, and safety – ensuring timely collection, reducing overflow, and enhancing public hygiene.



Video Link: <https://tinyurl.com/BinModule>

Next-Gen IoT Connectivity for Smart Waste

Seamlessly track every bin and vehicle in real time using latest communication technologies. Whether in dense urban environments or remote areas—our system ensures reliable, scalable, and low-power connectivity for uninterrupted waste operations.

LoRaWAN

Ideal for long-range, low-power data transmission from remote waste bins.

NB-IoT

Reliable connectivity in dense urban environments with deep indoor coverage.

Cat-M

Supports mobile assets like garbage trucks for real-time tracking and data sync.

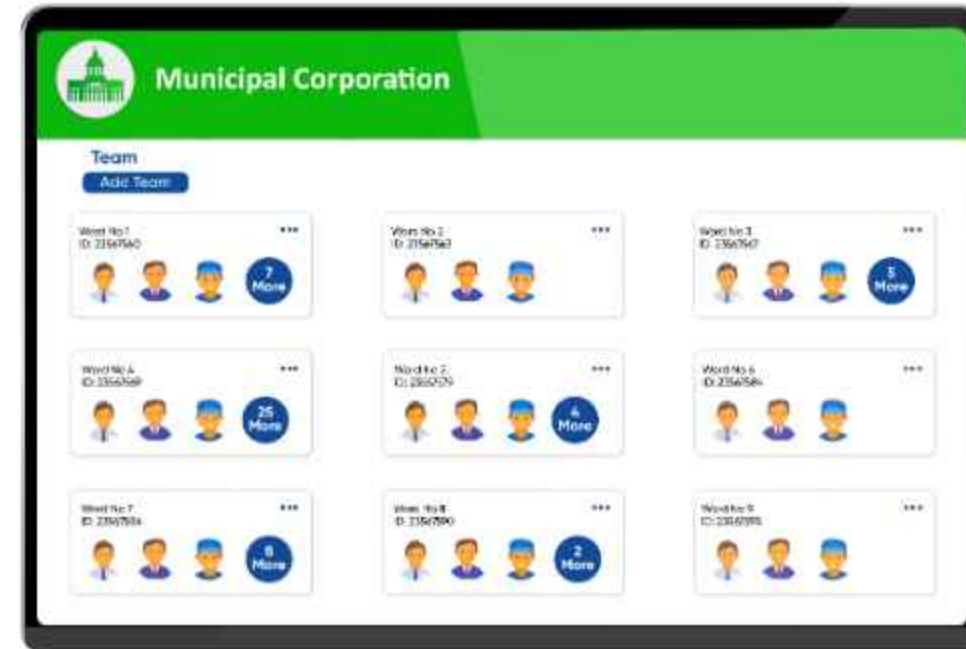
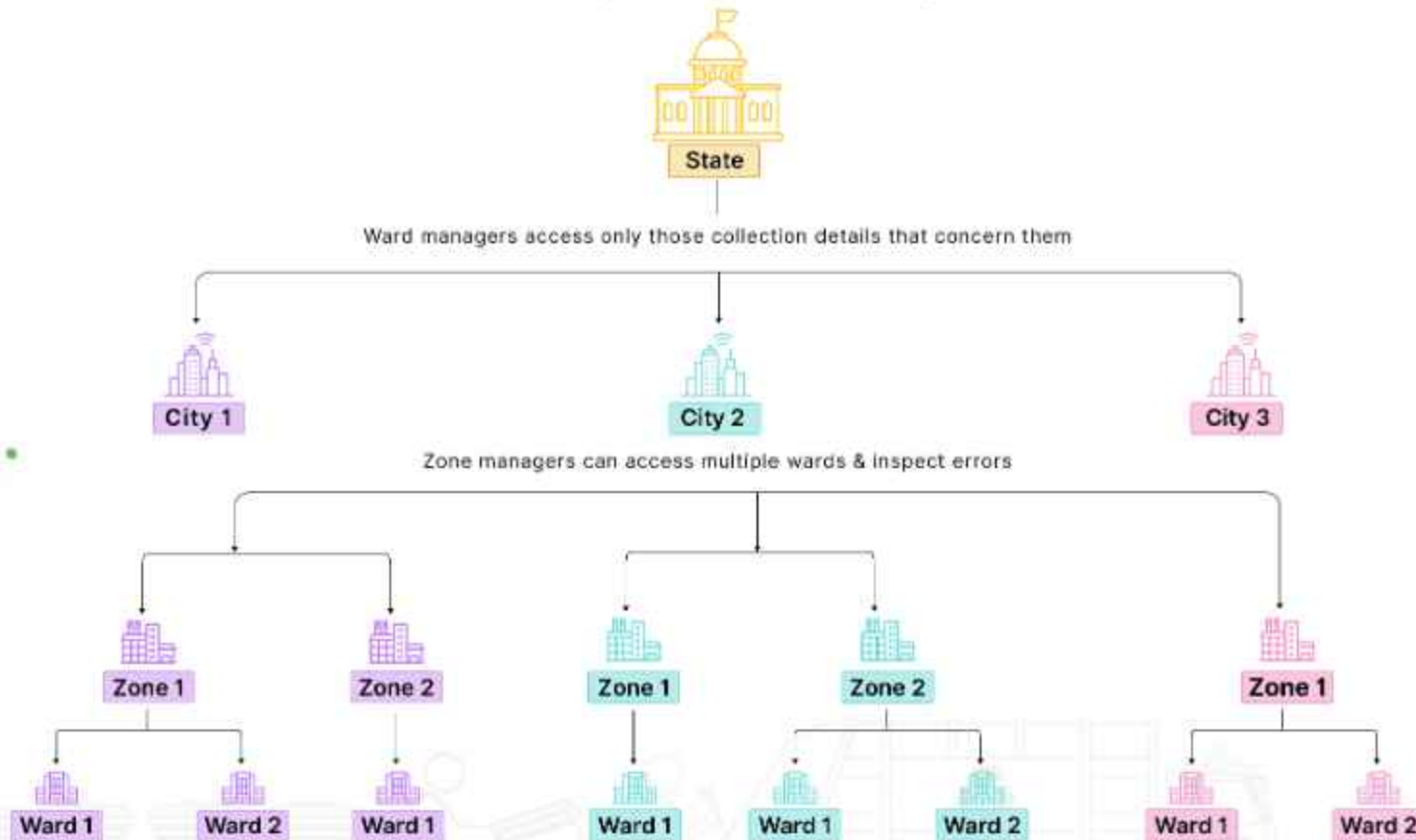
IoT Platform

Unified dashboard integrating all devices for centralized monitoring and control.



Access tailored by zone, role, and responsibility — from admin to field staff.

Different scope of visibility for different managers



Smarter Management- Contractors & Their Teams

Track, evaluate, and empower your contractors with real-time data — turning every contract into a performance-driven partnership.



See work efficiency, KPIs & performance scores



Catch up with alerts and task violations



Monitor revenue collection



Proof of service with geo-tagging

+ And More!



Powerful & Customizable Reporting Engine

Our platform equips municipal admins with hundreds of ready-to-use reports and the flexibility to design custom reports tailored to specific operational, compliance, or strategic needs.



Job Summary



Complaint Summary



Trip & Route Analysis



Checkpoint Reports

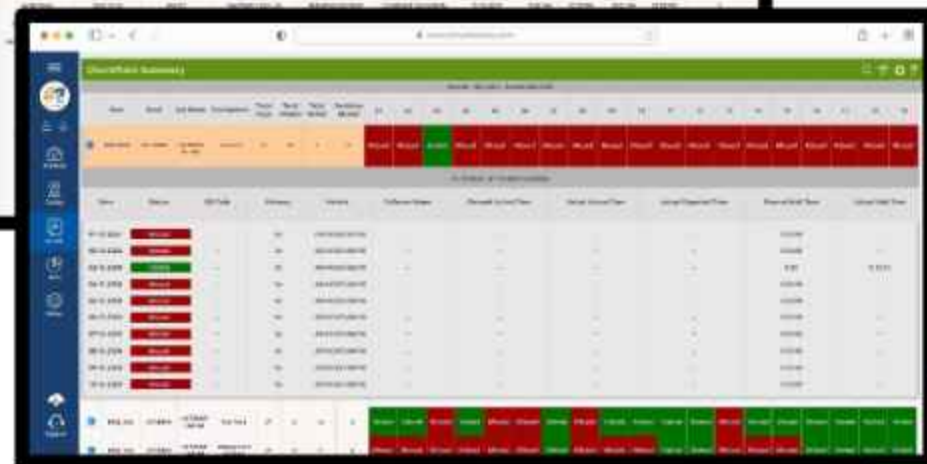


Coverage Reports



Custom KPIs

+ And More!



What's For Waste Contractors?



A Smart System Built for Contractors Too

Contractors aren't just part of the system – they operate smarter with it. With dedicated dashboards and mobile apps, contractors get real-time control over their fleet, field force, and revenue – ensuring cleaner streets and stronger performance.

