

An aerial photograph of a city skyline, likely Seattle, with a dense cluster of skyscrapers in the background and residential buildings in the foreground. A large green rectangular overlay is positioned in the center, containing the text ((SENSONEO)) in white. Below the green overlay is a white rectangular area containing the text 'Manage waste smarter' in black.

((SENSONEO))

Manage waste smarter

“Sensoneo provides smart enterprise-grade waste management solutions for cities and businesses to cost-efficiently manage the waste lifecycle, to improve the environment and well-being of people “

Martin Basila
CEO and Founder



About company

Sensoneo has been providing complex smart waste management solution to global markets since 2014.

We drive innovation in waste management market by development of comprehensive measurement and analytical tools complemented by the state of art hardware designed in-house.

Sensoneo hardware solution is compatible with majority of IOT networks worldwide operating on GPRS, NB-IOT, CAT-M, SIGFOX or LORA.

Sensoneo Quality Management System is certified ISO9001:2015 and ISO14001:2015 as QUALITY is a priority in Sensoneo.



10

Senior Engineers

Developing in-house state of art hardware and software solutions

56

Countries

With SENSONEO active sensor units and software deployed

320

On-going Projects

With waste collectors, municipalities, waste brokers, universities, highway operators...

40

Certified Partners

Local partners supporting deployments in various regions worldwide.

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An aerial photograph of a city, likely Seattle, serves as the background. Overlaid on this is a 2x2 grid of colored rounded rectangles. A white crosshair, consisting of a vertical arrow pointing up and a horizontal arrow pointing right, is centered over the grid. The four quadrants are: top-left (red) 'Asset Management Solution', top-right (green) 'Waste Monitoring Solution', bottom-left (purple) 'Route Planning Solution', and bottom-right (teal) 'Industry Specific Solutions'.

**Asset Management
Solution**

**Waste Monitoring
Solution**

**Route Planning
Solution**

**Industry Specific
Solutions**

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Smart Waste Management Solution

Asset Management

Sensoneo Asset Management solution enables you to **digitize your waste infrastructure and collect reliable verifications on your services.**

Once the bins are not anonymous (Smart Tags), you can create detailed bin database and introduce asset tracking. Above database, we create digital maps of your waste infrastructure showing its qualitative analysis (density, distribution, capacity...).

