Waste Management

outline

Problems of Today

Solutions of Tomorrow

Kruunuvuorenranta, Helsinki

Where does the trash go?
Storytime Hong Kong

adaption

Problems of Today
trash collection

ClassicRefuseTrucks.com (Recology)

Problems of Today
waste management

ClassicRefuseTrucks.com (Recology)

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Problems of Today
waste management

The general waste collection system is outdated!

Problems of Today
waste management
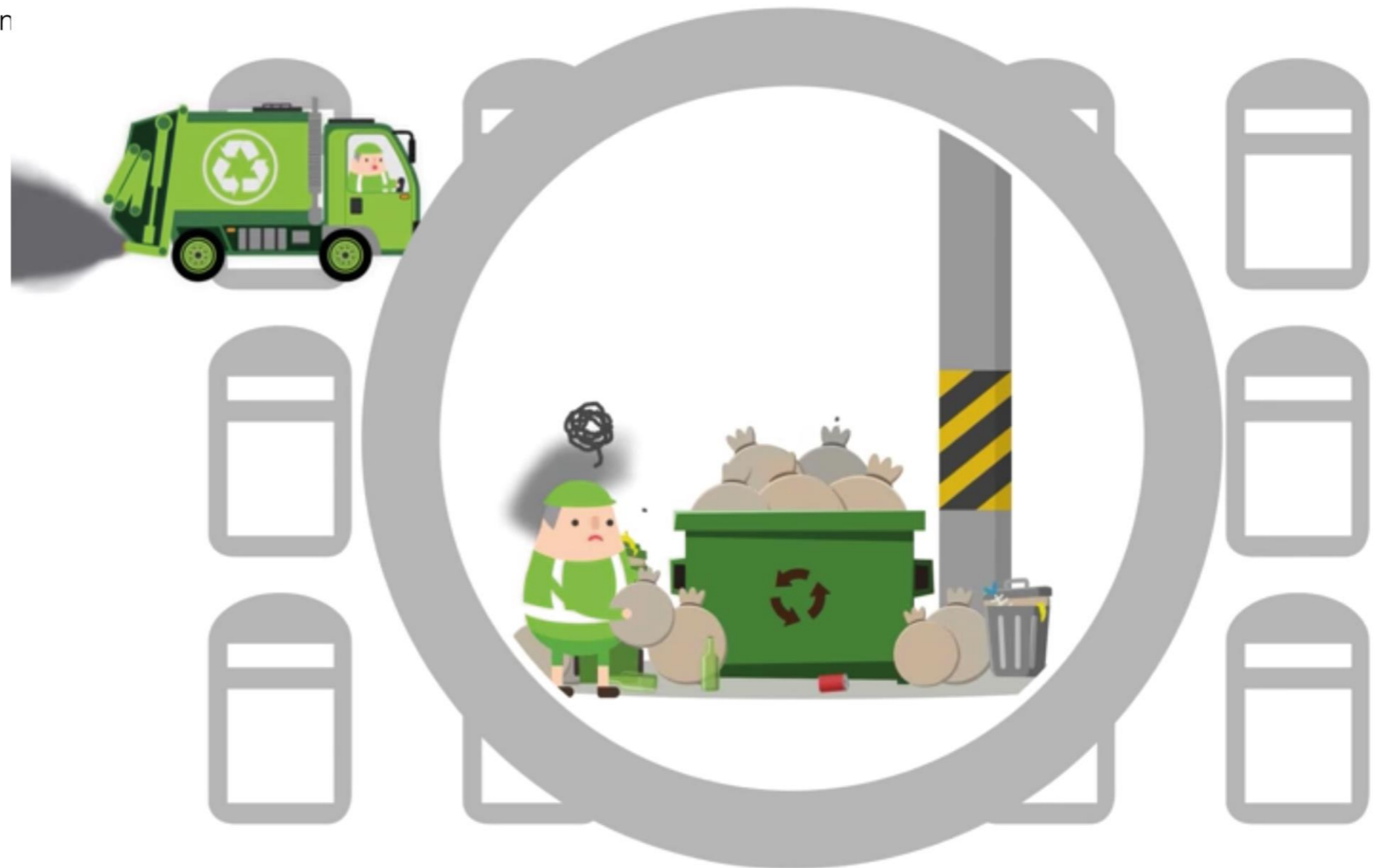
general problems of todays waste management system

waste streams are set to rise substan

underfilled vs overfilled trash bins

unhygienic conditions

excessive fuel usage

Unsorted trash

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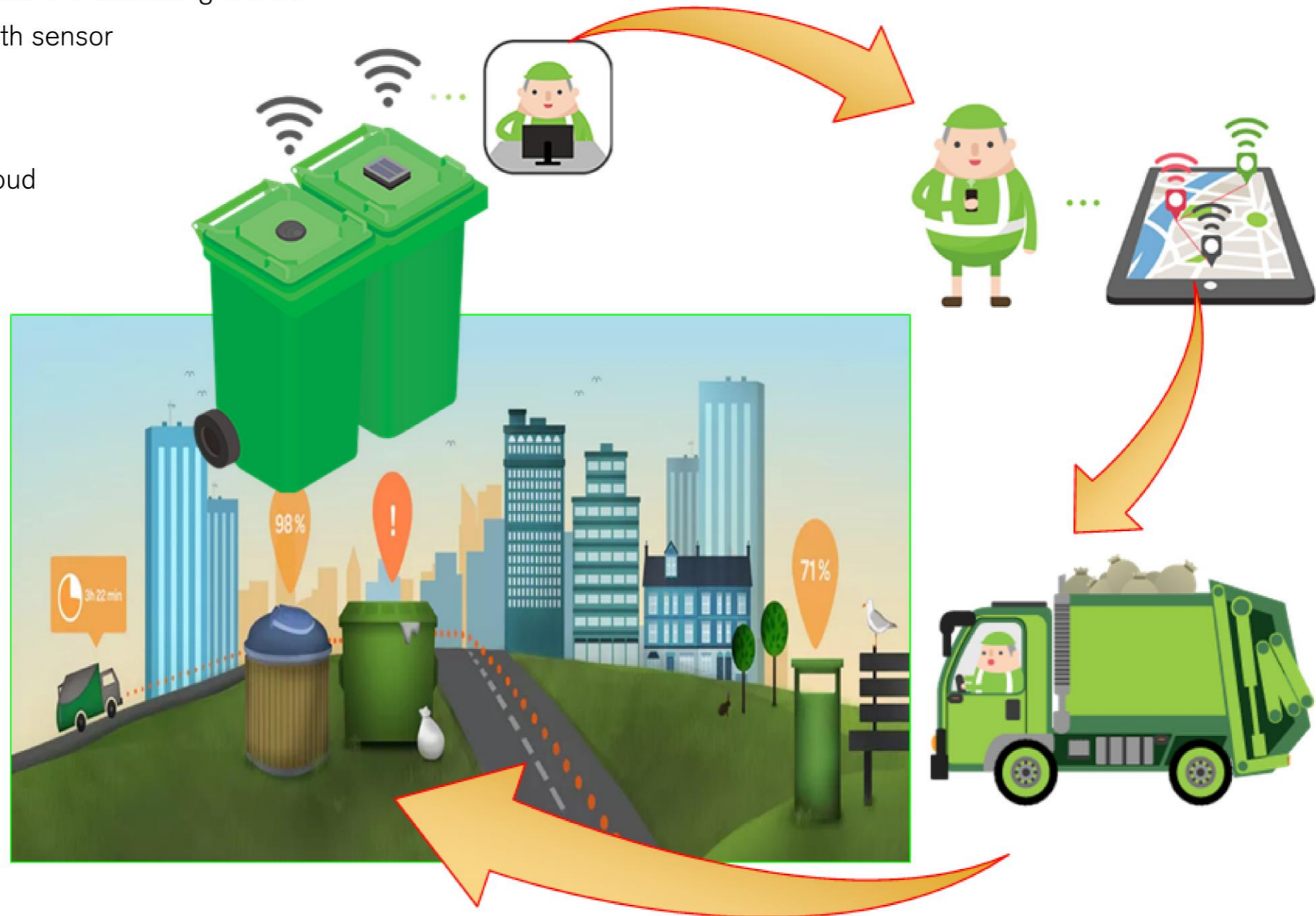**solutions to improve waste management system**

smart bin

+ IoT

Solutions of Tomorrow
smart bin

Upgrading of existing system to becoming "smart":

fill level measurement with sensor

IoT implementation:

collection of data into cloud

Real-time monitoring of bin levels

OPTIMIZING
ROUTE

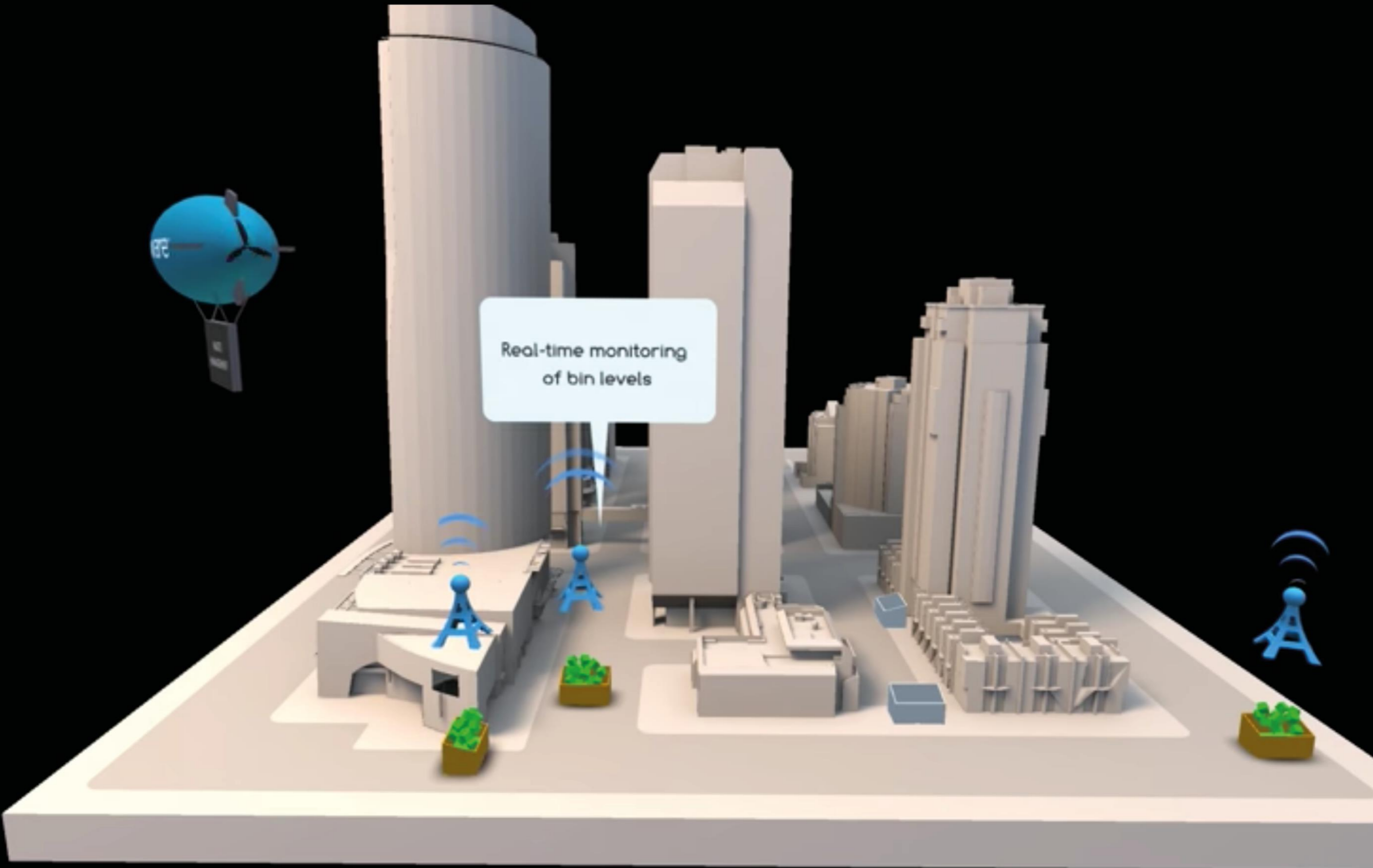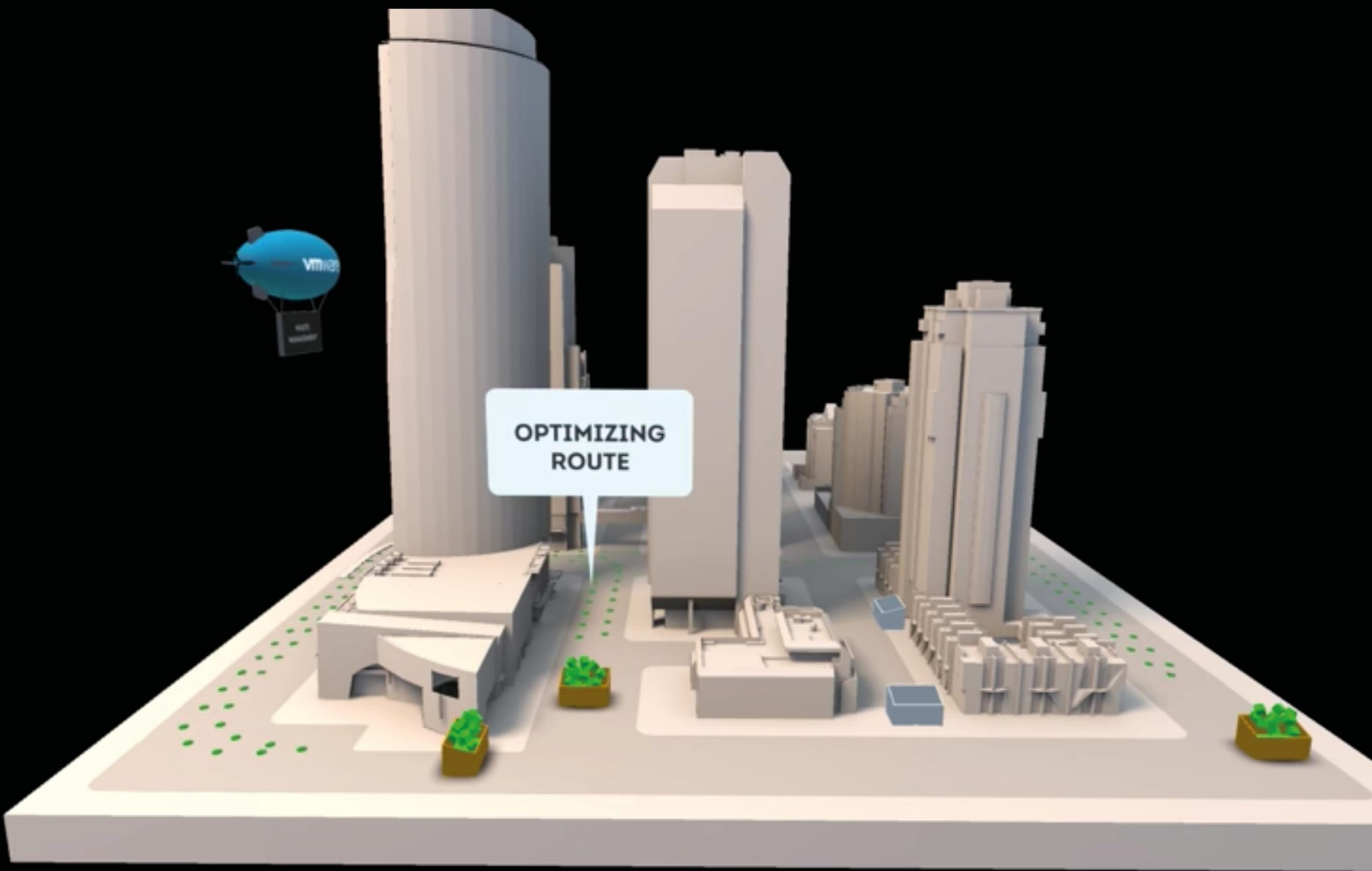Smart bins route sanitation trucks efficiently

Solutions of Tomorrow
smart bin

Upgrading of existing system to becoming "smart": fill level measurement
with sensor