-  **Dedicated Contractor Dashboard –**
Role-based access to routes, vehicles, and field status
-  **Mobile App for Field Teams –**
Track and guide drivers, cleaners, and supervisors
-  **Live Route Monitoring –**
Ensure collection is done properly, with proof
-  **Revenue Tools –**
Track billing, penalties, and incentives tied to service



Contractor Capabilities That Drive Results

Contractors aren't just part of the system — they operate smarter with it. With dedicated dashboards and mobile apps, contractors get real-time control over their fleet, field force, and revenue — ensuring cleaner streets and stronger performance.



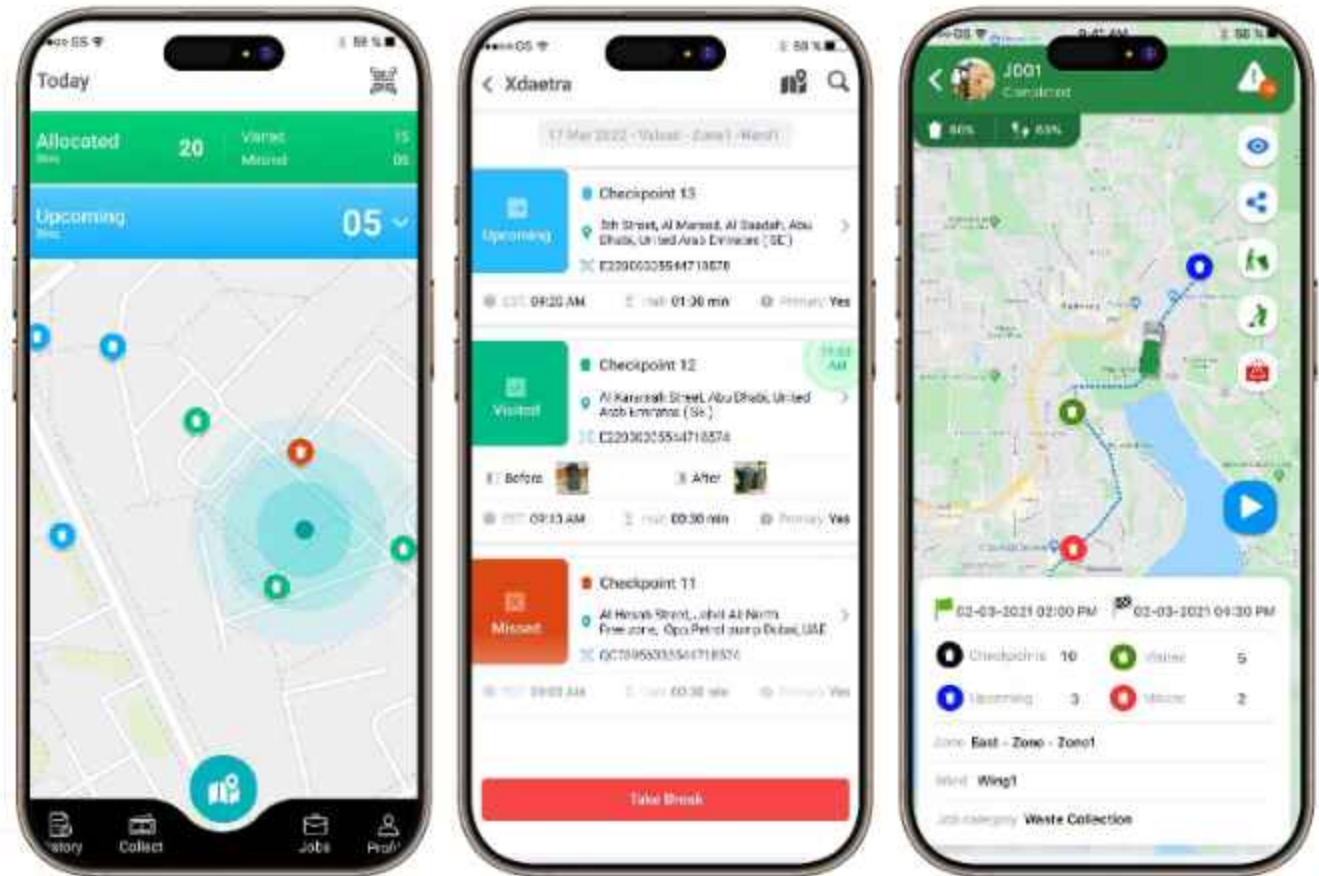
What's For Field Force?



Enabling the Field Force – Smart & Action-Driven

The mobile app equips waste collectors with real-time visibility, job clarity, and easy reporting – turning every field worker into a data-driven executor.

-  **View Daily Assigned Jobs –**
Instantly access today's pickup route and checkpoints
-  **Live Navigation & Smart Routing –**
Get guided path to each bin location
-  **Photo Proof – Before & After Collection –**
Upload bin images for accountability
-  **Incident Reporting (SOS / Issue Log) –**
Report blocked access, bin fire, or overflow instantly
-  **Live Job Status Update**
Mark bins as visited, missed, or delayed in real time
-  **Performance View (Self Stats)**
Track daily progress, completion rate, and missed tasks



Proof of Services

Before/After image upload feature ensures better accountability by allowing collectors to upload pictures of bins before and after the collection process. This helps maintain service quality and transparency.

1 Start the journey to the next checkpoint



2 Reach the checkpoint and capture a 'Before' photo



3 Scan the bin to check in and complete the task



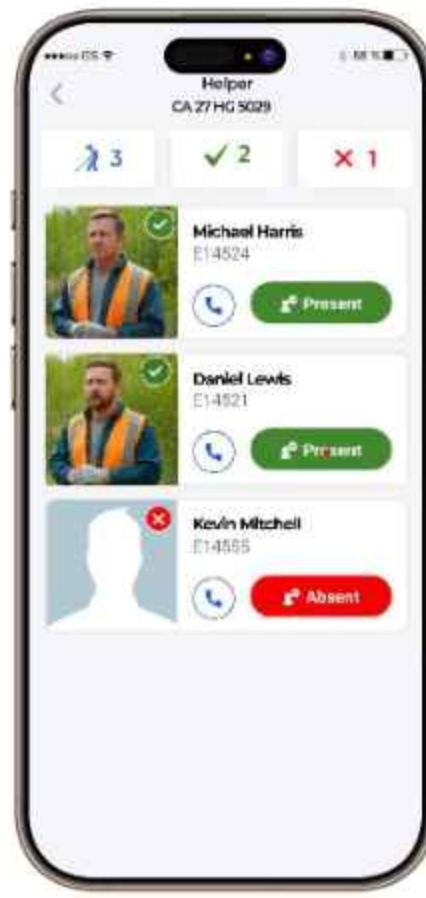
4 Collect waste and take an 'After' photo as proof of completion



Smart Helper Management

Track, assign, and manage field helpers with ease. Our Helper Management feature gives supervisors complete visibility into team participation, presence, and performance — ensuring accountability and seamless execution on the ground.

- Assign Helpers to Specific Jobs & Routes
- Track Attendance (Present/Absent Status)
- Live Monitoring of Helper Activity
- Helper-Wise Performance Metrics
- Seamless Coordination Between Drivers & Helpers



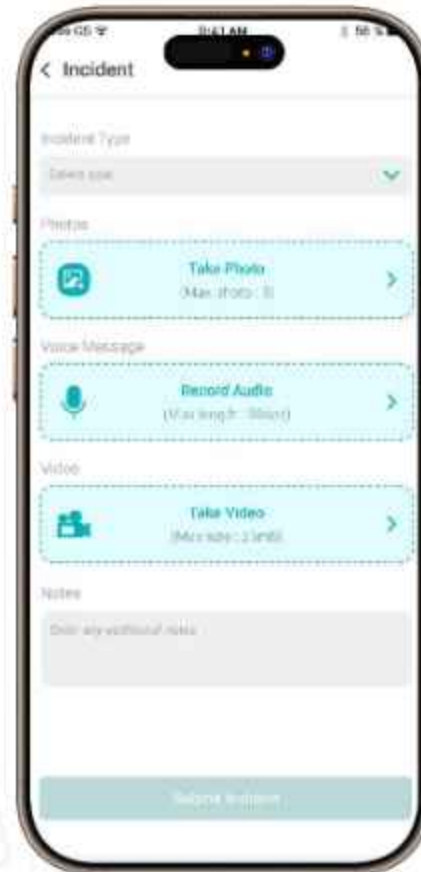
Incident Reporting Made Easy & Instant

Empower your field force to report real-time issues with just a few taps. Whether it's an overflowing bin, blocked access, or route hazards — incidents are logged with photo, audio, and video inputs, ensuring swift action and uninterrupted operations.