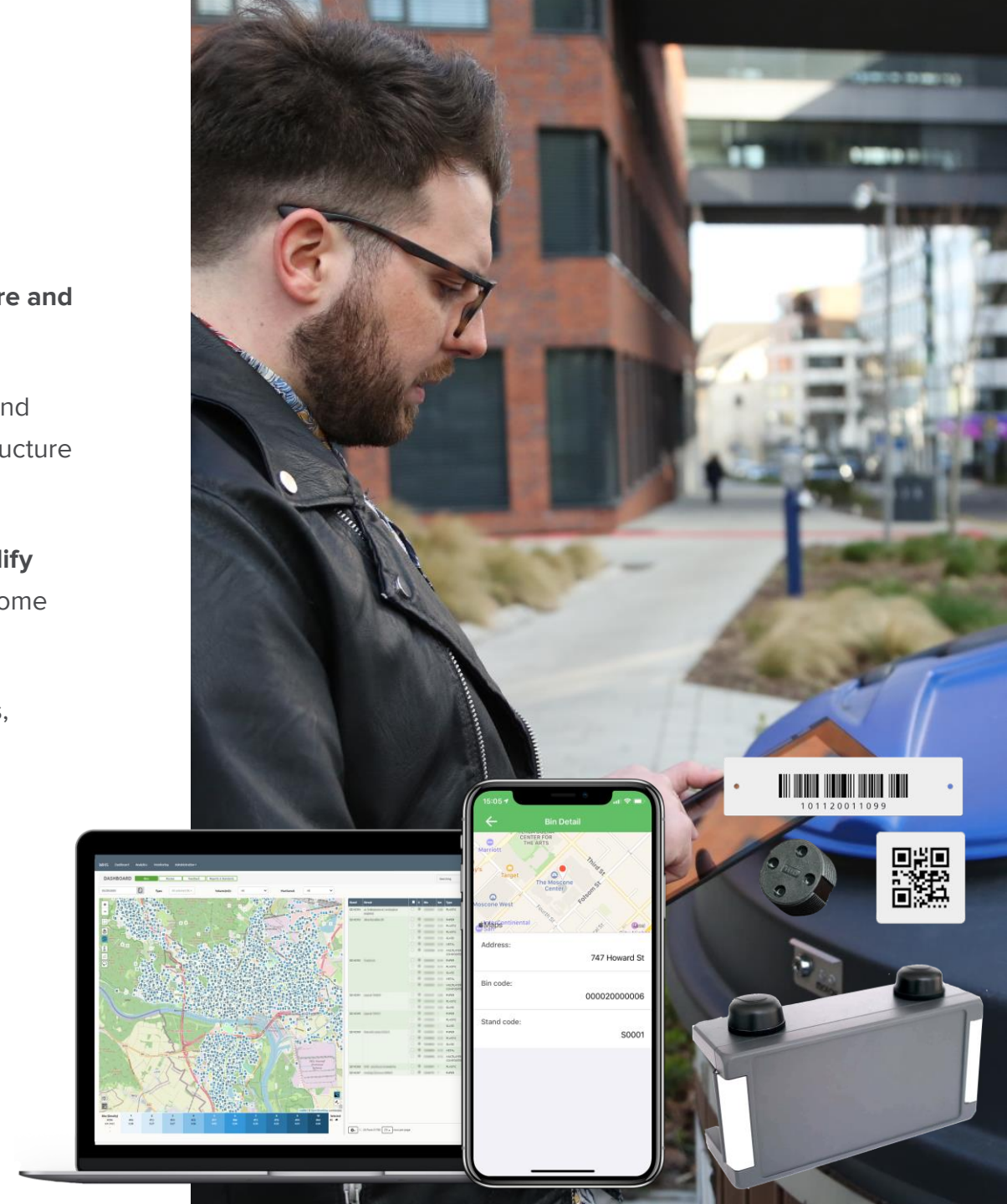
Asset tracking has proven to increase quality of service, improve maintenance, simplify billing & customer communication, and improve fraud prevention. Even citizens welcome clear bin identification.

WatchDog, Sensoneo's ultimate service monitoring device for waste collection vehicles, is the key element of the solution providing

- ✓ Automatic service verification
- ✓ Automatic asset mapping and updates
- ✓ Automatic fraud prevention (unpaid bins)
- ✓ Extremely precise vehicle tracking even in dense urban areas



Solution includes Smart Bin Tags, Smart Waste Management System for operators, WatchDog for vehicles and Citizen App for citizens.





Smart Waste Management Solution

Waste Monitoring

Sensoneo Waste Monitoring solution provides **remote control over bins and power data-driven waste collection.**

Smart Sensors use ultrasound technology to **measure the fill levels in bins & containers several times a day** and send the data to the Dashboard for Operator via Sigfox, NB-IoT, LoRaWAN, CATM and GPRS. Sourcing data to another platform is an option.

To engage citizens, we designed Citizen App, a mobile app informing people of the nearest-available empty bin and **enabling them to provide real-time feedback.**

The Operator has access to **detailed bin inventory, digital interactive map, sensor configuration**, display of live data from Smart Sensors, future predictions on fill levels, different notifications - fire and tilt alarm, and citizen feedback. All available in Smart Waste Management System, powerful cloud-based platform on Microsoft Azure.

- ✓ Remote bin monitoring
- ✓ Eliminate overflowing bins
- ✓ Plan data-driven waste collection
- ✓ Track recycling habits of citizens

Solution includes Smart Sensors, Smart Waste Management System for operators, and Citizen App for citizens.

Smart Waste Management Solution

Route Planning

Route Planning solution **automates the management of the waste collection routes**, based on precise pre-defined data on bins, vehicles, depots, and landfills/ incineration sides.