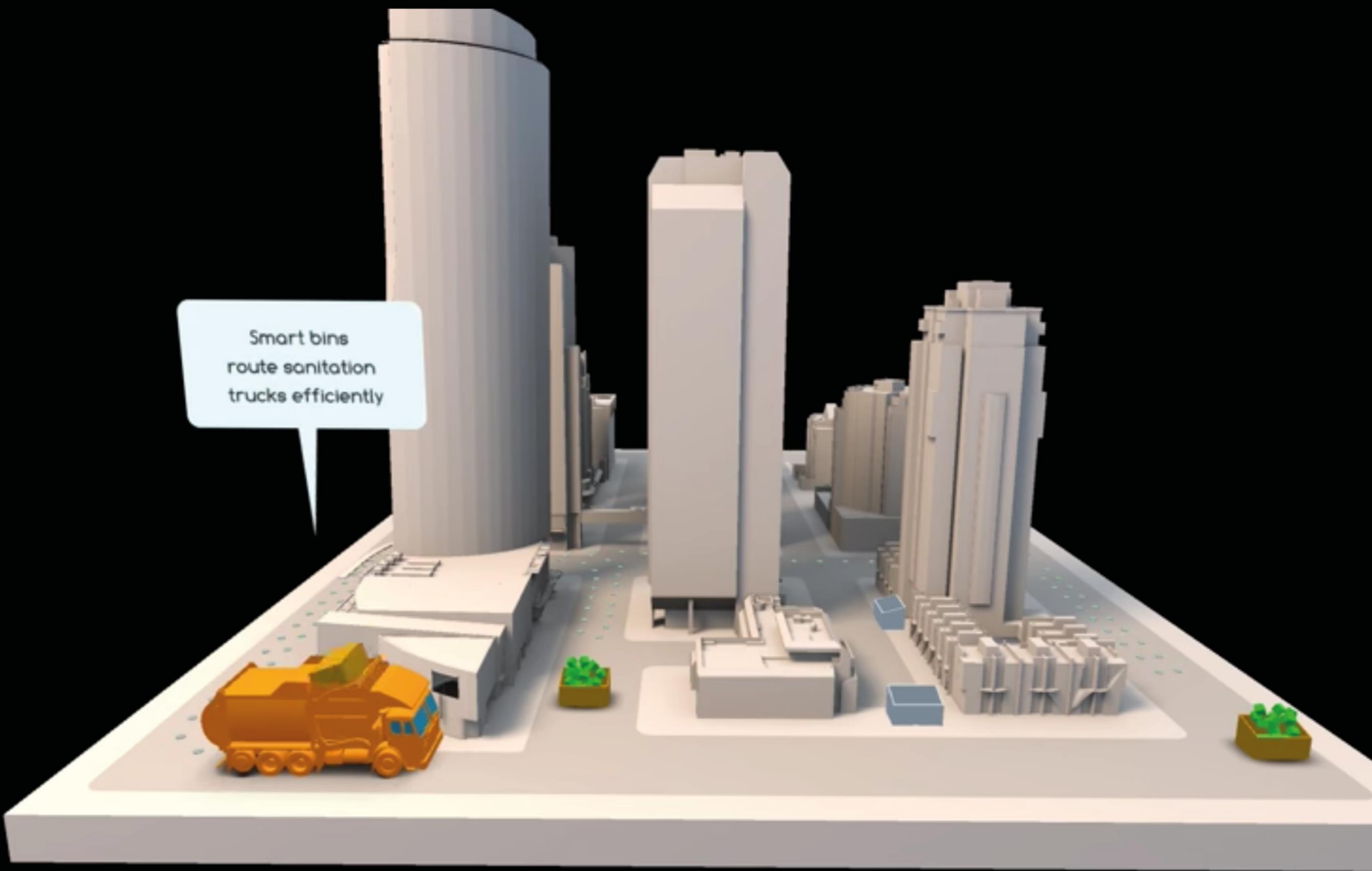IoT implementation: collection of data into cloud

Optimization of collection routes

Fewer collection visits reduce congestion and traffic interruption

Fewer collection visits reduce carbon dioxide and other emissions

Improved street sanitation

Solutions of Tomorrow
waste management

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solutions to improve waste management system

smart bin

making use of data / IoT

problems of smart bin system

ultrasonic sensor not accurate

recycables have different strategy for the end of life management

Solutions of Tomorrow
waste management

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implementing RFID

Solutions of Tomorrow

5.0   Diagram of system

USB GPS

Camera

Computer

Web Server

Work Station

RFID Reader

Garbage Bin

Controller Box

Waste Truck

Solutions of Tomorrow
waste management
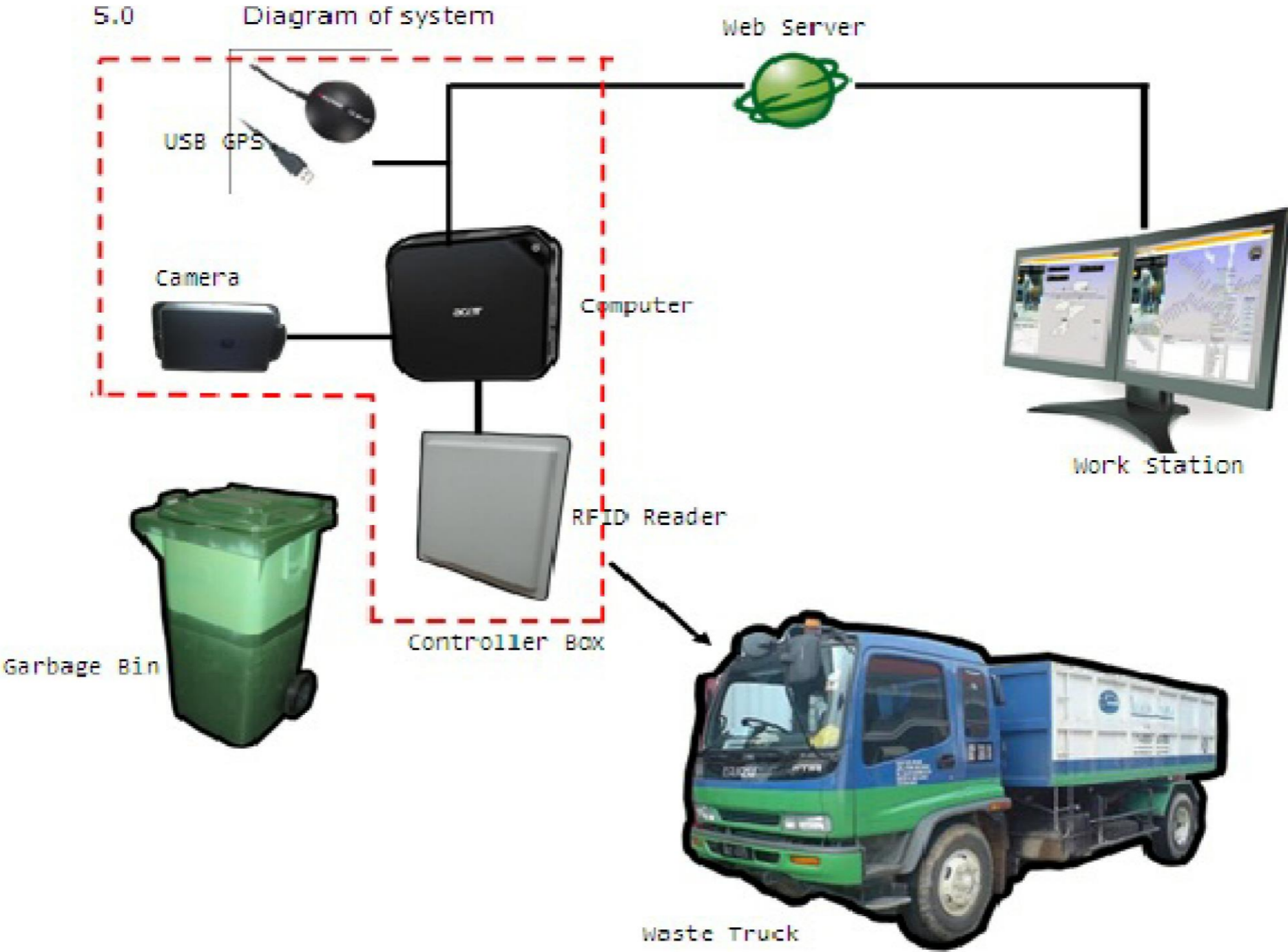
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pneumatic waste collection