1 Select Incident Type from the App



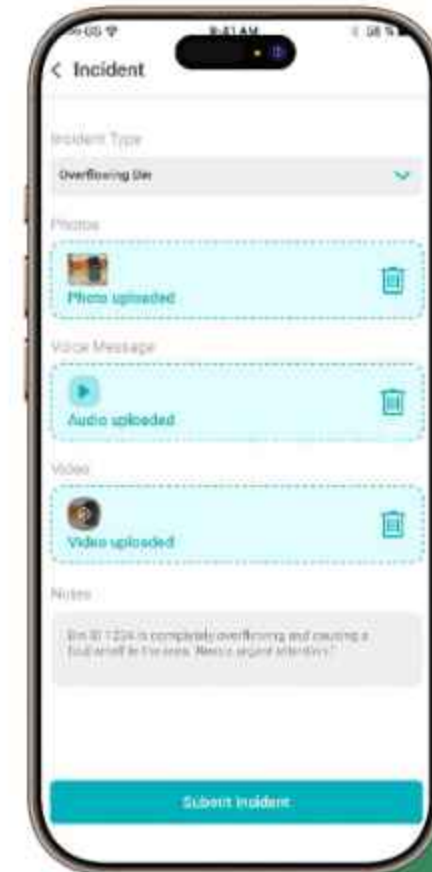
2 Capture Evidence in Real-Time



3 Submit Complete Incident Report



4 Track & Close the Loop



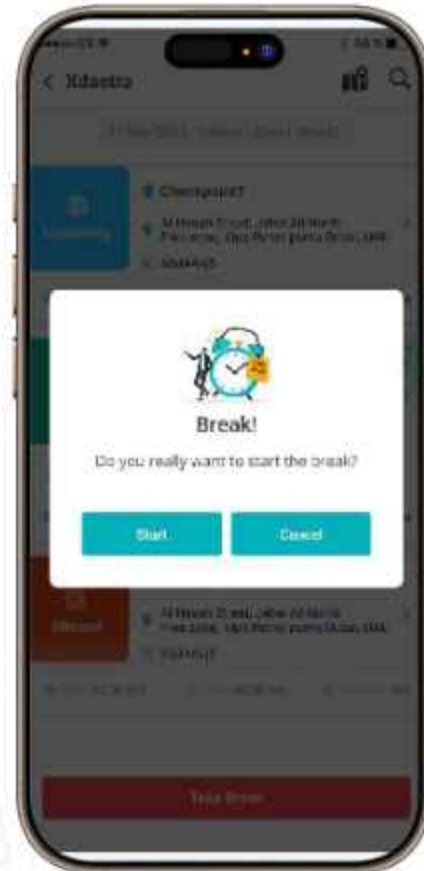
Smart Break Management

Allow waste collectors to take timely breaks without disrupting operations. Our break management ensures accountability, proper time tracking, and seamless coordination between field teams and supervisors.

1 Tap 'Take Break' directly from the app



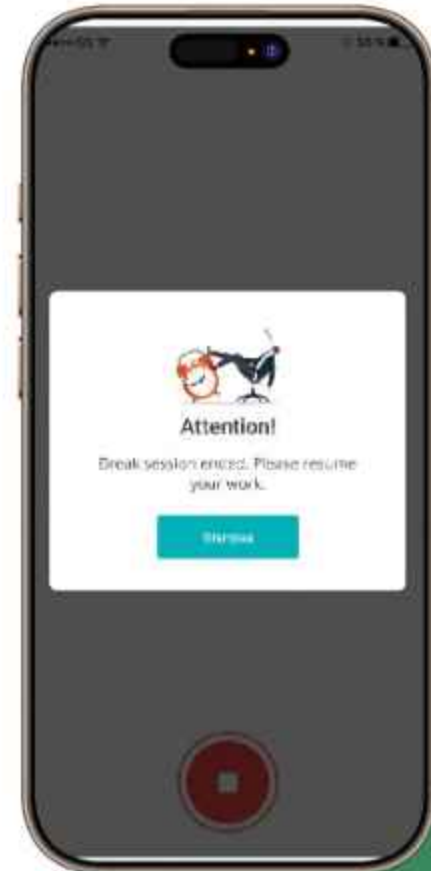
2 Countdown timer to track remaining break time



3 Break end alert (sound, vibration, pop-up)



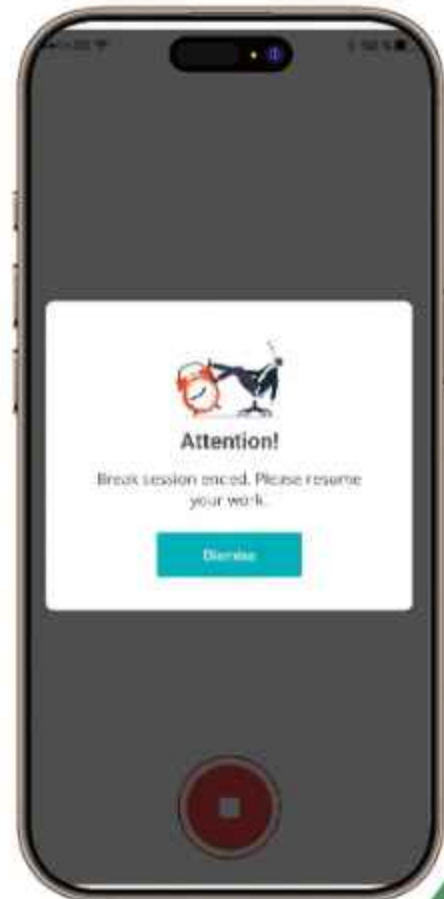
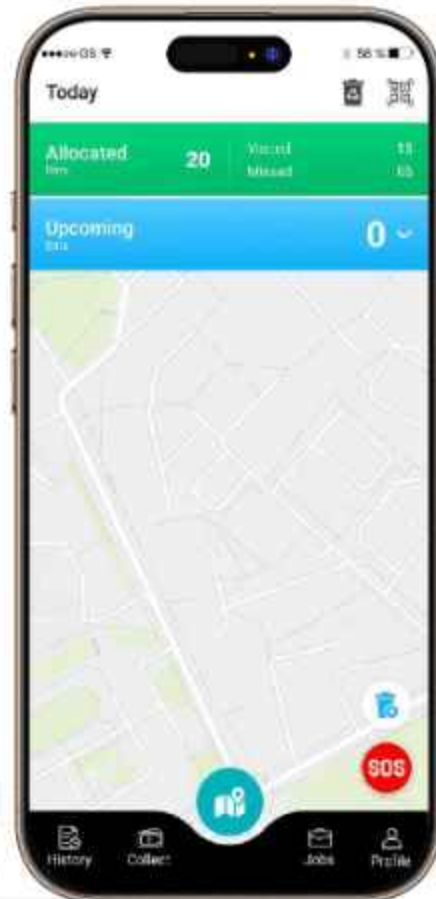
4 Break status tracking with duration and time



Instant SOS Alerts for Collector Safety

Protecting your field force in every emergency. The SOS feature empowers waste collectors to immediately raise alerts in critical situations. With one tap, they can notify the right teams, ensuring real-time response and swift assistance.

- Instant Emergency Alert**
One-tap SOS button to notify relevant teams.
- Real-Time Communication**
Enables live tracking and direct contact.
- Quick Resolution**
Accelerates field response and emergency handling.



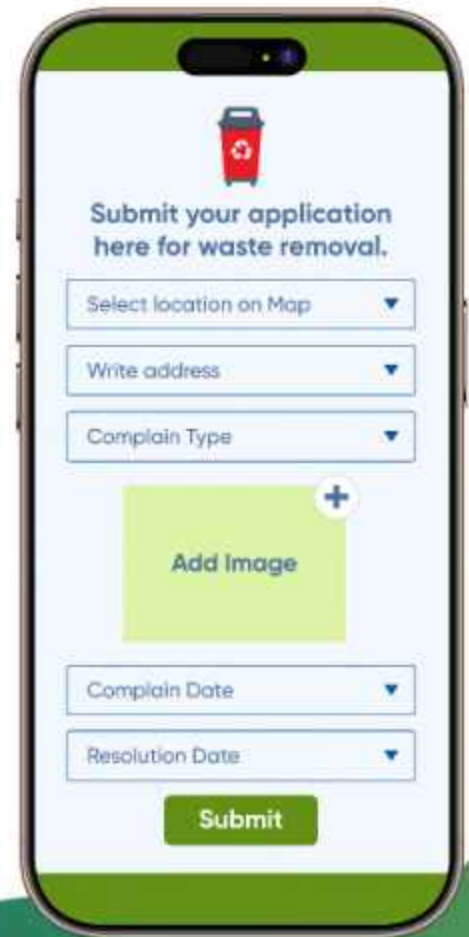
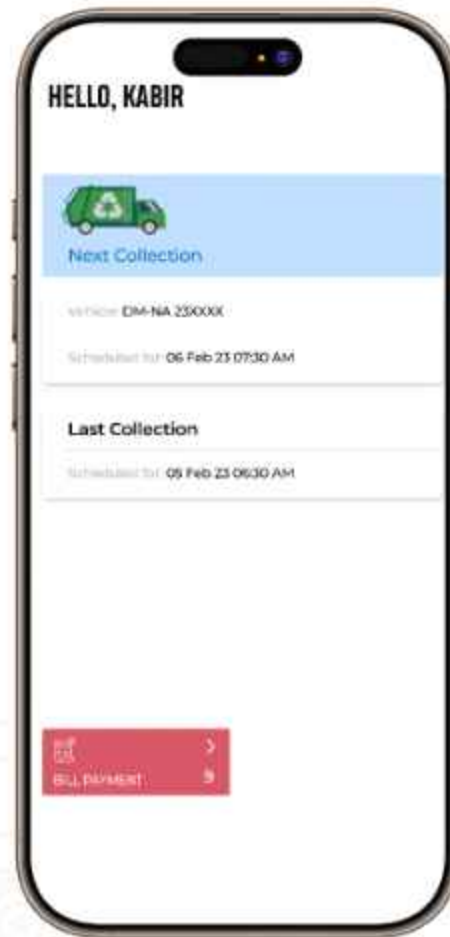
What's For Citizens?