Solution benefits show in **fewer kilometres driven per kilogram of collected waste and better use of vehicle capacity & time. Even environmental impact is lesser.** More efficient routes mean **less noise pollution, less air pollution and fewer traffic congestions.**

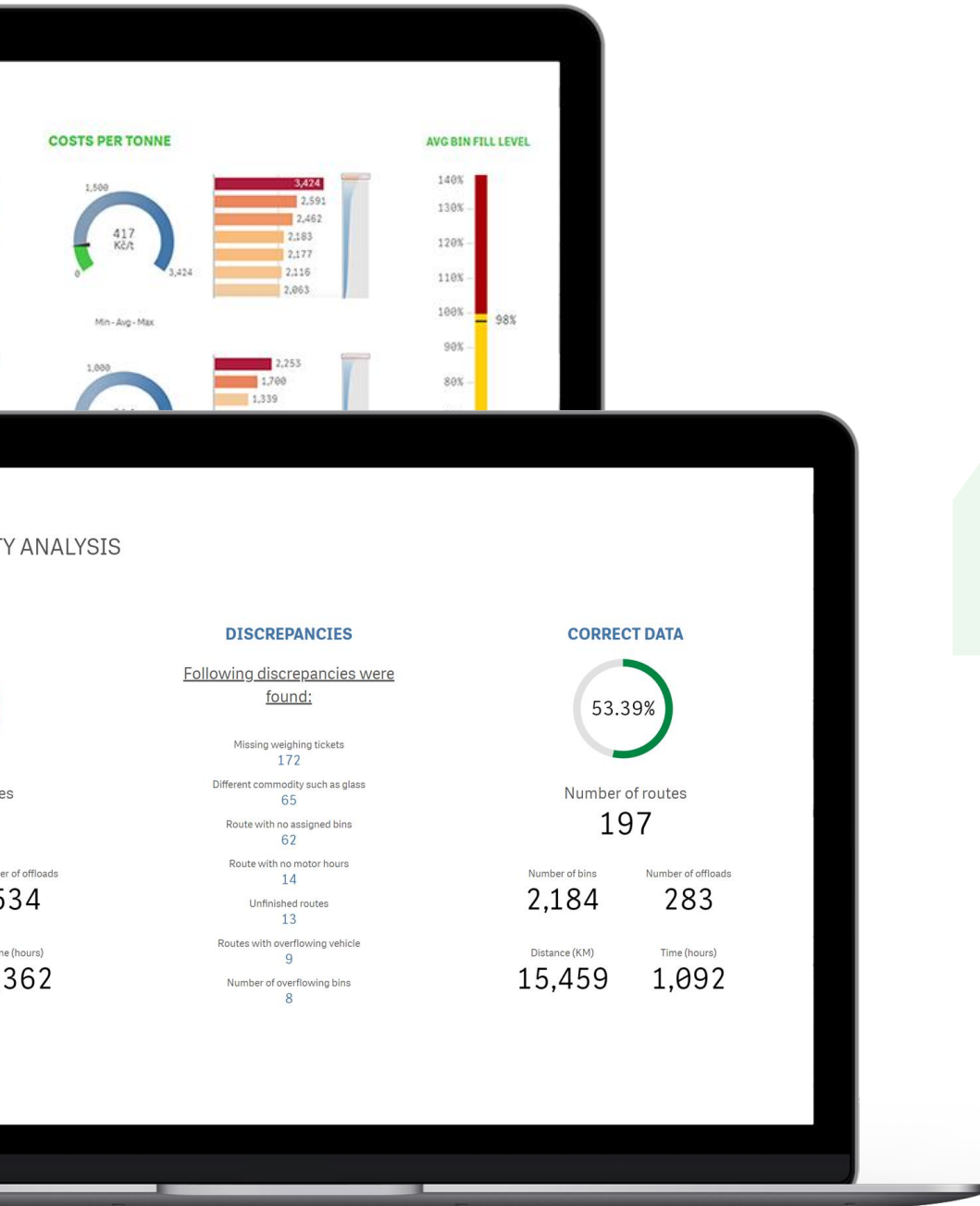
Route Planning Engine is result of inhouse R&D. No other engine available on the market have met our needs – **input 100 vehicles and 10 000 bins**, and calculate a collection plan. The Engine is part of Smart Waste Management System, a powerful cloud-based platform. With everchanging routes, even less experienced drivers can rely on **step-by-step navigation on the route via Driver Navigation (App).**

WatchDog, Sensoneo's ultimate service monitoring device for waste collection vehicles, feeds the Platform with vehicle tracking and service verification data to see if reality fits the plan.