Solutions of Tomorrow
pneumatic waste collection

Increased hygiene

Out-of-sight collection of trash

no collection trucks on the streets

decreased noise

elimination of the bad odor from trash
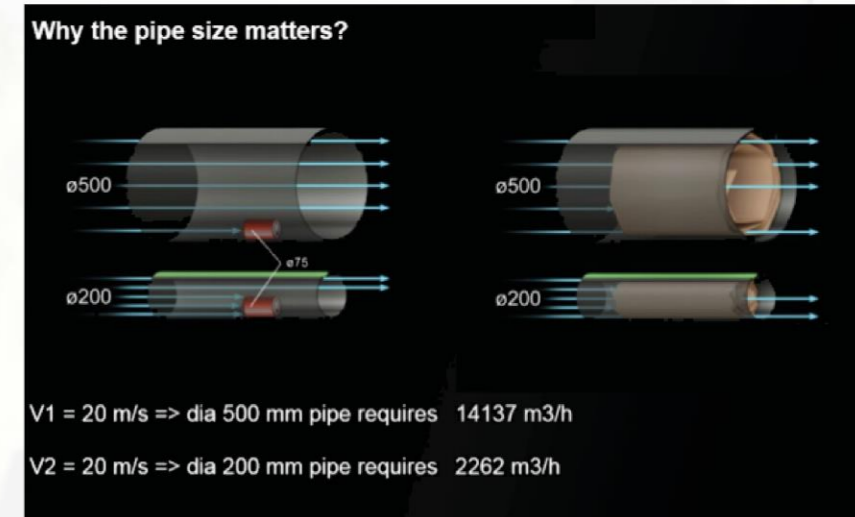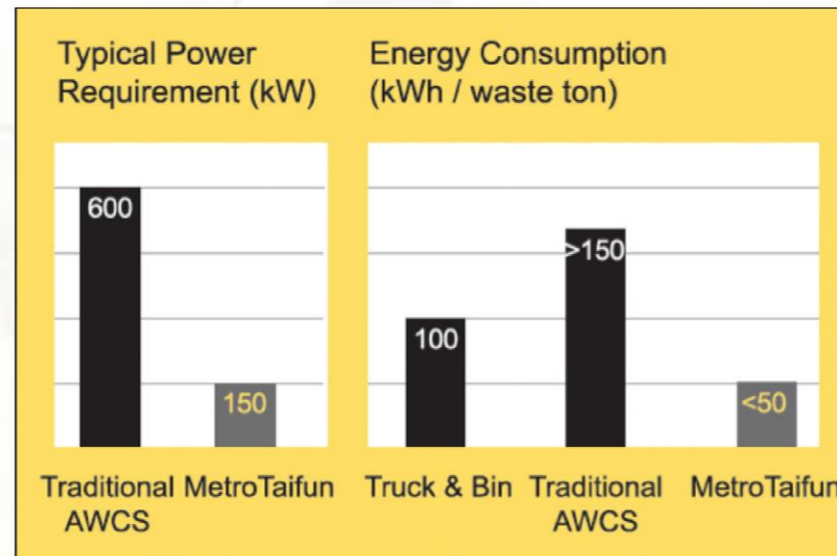
improved public space

Solutions of Tomorrow
pneumatic waste collection

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Increased hygiene

Out-of-sight collection of trash

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improved public space

Typical Power Requirement (kW): Traditional AWCS 600, MetroTaifun 150

Energy Consumption (kWh / waste ton): Truck & Bin 100, Traditional AWCS >150, MetroTaifun <50

Why the pipe size matters?

V1 = 20 m/s => dia 500 mm pipe requires 14137 m3/h

V2 = 20 m/s => dia 200 mm pipe requires 2262 m3/h

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implementing RFID

pneumatic waste collection

optimizing recycling system

Solutions of Tomorrow

WASTE

WASTE COLLECTION

TO PLANT

FUEL

GAS

ELECTRICITY

ENERGY

WASTE PROCESS

CONVERTED   HEATED   PROCESSED
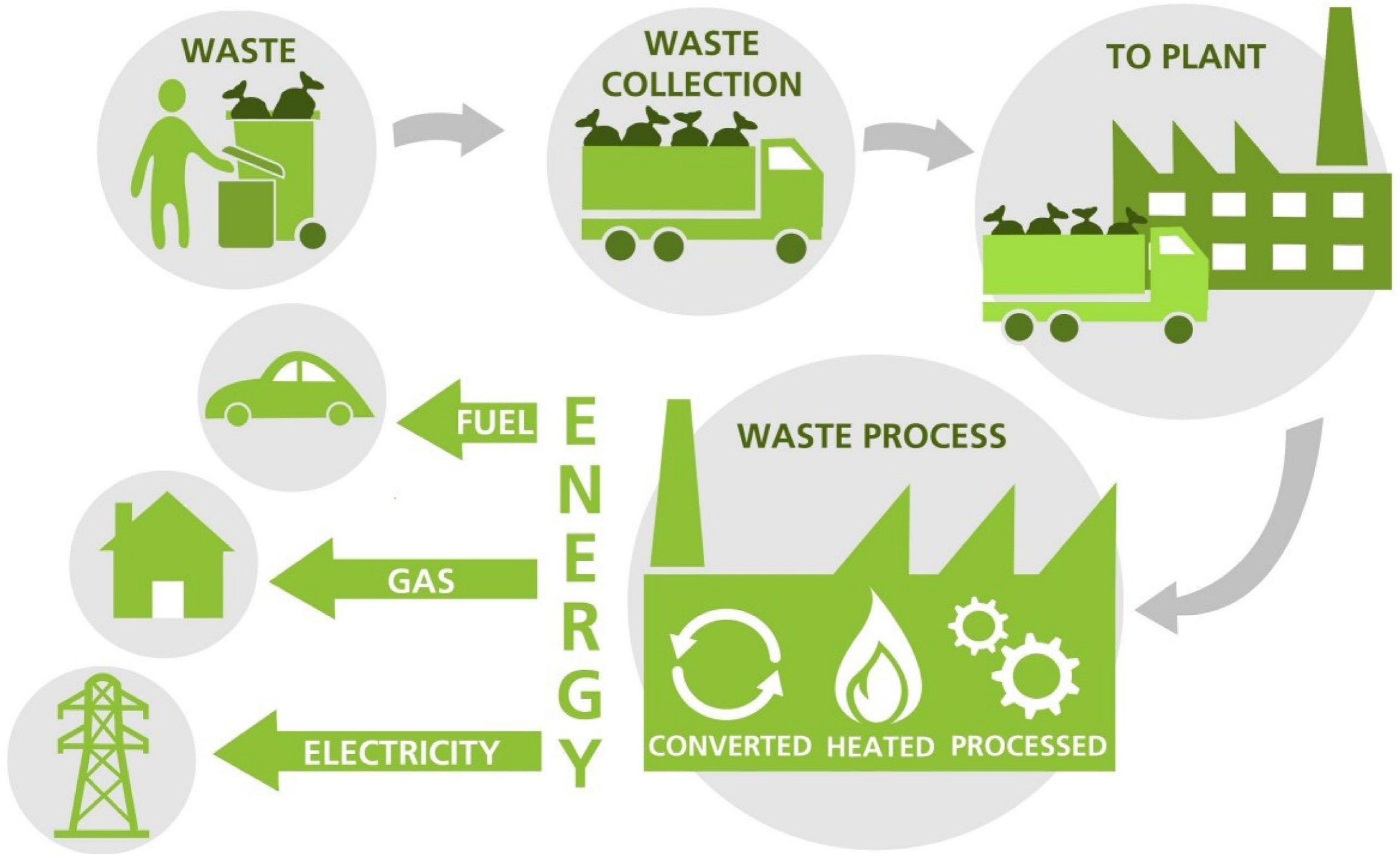
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solutions to improve waste management system

smart bin

making use of data / IoT

implementing RFID

pneumatic waste collection

optimizing recycling system (waste to energy)

example of implementation
automatic waste collection system (AWCS)