Empowering Citizens to Be a Part of Clean City Mission

The Citizen App connects end-users with waste departments in real time — enabling transparency, service feedback, and cleaner communities.

- Track bin pickup schedules & vehicle location
- Submit complaints with photo & GPS tag
- View collection history & status
- Close the feedback loop with real-time updates



All-In-One Dashboard for Citizen Awareness

From tracking complaints to paying bills — the Citizen Engagement Dashboard puts everything in your pocket. Stay informed, take action, and be part of a cleaner community.

Track Every Complaint:

Know what's open, what's closed, and what's been resolved.

Get Feedback from the Municipality:

No more guessing if your voice was heard.

Pay Waste Bills Seamlessly:

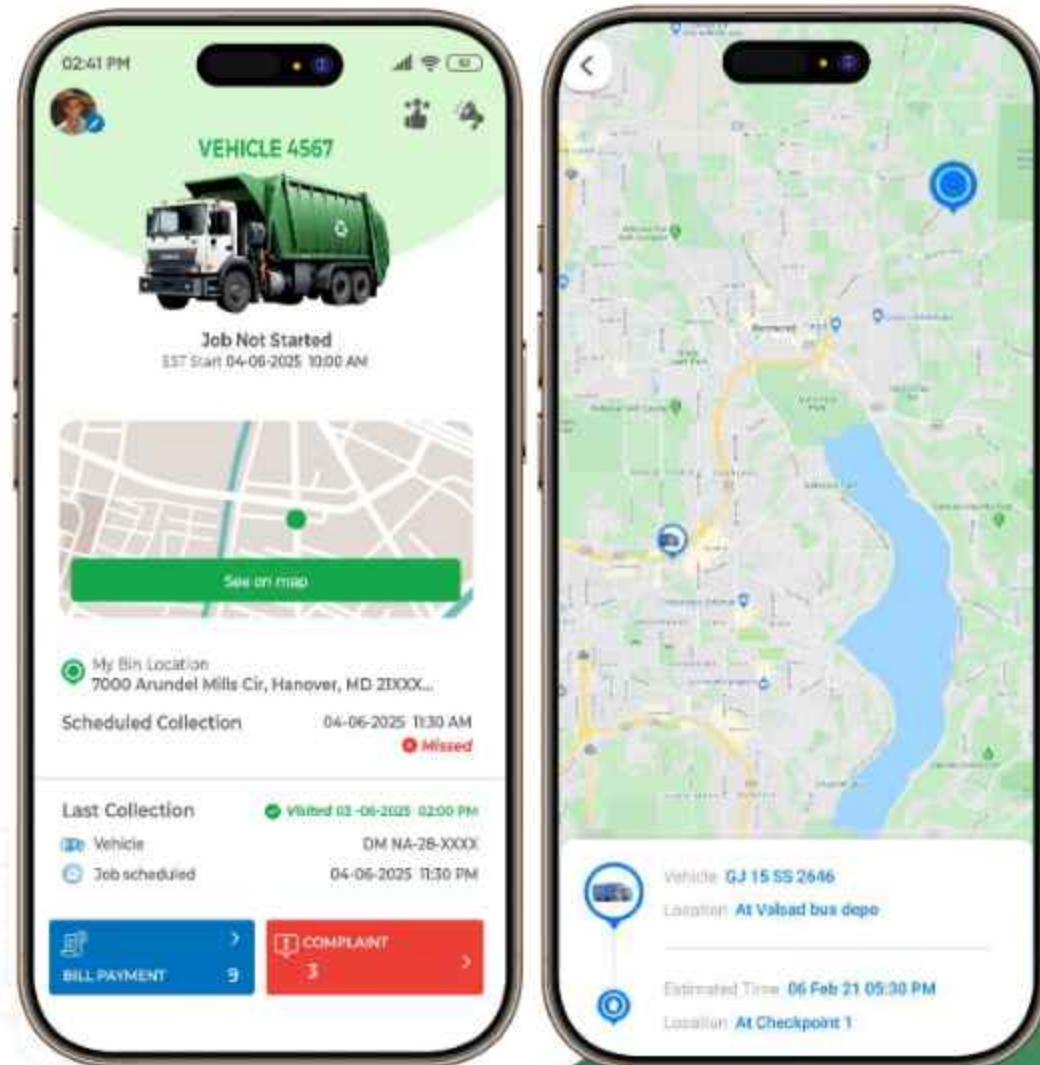
Skip the queue, pay from anywhere.

Join the Clean City Movement:

Your app, your action, your impact.

User-Friendly & Always On:

Built for real citizens, not just techies.



Effortless Digital Payments, Anytime, Anywhere

Enable your citizens and B2B clients to pay waste management bills directly through the app – anytime, from anywhere. Seamlessly integrated with multiple payment gateways for smooth and secure transactions.

Multiple Gateway Support

Choose from a variety of integrated payment gateways.

In-App Billing & Reminders

Automated alerts for due payments and invoice history.

One-Tap Checkout

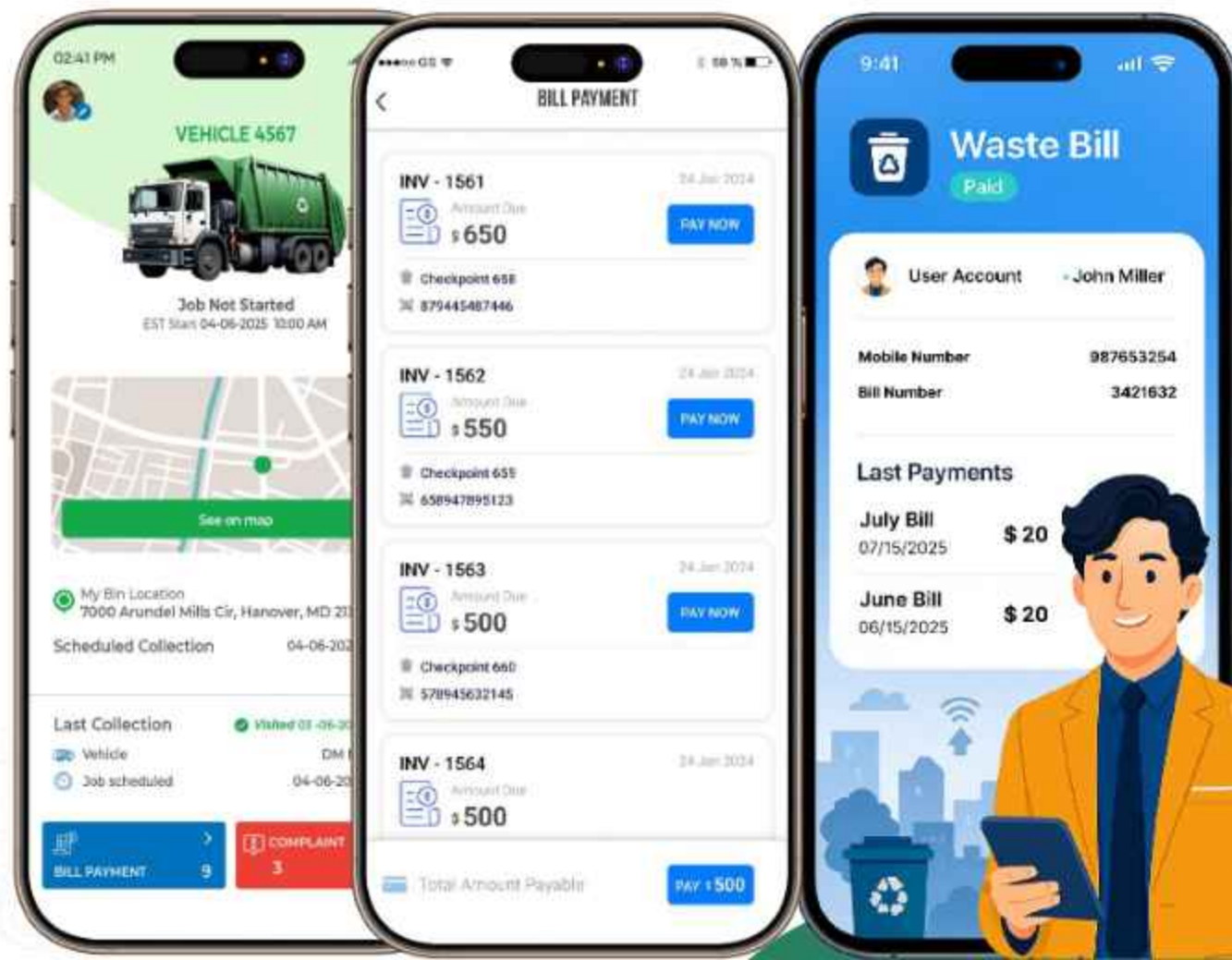
Quick payments with a single click for hassle-free experience.

Secure Transactions

End-to-end encrypted and audit-ready.

Boost Revenue Collection

Improve payment compliance and cash flow without additional operational load.



Citizen Connect: Engage, Report, Improve

Empower every citizen to become a part of the city's progress. From reporting issues to sharing feedback and paying bills—our all-in-one dashboard ensures transparency, accountability, and smarter governance at your fingertips.