- ✓ Plan collection routes automatically
- ✓ Optimize collection routes, frequencies and vehicle loads
- ✓ Calculate collection costs, time and distance
- ✓ Navigate drivers with mobile app

Solution includes Smart Waste Management System for Operators, Driver Navigation for Drivers WatchDog for vehicles. Data from Smart Sensors or Smart Bin Tags are beneficial.





Smart Waste Management Solution

Collection Efficiency Analysis

How efficient is your waste collection?

Sensoneo Collection Efficiency Analysis provides a **clear understanding of how well you currently operate** in terms of waste collection. Can you truly rely on your records? Are your current collection routes efficient? Do you maximize the use of vehicle capacities? Where could you save costs?

Answers to these and many other questions are already present in your existing records. Sensoneo experts provide a **comprehensive analysis of your “AS-IS” status through a deep dive and evaluation of your existing records.**

„AS-IS“ status serves as basis for improvements. Let our Route Planning Engine replan existing routes and **see quantified savings and ROI.**

- ✓ Adjust pickup frequency as needed or even collect on-demand
- ✓ Identify fast filling bins (potential for large-capacity bins)
- ✓ Be smart and plan pickups to maximize use of vehicle
- ✓ Stay on top of ever-changing city ecosystem

Solution includes Collection Efficiency Analysis. Data from Smart Sensors or Smart Bin Tags are an advantage.

Smart Waste Management Solution

Ultimate Service Monitoring Device

For Waste Collection Vehicles

WatchDog device is **essential part of our Route Planning and Asset Management** Solution. It is a result of inhouse R&D. WatchDog is a **device mounted on the collection vehicle** that feeds our platform or any other platform with valuable and reliable data.

WatchDog + Vehicle: Device design ensures a **high location accuracy** (GNSS, +/- 10cm) even where most GPS trackers struggle (in **highly dense urban areas** or mountain valleys). Still accurate tracking even in case of **lost signal is available through dead reckoning**. Such vehicle tracking allows for **sensitive monitoring of driving patterns** (acceleration).

WatchDog + RFID Tags: Imagine you **recognize every bin** you empty, and even those near the vehicle. Welcome precise **service verification** (bin& timestamp& GPS) and fast **fraud prevention** (unauthorized trash pickups). Such detailed tracking ease **settling customer disputes (missed pickups)**, employee disputes and provides **unprecedented remote control**.

- ✓ One complex device replacing several basic ones
- ✓ Device installation under 90 minutes. No adjustments to vehicle needed.
- ✓ Network agnosticism (GPRS, NB IoT, CATM1, LTE)
- ✓ Integration via all common interfaces

WatchDog is available as a part of Sensoneo solution or separately. We can accommodate API or direct integration. .

Device
installation under
90 minutes





7 days

Express system
deployment

Industry Specific Solution

Factory Waste Management

Factory Waste Management solution **minimize disruptions of the production by waste collection**. Where production happens, waste is produced. Eliminate overflowing bins or unnecessary disruption by waste collection.

Solution **automates management of waste collection** based on the floorplan, precise pre defined data about fleet, schedules, depots, and discharges.

- Just in Time Waste Collection
- Precise collection of the requested bins only
- Manual (Smart Button) or automatic (Smart Sensor) pickup requests
- Automated route planning without the need of human interaction
- Step-by-step driver navigation on the factory floorplan
- Feedback gathering during the collection route
- Data analyses from each bin and route

Solution includes Smart Button or Smart Sensor, Smart Waste Management System for operators and Collection App for drivers.