Mecca, Saudi Arabia

Stockholm, Sweden

Linköping, Sweden

Västarås, Sweden

Zhuhai, China

Helsinki, Finland

Helsinki (Malmi), Finland

Tampere, Finland

Espoo, Finland
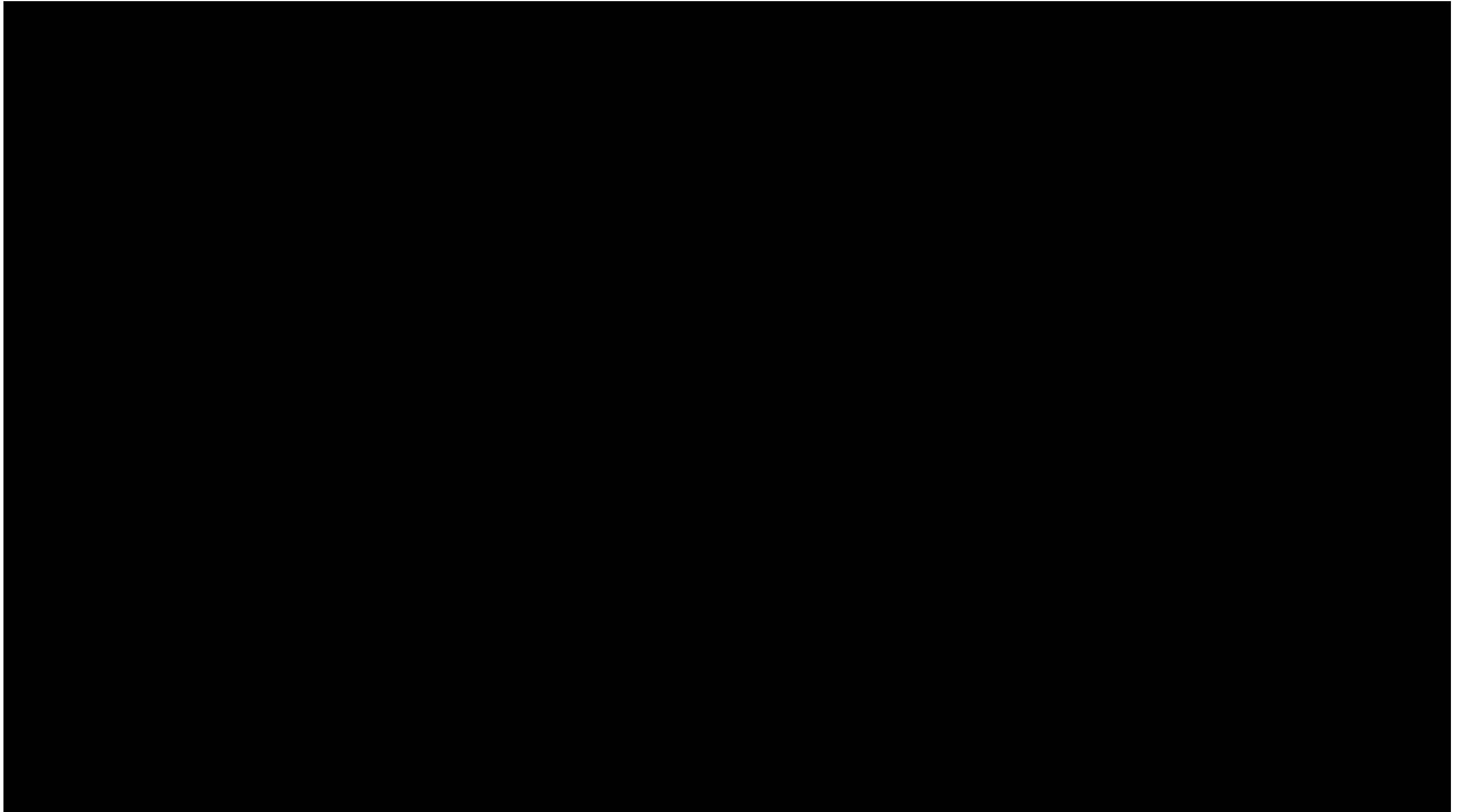

Vantaa, Finland

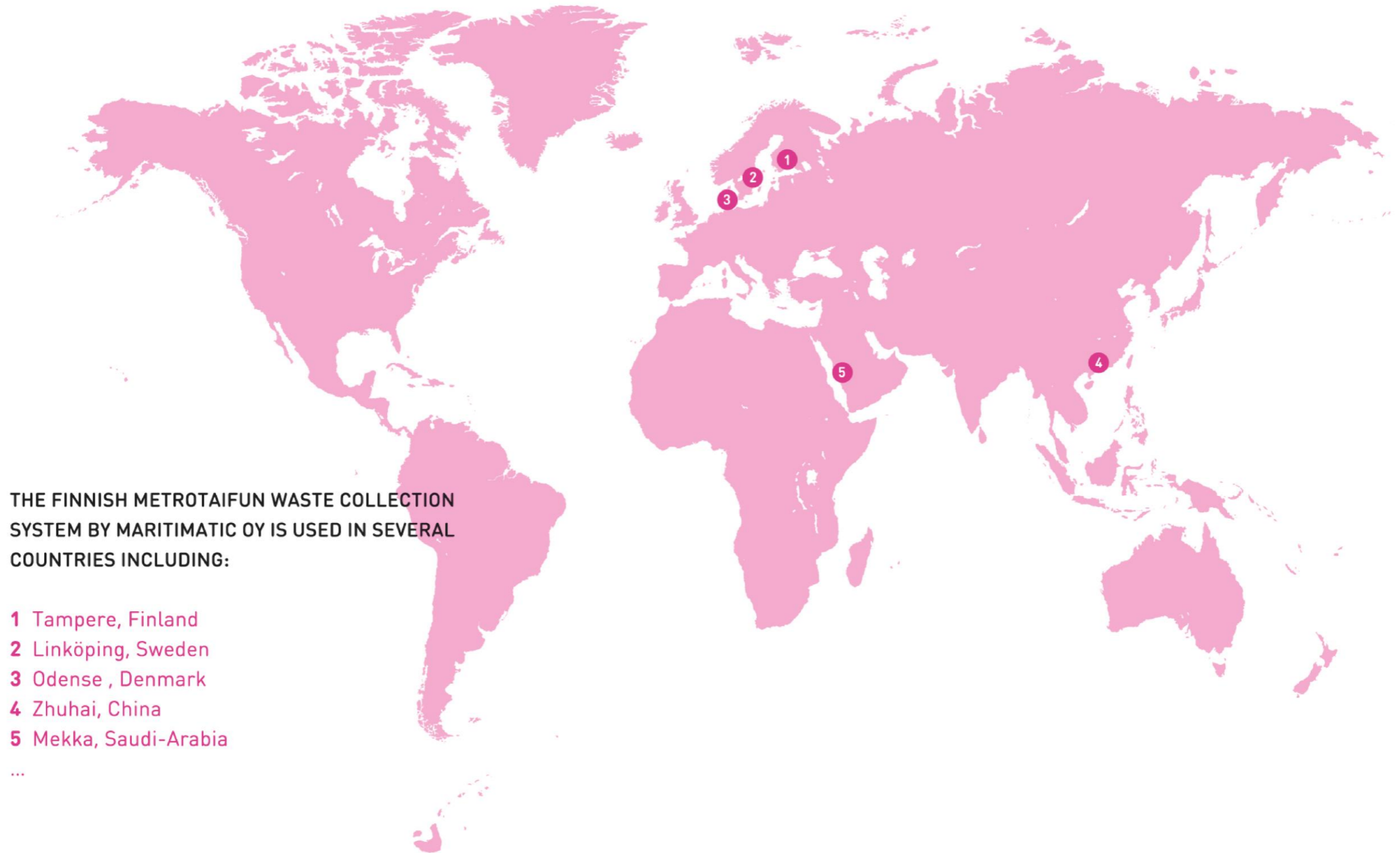Frøya, Norway

Hail, Saudi Arabia

example of implementation
envac AWCS

example of implementation
MariMatic AWCS

THE FINNISH METROTAIFUN WASTE COLLECTION
SYSTEM BY MARITIMATIC OY IS USED IN SEVERAL
COUNTRIES INCLUDING:

1 Tampere, Finland
2 Linköping, Sweden
3 Odense , Denmark
4 Zhuhai, China
5 Mekka, Saudi-Arabia

...

example of implementation
automatic waste collection system (AWCS)

**Kruunu-
vuoren-
rannan Rode**

MaritiMatic MetroTaifun AWCS

Waste inlets	400
Fractions	4
Pipeline length	10 km
Build up	June/2014 – 2025
	Phase 1 into use March/2017

Kruunuvuorenranta

Residents	14,000
Jobs	1,000
Land area	143 ha
Water area	117 ha
Construction	2013–2030

Kruunuvuorenranta is a diverse land area of 143 hectares, situated a mere three kilometres away from the City Centre.

There will be varying types of buildings in this area which will mostly be made up of apartment buildings. The beach boulevard will have townhouses, low-rise buildings by the shore and taller buildings further inland.

Kruunuvuorenranta neighborhood is only 3km from Helsinkis city center, taking only 15 min by tram (to be built) to get there.