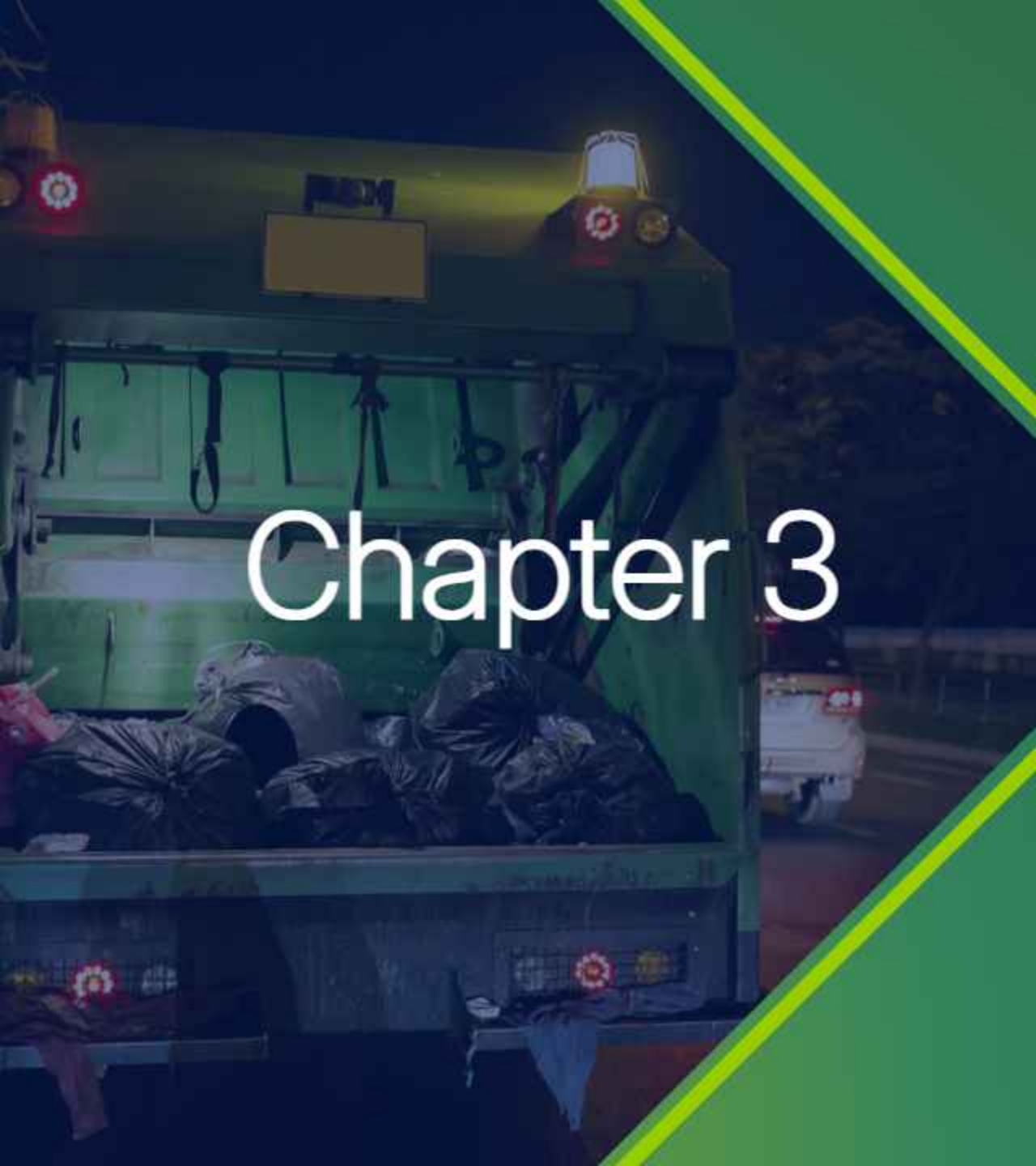
Complaint Module

- ☐ Location-Based Issue Reporting
- ☐ Detailed Complaint Categories
- ☐ Real-Time Tracking
- ☐ Instant Notification to Admin Panel



Feedback Module

- ☐ Service Quality Ratings
- ☐ Custom Suggestions & Comments
- ☐ Continuous Improvement Engine



Chapter 3

Why Bongo IoT's Smart Waste

- ☐ Unique capabilities
- ☐ Benefits for each stakeholders

What Makes Our Platform So Special?



White-Labeled & Customizable

Your branding, your rules. No Tech Limit!



Scalable & Algorithm-Driven

Adapt clean city mission at any level, powered by smart logic.



On-Premise / Govt. Cloud

Flexible deployment with full data control & security.



Policy & Compliance Centric

Aligned with Swachh Bharat, Smart City, and CPCB digital standards.



IoT-Ready Architecture

Works with any sensor — GPS, RFID, bin-level, and more.



Open for Any Integration

Easily connect with municipal MIS, ERP, or third-party apps etc.



Flexible Hardware Integration for Smarter Operations

Connect with any IoT hardware or sensor — giving you the freedom to deploy smarter devices for deeper insights, automation, and control.



GPS trackers with SIM for vehicle tracking



RFID/QR tags for bin identification



Bin-level sensors (ultrasonic or weight-based) for fill monitoring



Fuel level sensors for fuel monitoring



Video monitoring with 360-degree view and driver behaviour monitoring



RFID readers & face recognition for driver identification and attendance

Brain Behind the Platform-Key Technologies

Our technology stack is designed for high-performance, precision, and adaptability – making it a perfect fit for large-scale city operations.

AI & ML

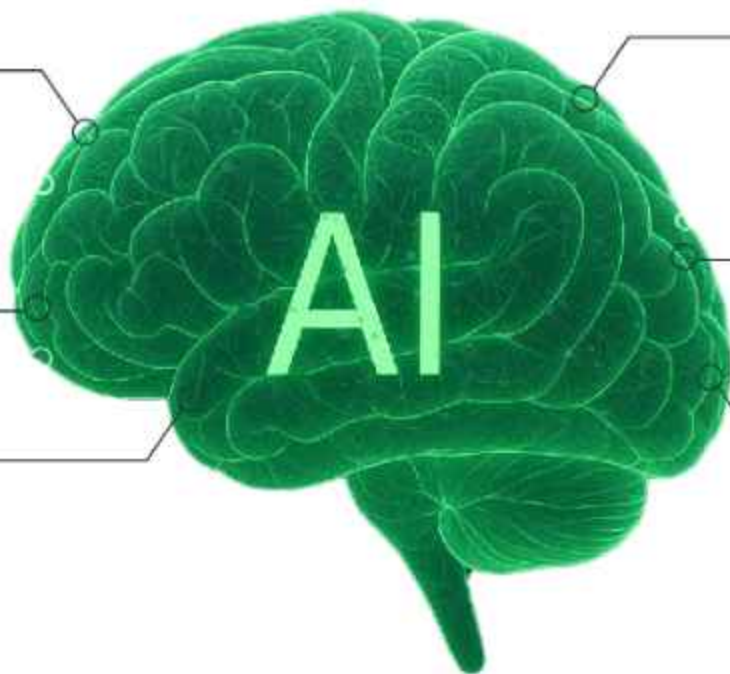
Deep learning for image processing, smart detection, and automation.

Big Data Analytics

Microservice-based reporting for real-time insights.

Digital Twin

Virtual replica of bins, vehicles & routes for live monitoring.



Java Backend

Secure, reliable, and scalable core engine support 24/7 uptime

In-House AI Team

Continuous updates, 100% custom algorithm control.

ANPR & Video Intelligence

Plate recognition & smart video feeds for operational safety.



Secure, Scalable & Government-Ready Infrastructure

Built on globally trusted cloud infrastructure with robust data protection and flexible deployment options – tailored for city-scale operations and government standards.

Option 1: Bongo IoT Cloud-Based Deployment

- ✓ Hosted on Amazon Web Services (AWS)
- ✓ S3 + MySQL for reliable storage & data management
- ✓ Cloud Type 3, Tier-4 Data Center security with 99.99% uptime

Option 2: Govt. Cloud / On-Premise Deployment

- ✓ Deploy on Government Cloud or your local data center
- ✓ We ensure smooth handover, configuration & support
- ✓ Full data residency compliance with government policies



Ready for Any Waste Type – Just Tell Us the Workflow

Our platform adapts to any waste stream – simply define your process, and we'll configure the tech to match.