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Industry Specific Solution

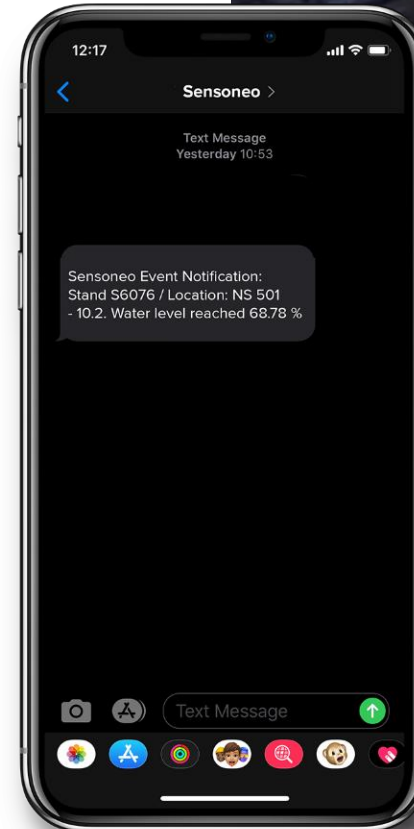
Early Overflow Warning System

Sensoneo Octopus sensor is an enterprise-class device intended as an early overflow warning system. **It measures water level in a manhole.**

It's fully adjustable for different depths. Thanks to adjustable water level indicators (tentacles), Octopus can detect up to 3 different thresholds up to 25 meters. As the water level is rising, the tentacles recognize when they start floating and send event-driven notification via GPRS or GSM network.

Operator can see notification in **Smart Waste Management System**, powerful cloud-based platform. The platform can even send customized notifications via SMS or email.

Solution includes Octopus Sensor for manholes and Smart Waste Management System for operators.



A person with short brown hair, seen from the back, is looking at a wall covered in various design sketches, photos, and diagrams. The person is wearing a grey and black striped sweater. The wall is a collage of creative work, including flowcharts, photographs of people and objects, and hand-drawn diagrams. The overall tone is professional and creative.

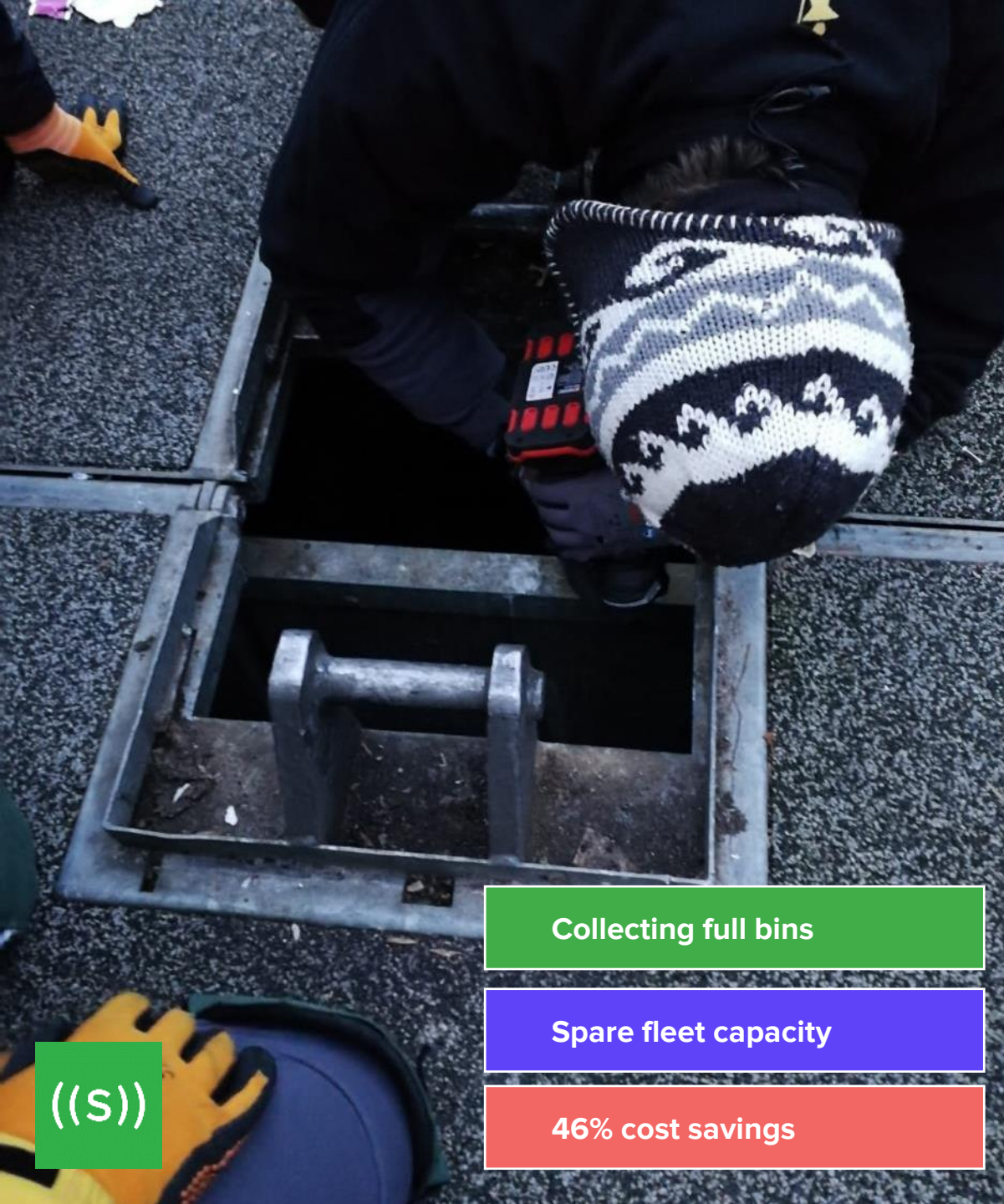
Good decisions are data-driven decisions.