Kruunuvuorenranta, Helsinki
automatic waste collection system (AWCS)
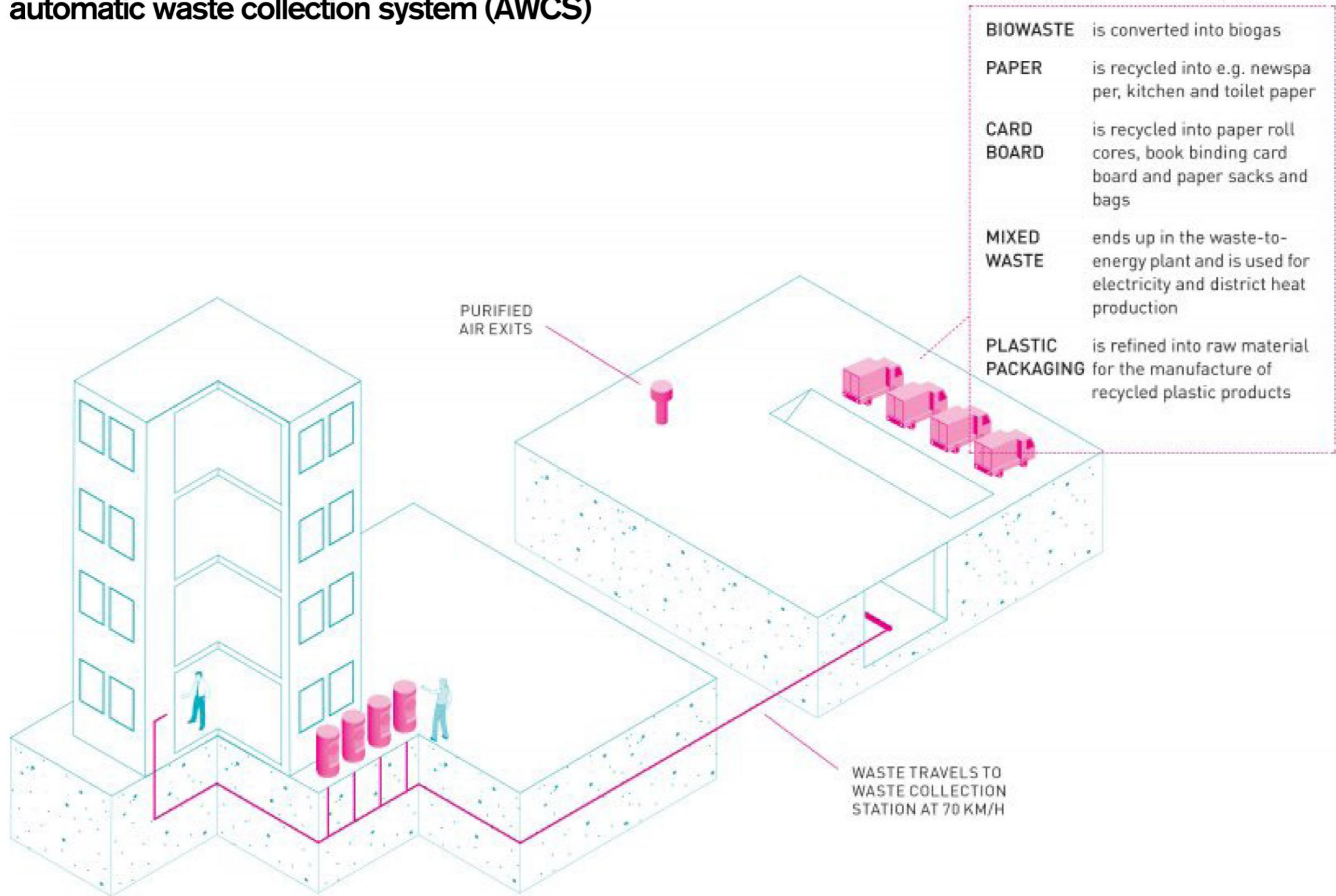
BIOWASTE is converted into biogas

PAPER is recycled into e.g. newspaper, kitchen and toilet paper

CARD BOARD is recycled into paper roll cores, book binding card board and paper sacks and bags

MIXED WASTE ends up in the waste-to-energy plant and is used for electricity and district heat production

PLASTIC PACKAGING is refined into raw material for the manufacture of recycled plastic products

PURIFIED AIR EXITS

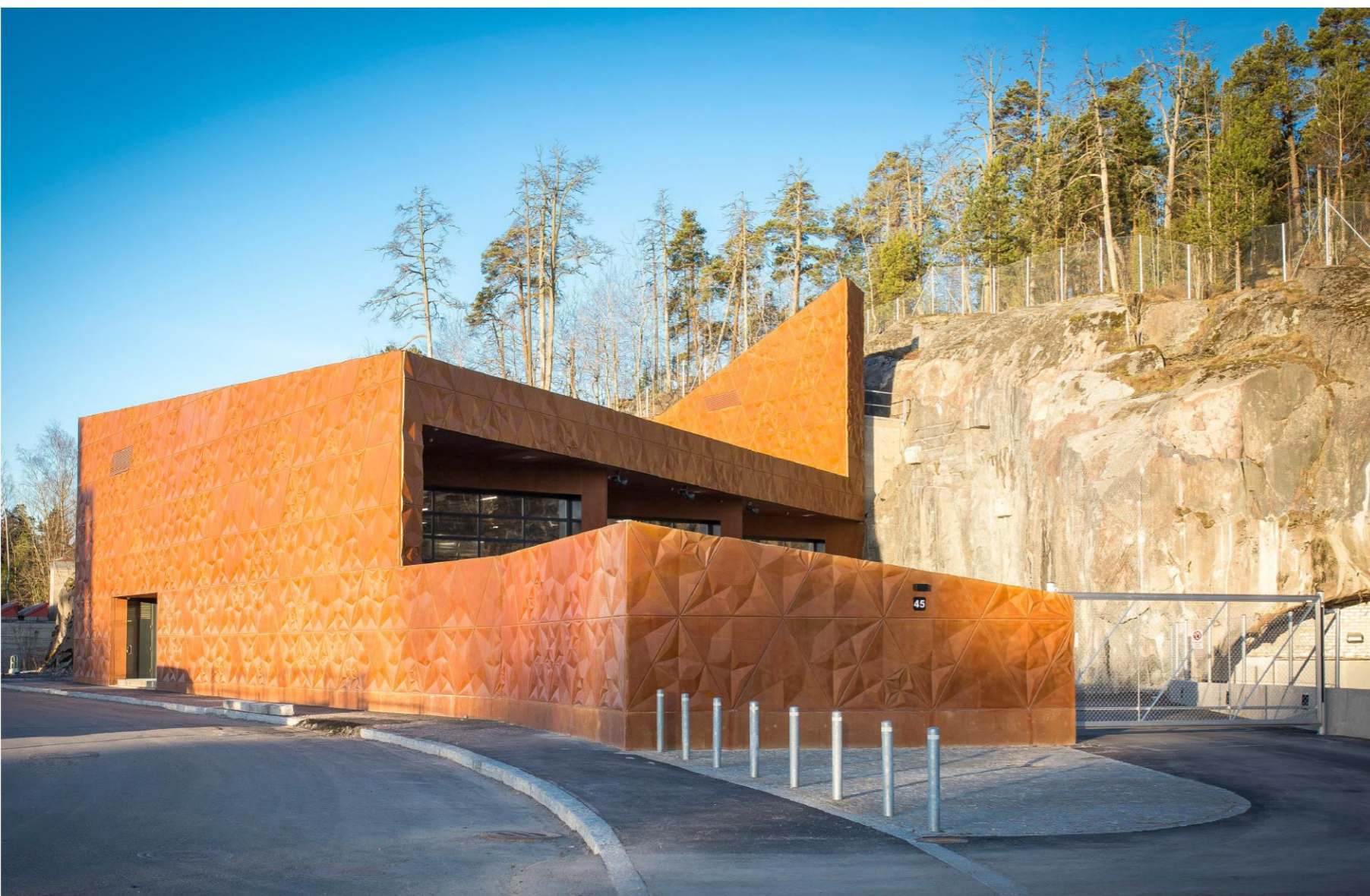WASTE TRAVELS TO WASTE COLLECTION STATION AT 70 KM/H

Kruunuvuorenranta, Helsinki
automatic waste collection system (AWCS)

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automatic waste collection system (AWCS)

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automatic waste collection system (AWCS)

MetroTaifun
Automatic Solid Waste Collection

Kruunuvuorenranta, Helsinki
automatic waste collection system (AWCS)

Koirasaarentie

MetroTaifun
Automatic Solid Waste Collection

Hong Kongs waste problem

Where does the trash go?

Where does the trash go?
Hong Kongs waste problem

stats

population	about 7,45 Million
area	2000 sqkm
density	6,300 capita/ km2
	up to 130,000 capita/km2

With around seven million people, crammed into an area of 2,000 square kilometres (772 sq miles), Hong Kong is currently the fourth most densely populated place in the world (after its neighbour, Macau, and Singapore and Monaco). With space at such a premium, there is precious little room to build new landfill sites.

Where does the trash go?

Hong Kongs waste problem

Municipal Solid Waste

Total disposal quantity   10,345 tonnes per day

going to landfills   66%

                               1.41kg/day per capita

Despite attempts to clean up its act, the region produced **3.7 million tonnes of municipal waste** in 2015 – the highest figure for five years. It has already **cycled through 13 landfill sites**, which are now being repurposed as parks, golf courses, and sportsgrounds, with just three sites remaining open. At this rate, it will only be a matter of a few years before those too begin to overflow. "If Hong Kong continues in this way, we will reach breaking point by 2020," says Chan – an estimate supported by Hong Kong's own Environmental Protection Department.

Where does the trash go?

Hong Kongs waste problem

As of January 1 2018, the global waste disposal problem has taken a significant turn. **China has banned imports** of many types of unprocessed rubbish.

Hong Kong has been **exporting 90 percent** of its recyclables to the mainland, and these new regulations now mean that the garbage has nowhere to go.

Of course, the problem was already present:

> **Completely inadequate recycling facilities**
> **lack of effort to reduce waste at source**
> **(by manufacturers and businesses)**
> **lack of policy**
> **irresponsible consumer behaviour**

have already taken the trash issue to an unsustainable point in Hong Kong for years.

Where does the trash go?