Household Waste



Commercial Waste



Industrial Waste



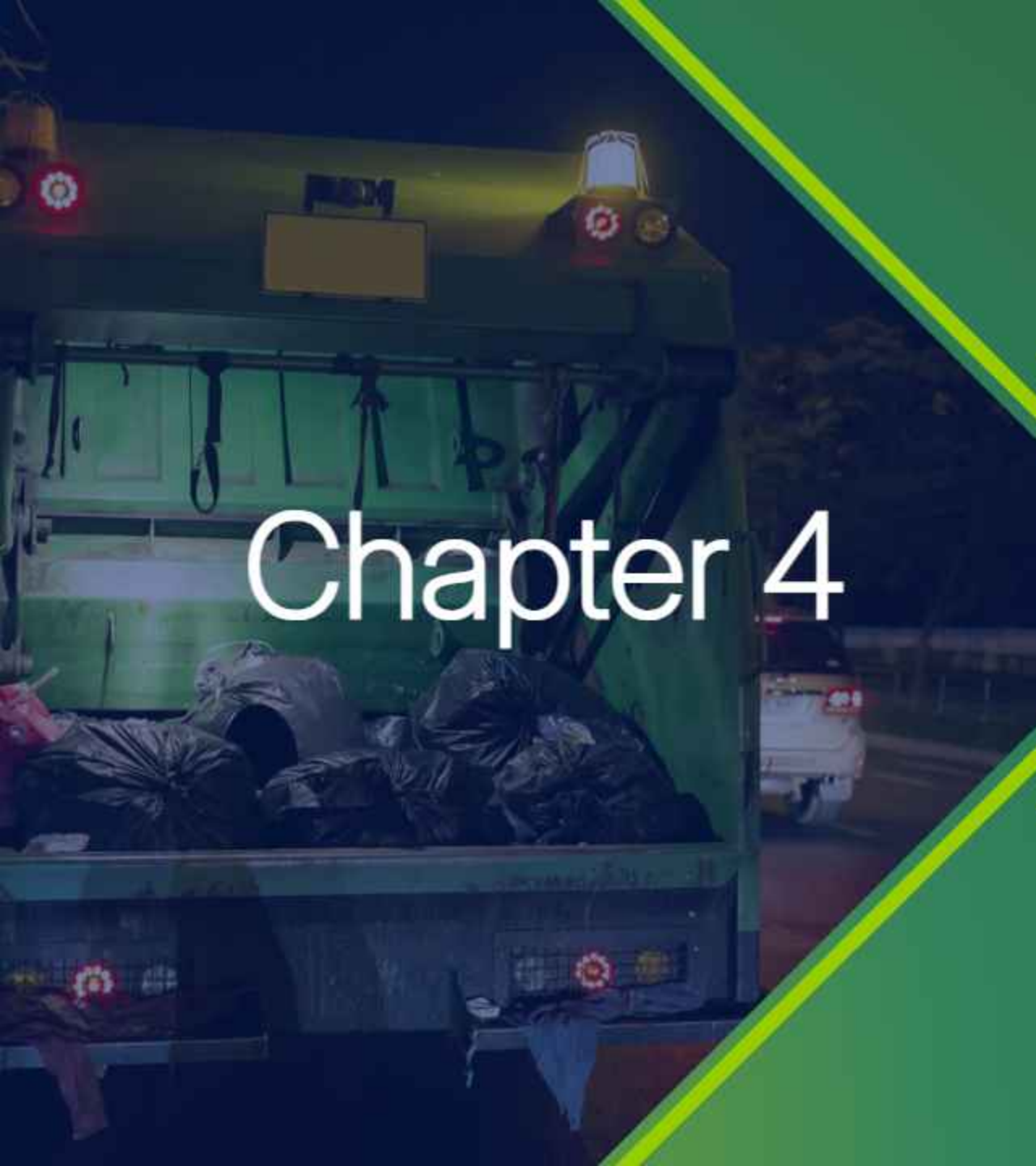
Construction & Demolition (C&D) Waste



Public Bin Management



Biomedical Waste



Chapter 4

Impact Metrics & Success Stories

- ❑ 360-degree impact & shared vision
- ❑ Case Studies with real success

Results That Speak for Smart Waste

Our technology stack is designed for high-performance, precision, and adaptability — making it a perfect fit for large-scale city operations.

30% ▲



Fuel savings due to smart routing

25% ▼



Drop in missed pickups through real-time monitoring

40% ▼



Reduction in citizen complaints

20% ▲



Improvement in contractor efficiency with route adherence

99% ▲



Accuracy in bin status visibility through IoT sensor

50% ▼



Reduced manual oversight and supervision

85% ▲



Improvement in asset and field force utilization

65% ▲



Improvement in reporting and data transparency

65% ▲



Improvement in public engagement

Smart Waste. Smarter Cities. Stronger Nation.

Empowering municipalities with smarter waste operations that drive cleaner cities, digital governance, and sustainable growth.

- ✓ Fewer overflows & missed pickups
- ✓ Boosts Clean City Competition scores
- ✓ Transparent vendor & field monitoring

Clean City Movement

Digital Governance

- ✓ Role-based access & digital workflows
- ✓ Paperless operations and auto-reports
- ✓ Citizen engagement via mobile apps

- ✓ Real-time dashboards for urban oversight
- ✓ Zone-wise route & bin monitoring
- ✓ Seamless integration with Smart City systems

Smart City Goals



- ✓ Supports SDG 11 (Sustainable Cities) & SDG 12 (Responsible Consumption)
- ✓ Reduces fuel use & emissions
- ✓ Promotes sustainable urban operations



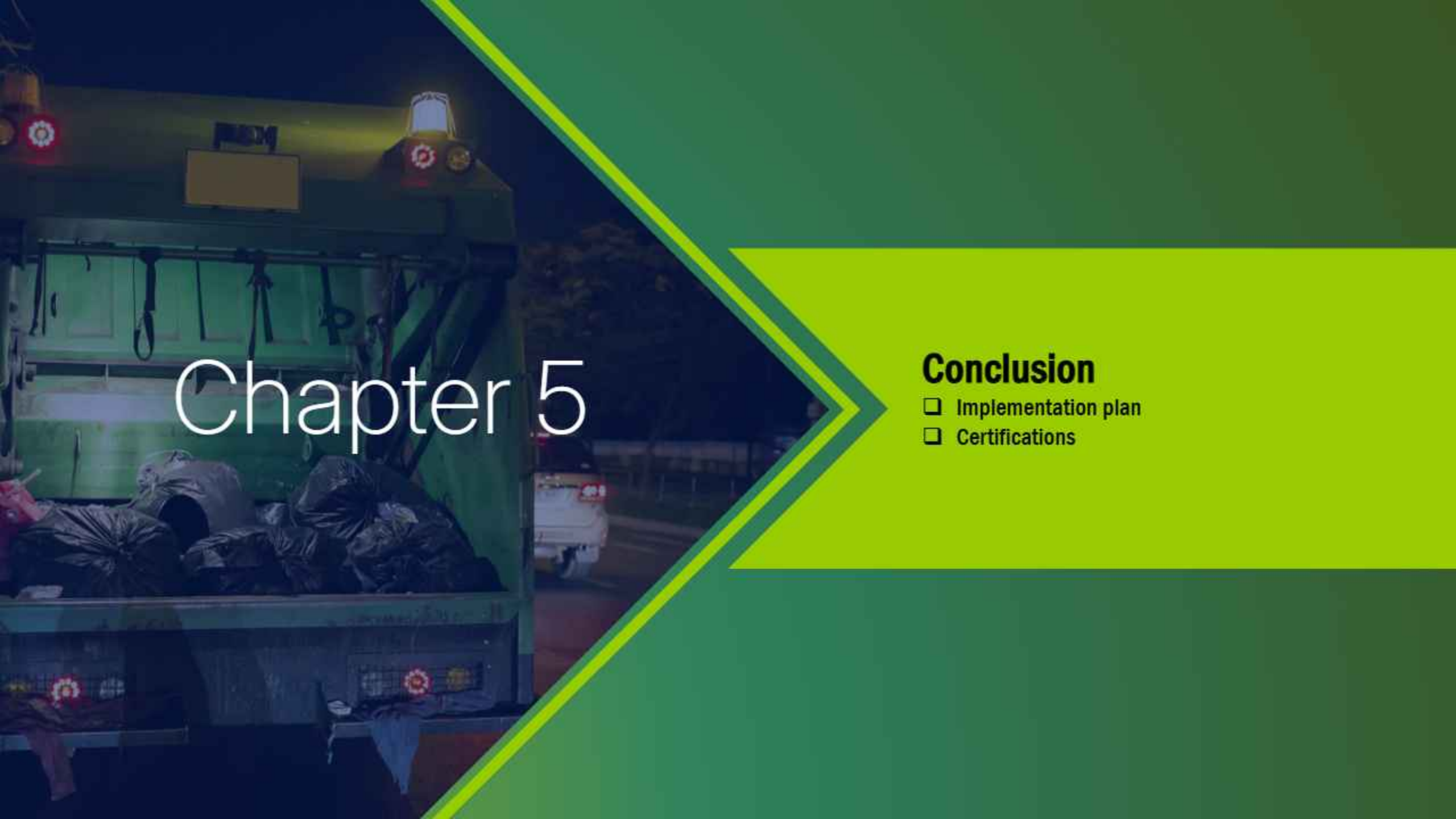
Success Story in Oman - A Real Transformation

Our Smart Waste solution has been successfully deployed across multiple countries' municipalities; Oman's outcome is one of the most successful ones. The result? A game-changing shift in how waste is managed:

Key Outcomes:

- ☐ **35% Reduction in Missed Pickups**
Real-time monitoring ensured every bin was accounted for.
- ☐ **40% Improvement in Route Compliance**
Smart routing kept contractors aligned and accountable.
- ☐ **100% Digital Visibility Across Wards**
From bin to dashboard — everything tracked, analyzed, and optimized.





