



Data Driven **Waste Management Solutions**

SMART CITY COMPONENTS

Smart Energy & Utilities

Smart Traffic

Air Pollution

Smart Buildings

Smart Parking

Public Safety

Smart Street Lights

Smart Waste



IMPACTS OF MUNICIPAL SOLID WASTE

Economic

Social

Health

Rodents & Pests

Hazardous/Combustible

Environmental

Aesthetic



TRADITIONAL WASTE MANAGEMENT

THE WASTE IN WASTE

OVERFLOWING trash makes streets and communities dirty, identifying trouble spots are difficult because collectors do not know when or where it occurs

EMPTY BINS do not need to be collected, but because of the lack of technology they go along with traditional routes

INEFFICIENCIES in waste management operations ranging from resource allocation and collection methods to scheduling and lack of optimization



SMART WASTE MANAGEMENT

WHAT IS IT?

Four essential features:

1. IoT-enabled deployment of waste bins
2. IoT-enabled fleet of collection vehicles
3. IoT network connection for communication
4. Integrated waste analytics platform

Effects of smart waste management:

- Real-time information on fill-level
- Optimized collection routes
- Increased collection efficiency by collecting only the bins that are full
- Cost reduction, enhanced management of city services
- Prevention of waste bin overflow (reduced pollution, odor, rodents)
- Less fuel burned by truck fleet



Cost ↓



 CleanCityNetworks (CCN)

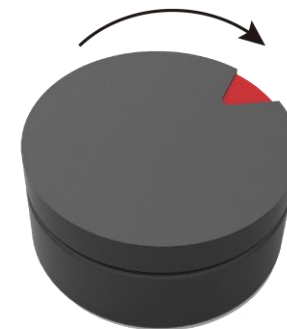
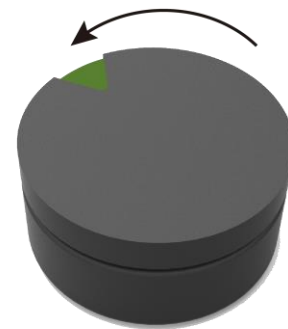
 CCNx

 CleanTRACK

 CleanCUBE

 CleanFLEX

 CleanCALL



VISIBILITY LEADS TO ACTION

THREE STAGE METHOD



DISCOVER

- Find Problems
- Collect Data
- Establishment of Baseline



INSIGHT

- Analyze data
- Reveal what works, what doesn't
- Seek Improvement



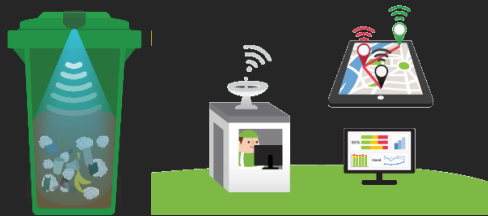
ACTION

- Implementation of Strategy
- Adopt new Methods

IMPLEMENTATION

WHAT IT LOOKS LIKE IN THE REAL WORLD

EARLY STAGE



- Discovery Stage
- Collect and Monitor Data

MID STAGE



- Insight Stage
- Analyze the data and draw conclusion for strategies

LATE STAGE



- Action Stage
- Development strategies should be approved and applied for the next phase

THE EARLY STAGE

DEFINING FEATURES



- ▶ Deploy sensors to collect and monitor data
- ▶ Assess and track performance while gaining insights on day to day operations
- ▶ Historical/Archival data increases transparency and accountability

THE MID STAGE

DEFINING FEATURES



- ▶ Change existing bins to smart bins
- ▶ Modify collection schedules and optimize routes
- ▶ Decrease in operational costs and increase efficiency

THE LATE STAGE

DEFINING FEATURES



- ▶ Deployment of fleet management systems
- ▶ Optimize for specific parameters that account for all operational aspects
- ▶ Decrease in collection frequency, overflows, and operational costs

CONSIDERATIONS

WASTE: A PROBLEM OR COMMODITY?

FEASIBILITY

COST-EFFECTIVENESS / OPERATIONAL EFFICIENCY

PILOT PROJECTS

POLICY MAKING / DURATION OF IMPACTS

AUTOMATION & HUMAN RESOURCES

ADVANCED WASTE MANAGEMENT

UNIVERSAL SMART CITY PLATFORM



**Smarter Cities,
Greener Communities**

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