



Quamtra

Smart waste management

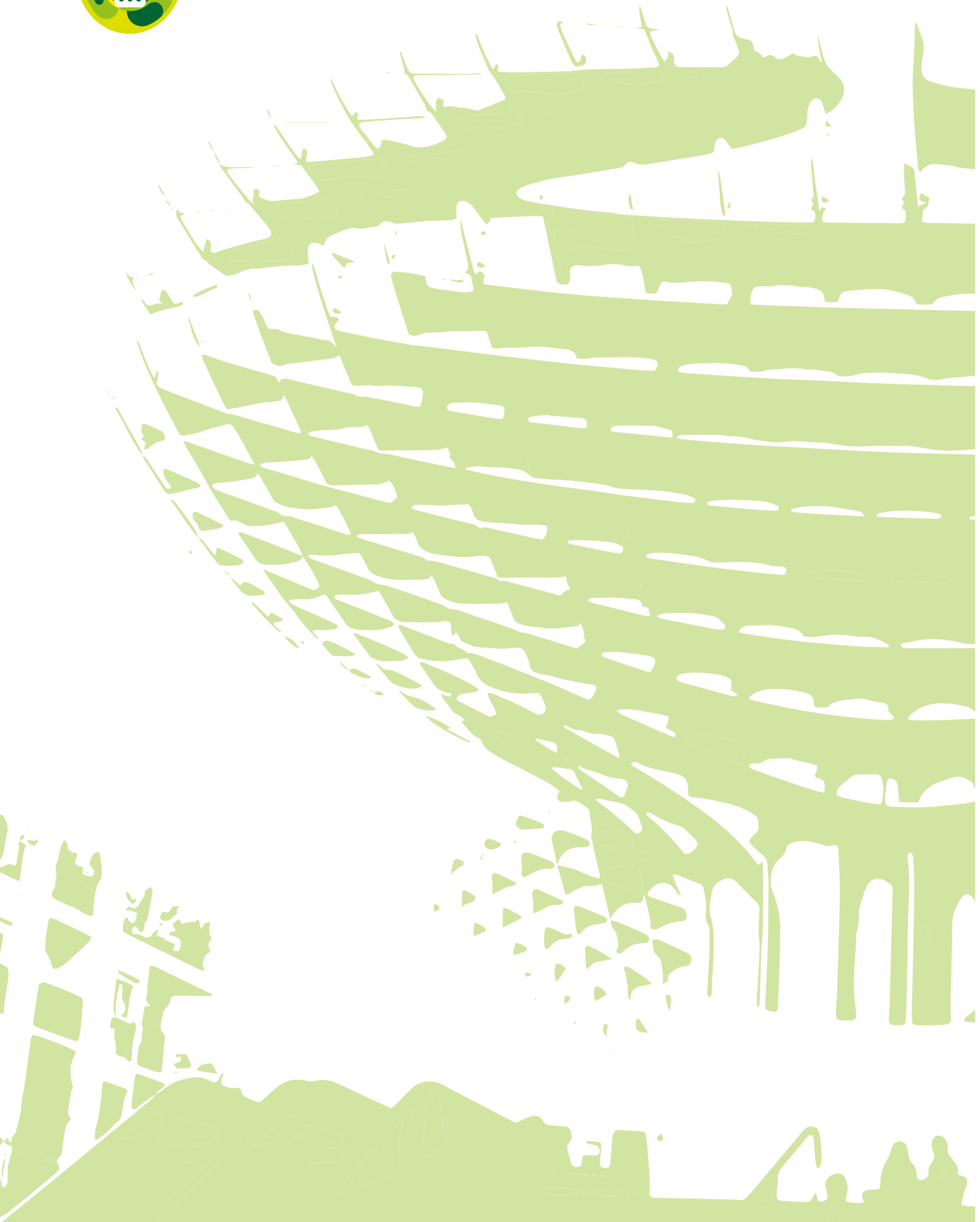
Wellness Telecom 

LIFE EWAS, a case study of
successful ICT implementation
for waste collection in Seville





Quamtra





LIPASAM, some figures

LIPASAM is the municipal waste collection company that serves the city of Seville. For the last 30 years, it has been responsible for cleaning 8.7 mi² and 669 miles of roads, as well as collecting urban waste and subsequently treating it to save resources and prevent environmental pollution. It serves approximately 700,000 citizens.

To do that 365 days a year, LIPASAM has an average workforce of 1,555 workers. It has 461 vehicles and manages 50,000 units of street furniture, including 13,000 waste containers.

LIFE EWAS PROJECT

Wellness Telecom leads a European project named LIFE EWAS, as part of an international consortium of companies invested in environmental consulting and waste management. The project goal is to test “Methodologies for efficient and sustainable waste management using ICT tools that enable the reduction of GHG emissions” (Greenhouse gasses).