Hong Kong is trying sustainability

Sustainable Use *of* Resources
Five-Pronged Approach

1 — Reduction at Source

2 — Food Wise HK

3 — Clean Recycling

4 — Waste to Energy

5 — Hygienic Landfilling

HONG KONG
BLUEPRINT FOR
SUSTAINABLE USE
OF RESOURCES
2013 – 2022
Environment Bureau

-40%

10-Year
Reduction Target

Where does the trash go?

Hong Kong solid waste landfills | HK Island waste production

Solid Waste

SENT	about 2,500 tonnes per day (2016)	43 Mm³	Tseung Kwan O (K)
NENT	about 4,020 tonnes per day (2016)	35 Mm³	Ta Kwu Ling (NT)
WENT	about 8,800 tonnes per day (2016)	61 Mm³	Tuen Mun (NT)
	total of 15,320 tonnes per day		

Hong Kong Island

MSW 1.41 kg/person/day

population (HK 2016 bycensus) 1 253 417

daily waste of 1,767 tonnes MSW per day (12% of total SW HK)
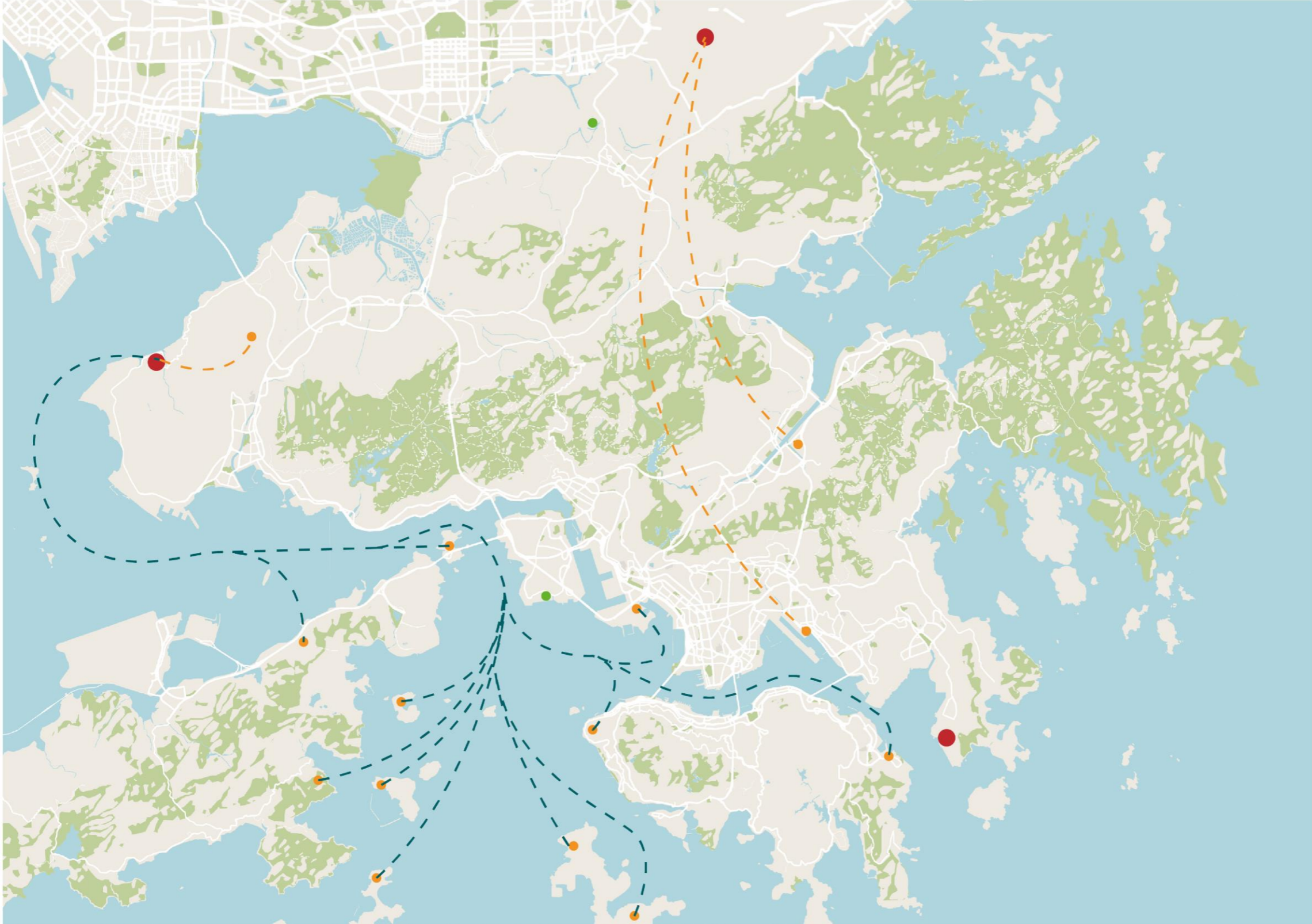
Kowloon

MSW 1.41 kg/person/day

population (HK 2016 bycensus) 2 241 347

daily waste of 3,160 tonnes MSW per day (20% of total SW HK)