Sensoneo enables you to make truly good decisions.

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Customer References



Collecting full bins

Spare fleet capacity

46% cost savings

Reference: Collection Routes for Prague, CZ

The Partner

City of Prague, the capital of Czech Republic, with 1.3 M inhabitants. Several collection companies are present, the project partner is Prague Services, the municipal waste collector. **Waste Collection revenue in 2019 was 56 M Euro.**

The Scope

Increase efficiency of waste collection by designing new collection routes. Collection Efficiency Analysis covers **5 400 bins** (bottom emptying) serviced by **19 vehicles**. About 65% bins is glass waste. 300 bins are monitored by Smart Sensors.

Expectations

- Analysis of AS-IS situation
- Designing new collection routes and schedules

Implementation

Analysis showed

- **BINS:** average fill level in bins was only 46%
- **FLEET:** fleet capacity (time) was used only by 43%
- **DATA QUALITY:** 25% of data from Prague was not complete

New collection routes & schedule brought 46% cost savings.



Large-capacity bins

498 monitored bins

30% cost savings

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Reference: Optimizing collection schedule

ThePartner

Municipal Waste Collector in mid-sized town /150k citizens/ in CEE region.
They collect **48k+ tons of waste per year from 23k+ bins.**

The Scope

Adjust waste collection schedule to accommodate new large-capacity bins / 5x bigger than old ones/. Prevent waste of resources on collection half-empty bins.

Expectations

- Waste Monitoring with Smart Sensor
- Plan dynamic collection routes based on fullness levels

Implementation

Implementation of Smart Sensors and Route Planning tools results in

- BINS: average fill level in bins is 75%
- FLEET: routes are calculated to fill up the vehicle
- ROUTES: dynamic planning based on predictions

New collection routes & schedule brought 30% cost savings.

60% cut on workload

Longterm cooperation

1 M Euro contract value

Reference:

Coordinating collection logistics with 3rd parties

The Partner

Asekol, a nation-wide take-back system for electrical and electronic equipment (EEE) in the Czech republic. They manage network of **25k+ pickup spots** /stores, schools etc./ and **3.5k+ “red” bins accross 78,865 km²**.

Asekol does not own vehicles. All collection is outsourced to local waste collectors – **40+ partners**.