Chapter 5

Conclusion

- ☐ Implementation plan
- ☐ Certifications

Step-by-Step Implementation Process



How Long Does It Take?

The full rollout is fast and phased – typically completed within 1 to 3 months, based on the number of wards and city zones.



Bongo IoT – Here for you, 24/7.



We Don't Just Deliver — We Stay With You

From onboarding to ongoing success — we ensure your team stays trained, your system stays updated, and your service stays uninterrupted.

Hands-on Training

Onboarding-training for municipality admins, contractors, field staff, and supervisors.



Online Support 24/7

Ticket-based resolution via mobile, email, or live chat.



Software & App Updates

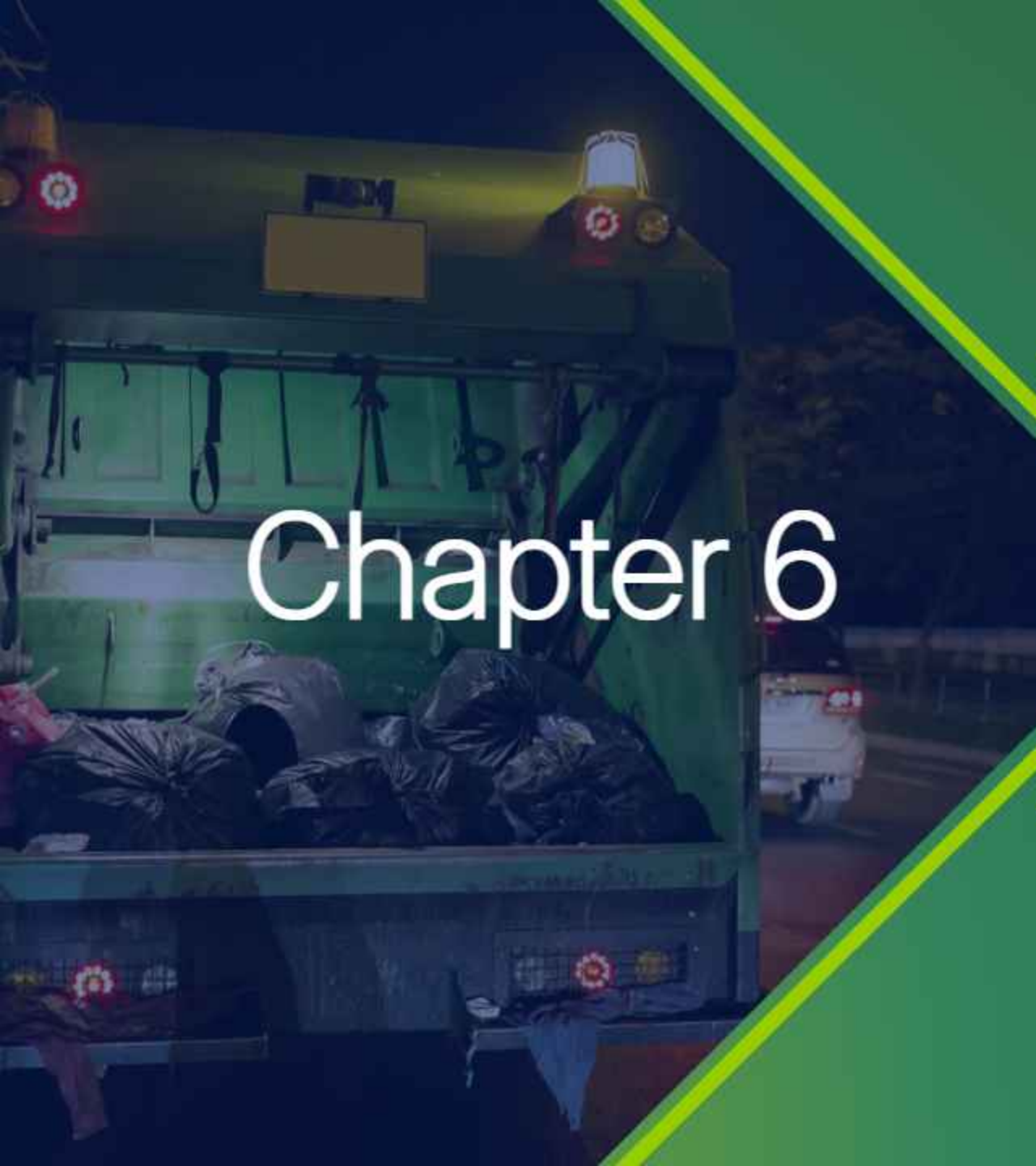
Continuous software maintenance, apps updates on the system on regular basis.