Through LIPASAM, a public sector partner in Spain, Seville became the

testing ground for piloting EWAS and scaling its results. EWAS is a European Commission initiative, born of the LIFE program within LIFE + 2013 Environment Policy and Governance Project application. The town of Chania, in Greece, was also one of the testing locations.

The project involved implementing an ICT solution applied to waste management to achieve waste collection optimization in 3 city routes, as well as the development of a public- information and awareness platform. The waste material chosen to for monitoring was glass, although the project has tested other waste materials. Because glass containers tend to fill in a homogenous way, it presented the best option to pilot the service experience. The data that follow are, therefore, based on monitoring glass.

In the Seville's case, a total of 268 containers were monitored: 215 side loading glass containers in 3 cyclical collection routes, 29 underground plastic, and glass containers, and 24 with different waste materials to test the device's validity.

STARTING POINT

LIPASAM's municipal solid waste collection plan was based on pre-defined routes, established by past service experience. This method resulted in unnecessary costs and underutilization of resources. Empty containers were often collected, while other containers would overflow causing an increase in cleaning costs and discontent among citizens.

With this scenario in mind, LIPASAM sought a system that would optimize its waste management. The LIFE EWAS project represented a perfect opportunity to implement ICT solutions that help public companies achieve improvement milestones.

PROPOSED SOLUTION

The technological solution used was Quamtra, a system developed entirely by Wellness Telecom that includes a hardware device for both measuring waste container fill level and collecting data, and a software platform for data management and visualization.

The hardware's sensors measure fill level through a configurable ultrasound beam, determining the dis-



tance between the top of the waste and the device, which is placed in the internal upper region of the container. In addition to this volumetric measurement, Quamtra's sensors incorporate other features like an accelerometer and a temperature sensor that enables data aggregates and other useful parameters for data collection. The data are transferred wirelessly to the management platform and analyzed by the municipal collection manager.

The knowledge Wellness Telecom gained while managing the problems posed by this and other projects, has resulted in a versatile measuring device that is compatible with multiple connectivity scenarios and most containers on the market.

These devices turn containers into smart containers that generate real-time data about their status. In turn, the collection manager receives useful information about their container system, allowing them to make permanent adjustments to collection routes based on waste volume in containers, alerts generated during vandalism instances, floods or fire alerts, and the seasonality and dynamism of a city like Seville (local festivals, events, etc).

PROJECT PHASES

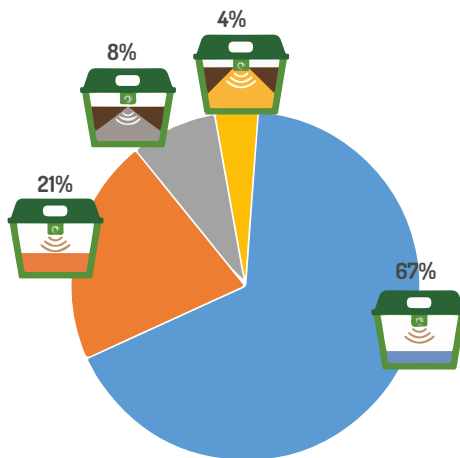
MONITORING phase: January-June 2016

After 6 months of monitoring, the Quamtra sensors installed in waste containers show the following:

- 67% of containers were being picked up at a fill level of 15-25%
- 21% of containers were being picked up at a fill level of 25-50%
- 8% of containers were being pic-

ked up at a fill level of 50-60%

- 4% of containers were being picked up at a fill level of 60-90%



15% - 25% 25% - 50% 50% - 60% 60% - 90%

It became evident that a large percentage of containers were being picked up with a very low fill level: 88% was collected with a fill level lower than 50%.

In this first phase LIPASAM gained previously unknown and valuable information thanks to the implemented solution:

- Monitoring and alerts for container fill level.
- Monitoring and alerts for collection with the accelerometer.
- Monitoring and alerts for potential vandalism with the temperature sensor and accelerometer.

ADJUSTMENT Phase 1: July-December 2016

Quamtra was used as an auditing service to re-plan routes based on:

- The measurements obtained in the monitoring phase, using historical data from January to June and discarding data in real time as the platform continued to collect it.

- The following two premises:

- > Containers should not overflow. To prevent this, alerts should occur when the fill level reaches 80%.
- > Each truckload, cannot exceed 10,000 to 11,000 kg (depending on truck model). This means 2 trips to the Waste Transfer Plant for each service round.

Based on these data and assumptions, LIPASAM generated a theoretical model to unify the three routes monitored in one and collect the containers that the model predicts will be full.