The Scope

Contract the right pickup frequency from partners. Waste monitoring in bins uncovers filling cycles to set the right pickup frequency. The schedule is fixed.

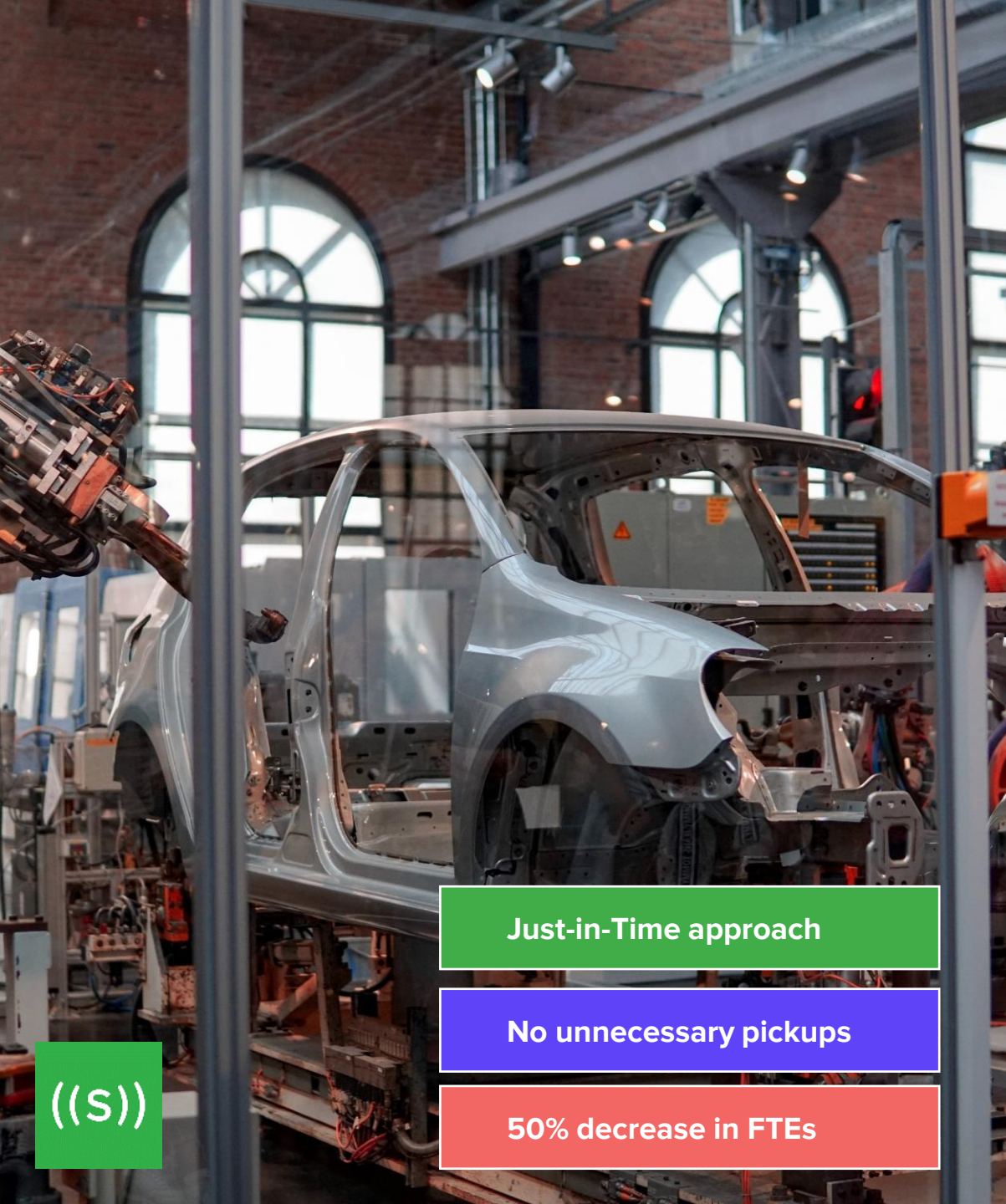
Expectations

- Decrease collection costs
- Eliminate overflowing bins
- Provide a service verification on contracted partners