On-Site Field Support

Dedicated field team for technical checkups, installations, and troubleshooting





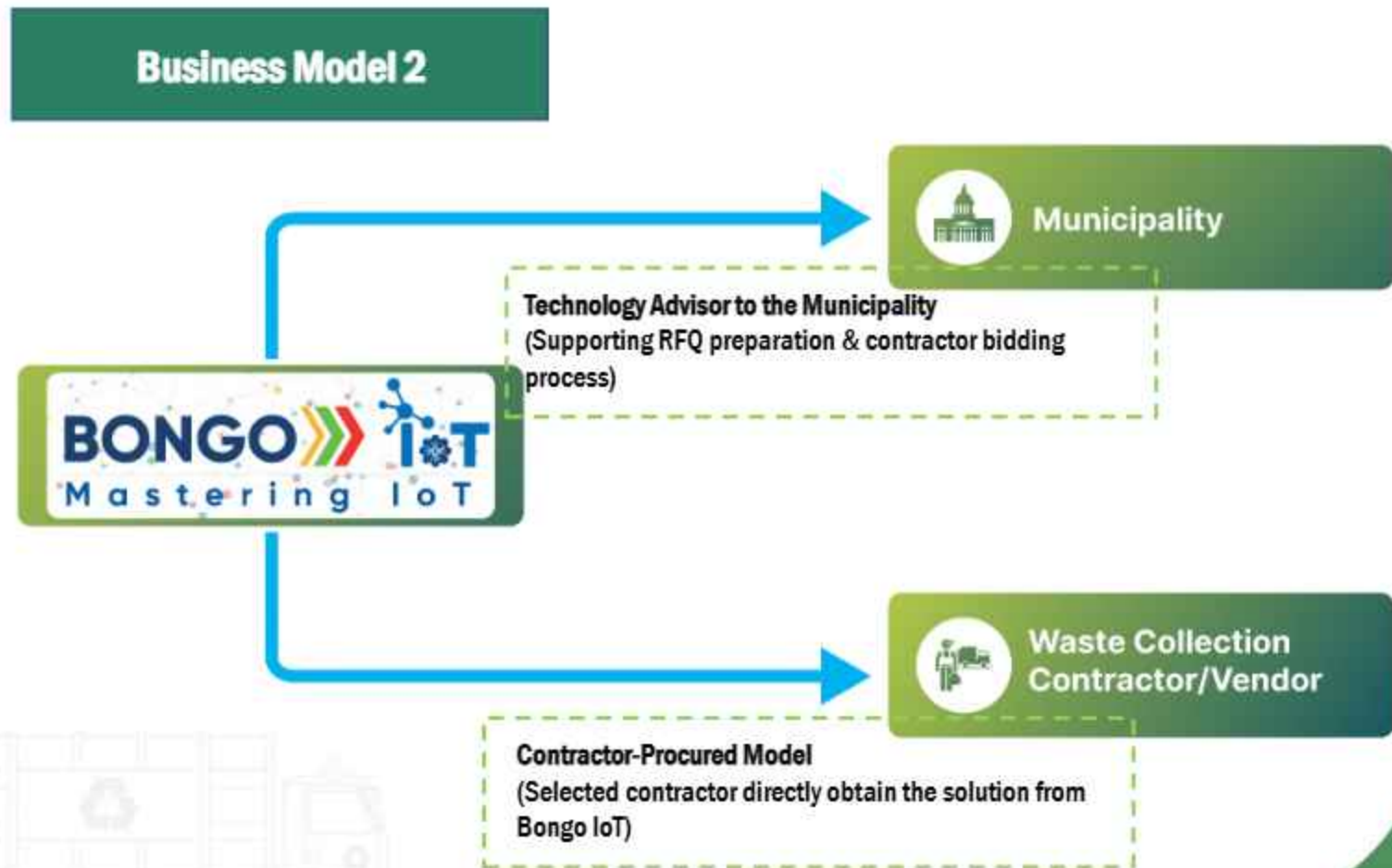
Chapter 6

Suggestions for Municipality

- ☐ Business Model
- ☐ Revenue Model

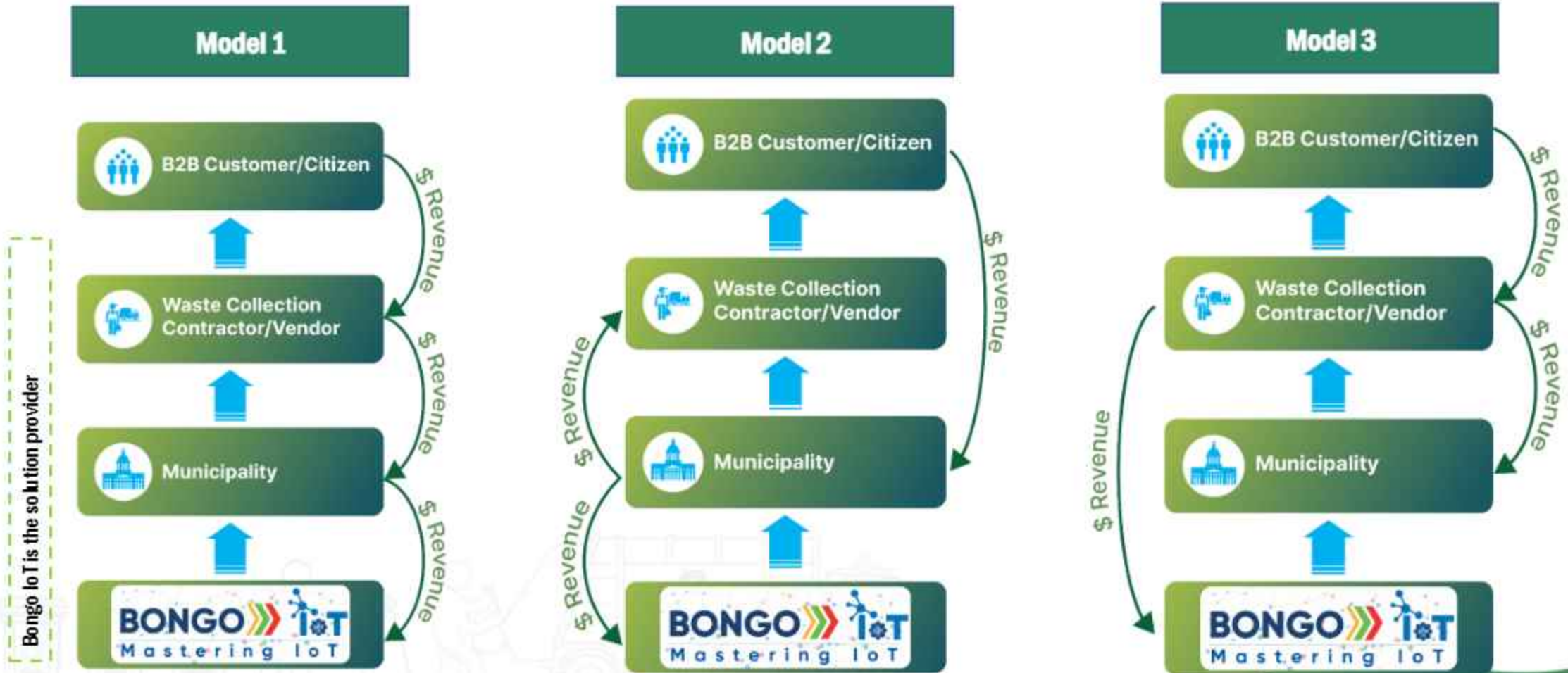
Choose Your Route — We'll Power the Journey

We offer two flexible models — municipal-led or contractor-driven — tailored to Ahmedabad's needs, with zero upfront investment from the municipality.



Revenue Without Investment – A Win for Municipality

With our Smart Waste, Municipality can streamline operations, ensure compliance, and generate revenue – without investing a single penny. The system is adopted by contractors, and citizens or B2B customers contribute through service-based billing.





Add-On+ Solution

Citizen Engagement &
Centralized Municipality
Management

Citizen Engagement- One App. All Services. One City.

Building a connected ecosystem where citizens get smarter access, and the municipality gains total control. Every department. Every service. One seamless digital flow.

Core Concept:

- 01 A unified **Citizen App** for accessing all municipal services
- 02 Real-time **request-to-resolution management** by relevant departments
- 03 **Feedback & rating system** for service quality
- 04 Transparent communication with **status tracking**
- 05 Centralized dashboard for the Municipality with **performance analytics**
- 06 Scalable to all public-facing departments (waste, water, electricity, transport, etc.)



The Citizen App – Smart, Simple, and Service-Centric

Designed for ease, built for impact – the app makes it effortless for citizens to engage with the municipality and take part in building a better city.



The Citizen App: User-Friendly Interfaces



Centralized Municipality Management

Visibility, Revenue, and Public Trust. A central digital system enables departments to work faster, respond smarter, and gain public trust — while unlocking new revenue channels through digitized service delivery.



One Platform for All Municipal Operations



Boosts Citizen Engagement & Public Trust



Stronger Control Over Contractors & Field Force



Transparent & Growing Revenue Streams



Data-Driven Analytics & Proof of Service for Govt. Reporting



Smarter Resource Planning & Predictable Budgeting



A Complete Digital Ecosystem for Municipality

Automated reports & insights

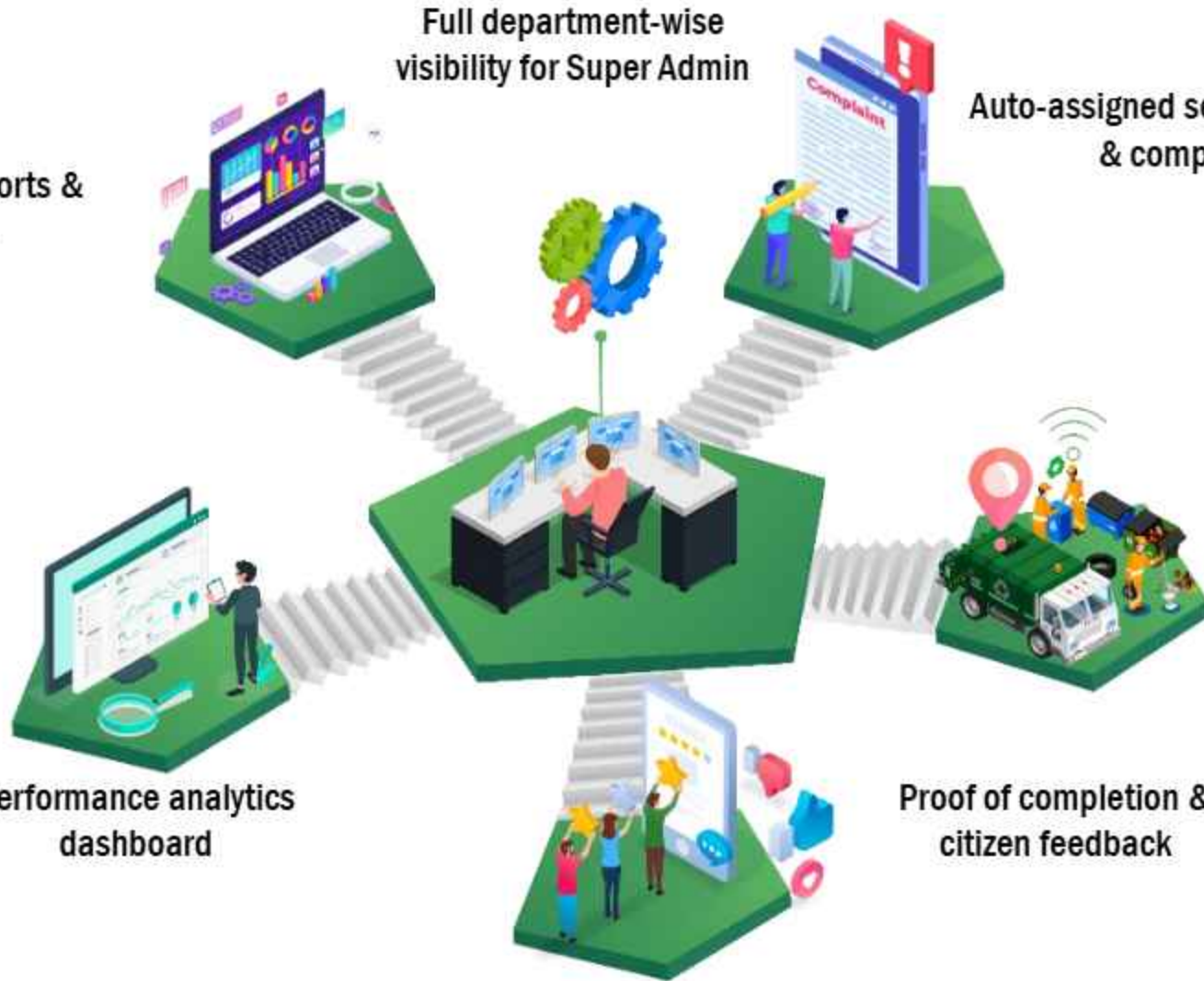
Full department-wise visibility for Super Admin

Auto-assigned service requests & complaints

Live task & field force tracking

Performance analytics dashboard

Proof of completion & citizen feedback



Globally Recognized Standards & Certifications

Our System is Designed to Meet the Highest Standards in Quality, Security, and Sustainability.

✓ **ISO 27001:2013**

Information Security Management System

✓ **ISO 9001:2015**

Quality Management System

✓ **ISO 14001:2015**

Environmental Management System

✓ **ISO 45001:2018**

Occupational Health and Safety

✓ **CE Certification**

European Conformity Marking

✓ **FCC Certification**

U.S. Federal Communications Commission

✓ **GDPR / Local Data Residency Compliance**

Ensures privacy and secure handling of data in line with regional policies (EU, GCC, etc.)



Let's Build a Cleaner,
Smarter City— Together



Thank You!

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