HK Island + Kowloon = 4,927 tonnes MSW (32% of total SW HK)
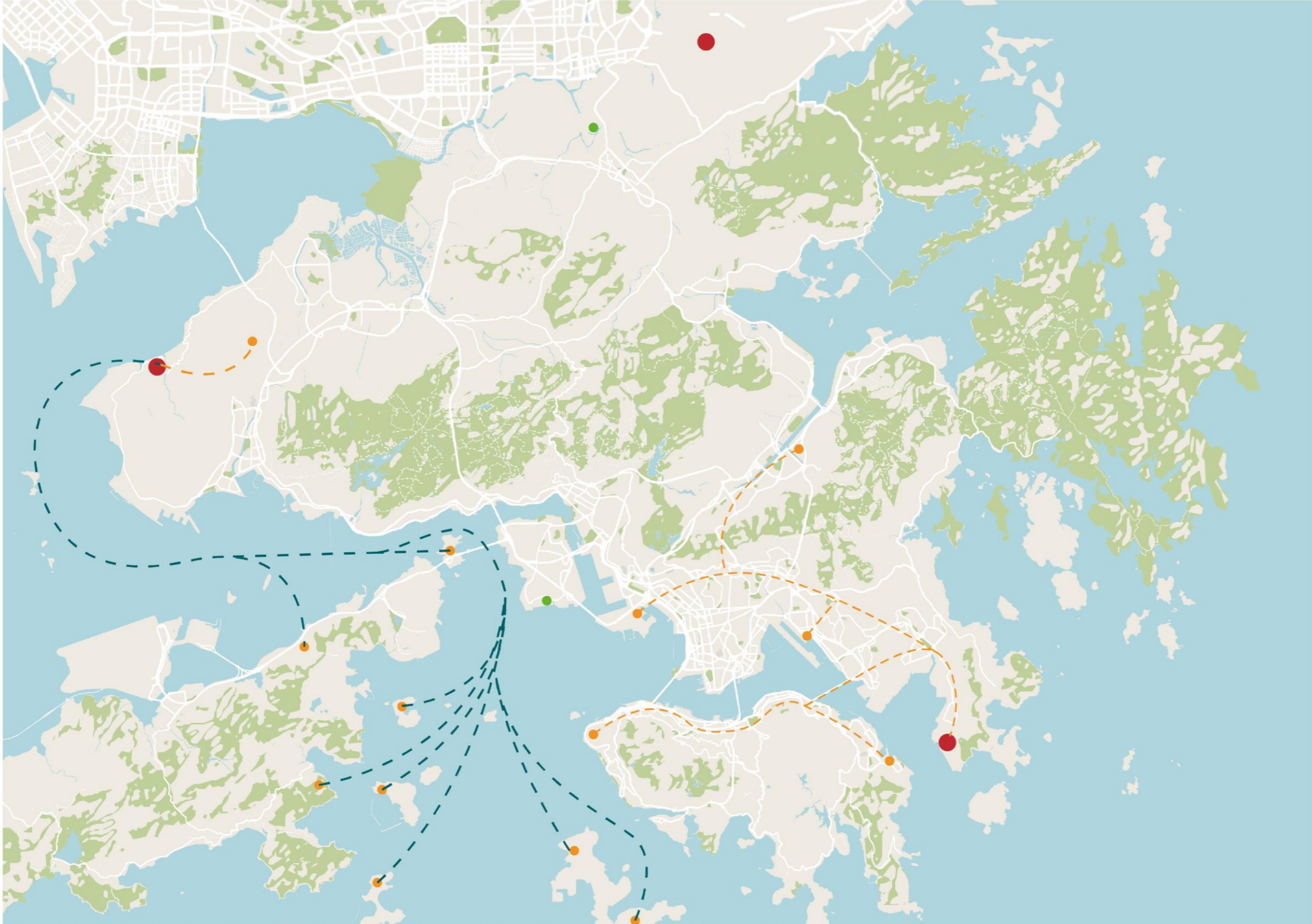
Where does the trash go?
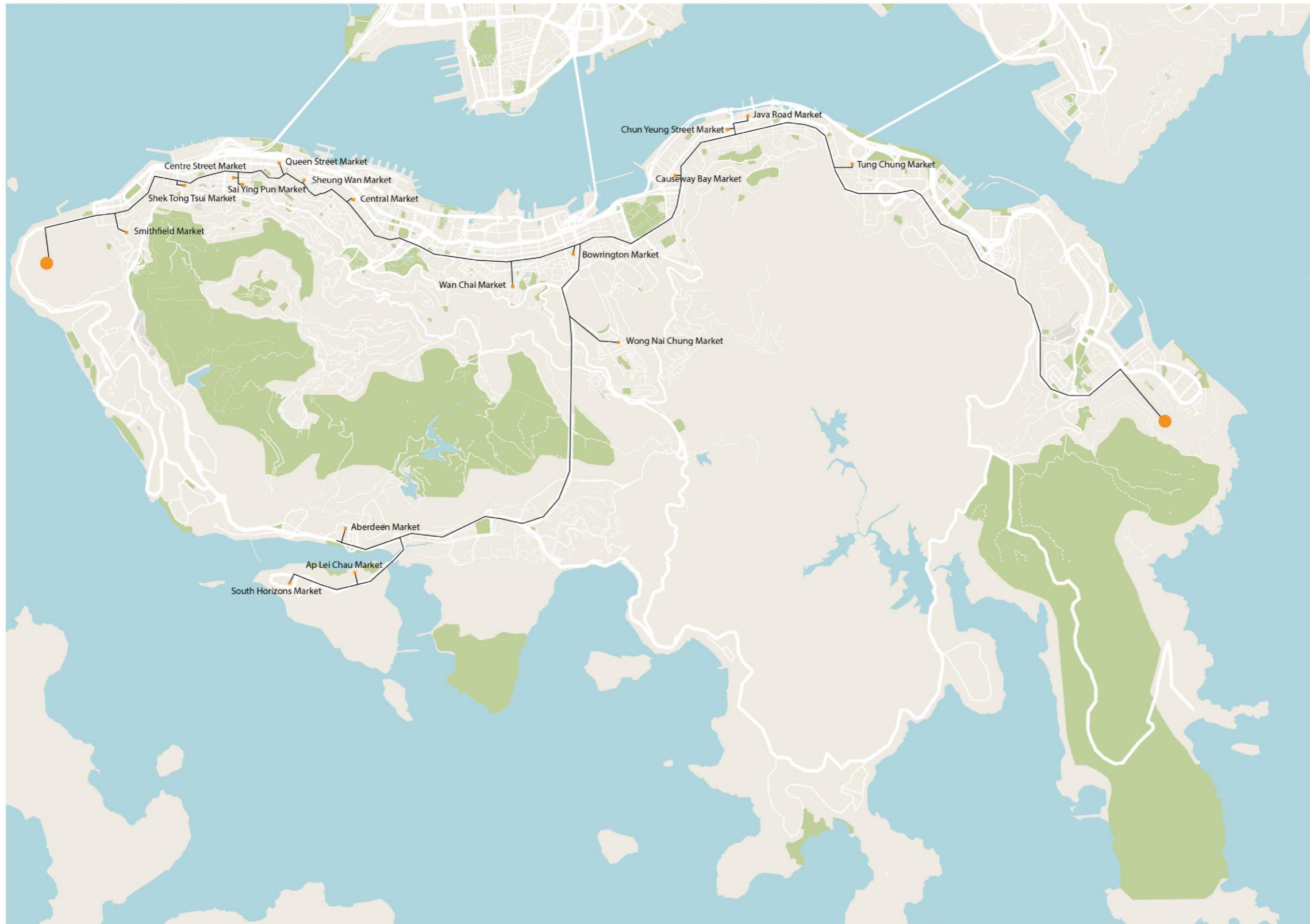## Hong Kong current municipal solid waste routes

Where does the trash go?

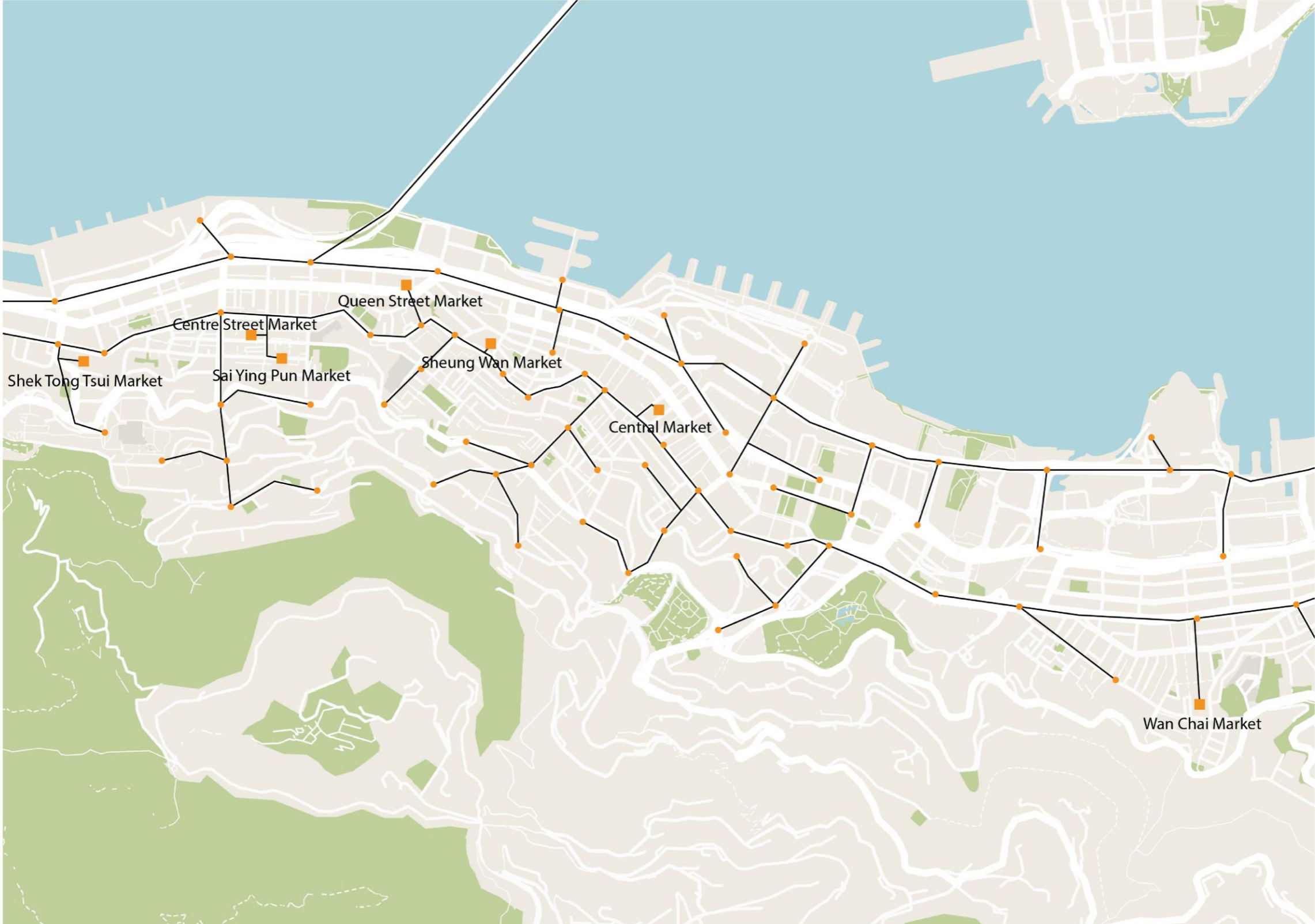## Hong Kong new municipal solid waste routes

Where does the trash go?

Hong Kong island | automated waste collection system

Centre Street Market
Queen Street Market
Shek Tong Tsui Market
Sai Ying Pun Market
Sheung Wan Market
Smithfield Market
Central Market
Java Road Market
Chun Yeung Street Market
Tung Chung Market
Causeway Bay Market
Bowrington Market
Wan Chai Market
Wong Nai Chung Market
Aberdeen Market
Ap Lei Chau Market
South Horizons Market

Where does the trash go?
Hong Kong island | automated waste collection system

Queen Street Market

Centre Street Market

Shek Tong Tsui Market

Sai Ying Pun Market

Sheung Wan Market

Central Market

Wan Chai Market

references

Hong Kong

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AWCS

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others

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https://www.beesmart.city/solutions/pneumatic-vacuum-automated-solid-waste-collection

etc.

google images

THANK YOU