Implementation

In 2016, we launched pilot on monitoring 50 bins. Today, we monitor 700+ bins in remote locations. Moreover, in 2020 Sensoneo is designing a Core system for Asekol to manage whole waste logistics. The foundation of the system was existing Sensoneo solution. **They expect to cut the workload of Logistics department by 60%.**

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Just-in-Time approach

No unnecessary pickups

50% decrease in FTEs

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Reference: Just-in-time Waste Collection

The Partner

Global automotive producer with HQ in the USA. The company decided for a pilot project in two factories based in Germany.

The Scope

Organize waste collection based on on-demand requests (Smart Button) or based on fixed schedule. Provide service verification and statistics on waste production.

Expectations

- Minimize disruptions of the production
- Eliminate overflowing bins and ensure sufficient bin capacity
- Automate logistic planning to streamline whole process
- Provide service verification and driver navigation within the floorplan

Implementation

In May 2020, the customer was looking for a new supplier to solve the waste logistics within their premises. Sensoneo solution was deployed and piloted during summer 2020. Now, **the whole waste collection in the factories is run by Sensoneo solution.** It is automated. Management has full remote control. Service quality improve significantly.



Just-in-Time approach

Less boxes, less pickups

70% cost savings

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Reference: Securing waste documents

ThePartner

Pan European Commercial Bank with offices in Vienna.

The Scope

Sensitive documents for shredding are collected and picked up by 3rd party. Thanks to secure design of collection boxes, it is not possible to see how full is the container. So when do you bring the new box?

Expectations

- Increase quality of service
- Minimize disruptions in the office
- Eliminate overflowing boxes and ensure safety of sensitive documents
- Seamless box replacements upon fullness

Implementation

Shredding boxes are monitored by Smart Sensors. The Operator (supplier!) has remote access to fullness data and can organize box logistics. Based on 3-month data, **number of boxes was reduced by 50% and on-demand pickup frequency is 20% lower than before.**



New collection routes

67% less vehicle time

63% cost savings

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Reference: Data driven collection routes

ThePartner

Private waste collection company servicing 2 municipalities located in close proximity. Municipalities have large-capacity bins that require hydraulic arm.

The Scope

Draw more efficient waste collection plan how one vehicle can service both towns.

Expectations

- Uncover bin filling cycles
- Set right pickup frequency
- Plan collection routes to minimize the time allocation of the vehicle – to free as much time for other customers

Implementation

Waste Monitoring with Smart Sensors have discovered that bins **are just 24 % full when collected** in Municipality A and just **45 % full when collected** in Municipality B. (Average for 6-month period).

Town A: Adjustments to routes and pickup frequency resulted in **63% cost savings**, 70% decrease in pickups and 67% savings on vehicle time.

Town B: Adjustments to routes and pickup frequency resulted in **43% cost savings**, 52% decrease in pickups and 49% savings on vehicle time.



Full remote control

Early warning on overflow

Keeping roads safe for driver

Reference: Global Highway Operator

The Partner

Granvia Operation is a 100% subsidiary company of VINCI Highways. The main focus of the company is 24/7 maintenance of entrusted motorways.

The Scope

Ensure no manhole will spill on the road **causing life threatening situations for drivers**. Early intervention by Granvia personnel saves lives. Granvia Operation was looking to remotely control the rising levels in manholes where oil is filtered from the rainwater.

The Expectations

- Early interventions with no stress (52 locations along a motorway)
- Full remote control over water levels and warning

Project:

In May of 2019, Sensoneo installed 52 Octopus Sensors to the oil separators. The system notifies Operator on rising levels. Operator have **sufficient time to send colleagues without stress** for a field visit eliminating any life threatening situations on the road.



**Better
quality of life**



**More bins
on right places**



**Cleaner & safer
streets**



**More free
public space**

Sensoneo creates Sustainable cities



**Less air &
noise pollution**



**Decrease in pickup
frequencies**



**Lesser burden
on traffic**



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