Several iterations of the model were produced between July and August to reduce the number of service rounds, as some issues associated the number of containers collected and their status became evident. Among the many iterations there were:

- 1 Dynamic Route of 50 containers every 12 days due to container overflows and excess truckloads.
- 1 Dynamic Route of 50 containers every 10 days due to container overflows and excess truckloads.
- 1 Dynamic Route of 55 containers every 7 days due to occasional excess truckloads.

The final analytical conclusion that the service rounds could be reduced while maintaining quality with a dynamic route of 50 containers every 6 days was reached and tested from September to December 2016.

ADJUSTMENT Phase 2: January 2017 onwards

As a parallel effort to piloting the new route defined during Adjustment phase 1 (a dynamic 50 container route every 6 days), the



Quamtra

real-time data from the Quamtra system, which LIPASAM continued to receive, was leveraged to validate the service model. This data provided evidence showing that a significant number of containers were still being collected below optimum fill levels, due to the rigidity of the initial theoretical service model. This first model did not incorporate the changing variable of fill frequency created by a dynamic population. The data also revealed that using Quamtra as a mere temporary auditing service system does not yield the full margin of improvement the solution provides.

LIPASAM then decided to discard the model and favor creating a definitive dynamic route, "THE EWAS ROUTE," which encompasses their three original routes. This route consists of 55 containers collected every 7 days where each container picked up is marked as suitable for collection by the system.



José Andrés Ferrete,
Head of
street
furniture,
LIPASAM

"With the information we received from the sensors and collection platform on glass containers' fill level, we were able to reduce the number of pick up rounds from 3 every 12 days, down to 1 every 7 days. This meant going from 100 rounds per year to 34, and optimized routes, going from 3 static routes to 1 dynamic one, 400 fewer hours a vehicle is on the street per year, which then means traffic improvement and reducing noise and odors caused by collection trucks."



**Permanent
monitoring and
adjustment of routes
depending on fill
level**

**Waste containers are
collected based on
historical fill level
data**





RESULTS

	STARTING POINT	POST EWAS POINT	REDUCTION
ROUTES	3	1	66%
SERVICES/ YEAR	100	34	
HOURS/YEAR	700	255	

The data collected to evaluate the benefits of implementing Quamtra’s technology over time show that this project now allows LIPASAM to offer Seville an optimized service. It has reduced collection costs by 60% after phasing out 3 fixed collection routes, for 1 dynamic route (The EWAS ROUTE). It has reduced annual collection service rounds from 100 to 34; the number of hours the trucks are on the street, thereby decongesting traffic; the miles driven; the fuel used, and the noise created.

	SERVICE	STARTING POINT (100 SERVICES)	POST EWAS POINT (34 SERVICES)	SAVING
COST (€)	460	46. 070	15. 642	30. 364
KM	107	10. 700	3. 638	7. 062
LITERS	56	5. 600	1. 904	3. 696

PROJECT BENEFITS

- Permanent real-time data source for route optimization and planning.
- Optimization and reallocation of collection resources.
- Reduced preventive and corrective maintenance.
- Reduced operating costs.
- Better service.
- Better perception of service quality by citizens.
- Public awareness.
- GHG emission reduction.

CONCLUSIONS

- The results show that ICT is an essential and inescapable part of optimizing the public services management.
- Real-time data allows a waste-collection manager to speed-up reaction to dynamic conditions affecting routes and increase service efficiency.
- Cities should be aware of the Smart paradigm to ensure their sustainability.
- Citizens must be at the heart of these initiatives and be included in the implementation solutions, as the benefits should result in better service to them.

NEXT STEPS

LIPASAM has decided to continue receiving Wellness Telecom service after the LIFE EWAS pilot program ends. The viability of this decision is owed to savings created during the pilot program, and motivated by the possibility of monitoring more types of waste containers.

Thanks to this experience, LIPASAM is now exploring new service improvement paths through ICT integration in their entire value chain.



Virginia Pividal García,
Managing Director,
LIPASAM

“Thanks to the application of this technology and the data provided by the sensors, our costs associated with collection have been reduced by 66%.”



José Antonio Cabo, Quamtra
Product Manager
Wellness Telecom

“Our Quamtra sensors turn containers into intelligent and active resources. This product is a perfect example of appropriate use of technology in favor of resource efficiency and emission reduction.”



Quamtra



IMPROVE THE QUALITY OF SERVICE OFERED TO CITIZENS

We are the IoT partner for Smart City Projects

Wellness Telecom is a company specialized in technological solutions for smart cities and industries

Our smart solutions based on the new paradigm of Internet of things: we devise, build and deploy solutions in both hardware and software development.

We design own intelligent infrastructures and technologies to provide and create more efficient, liveable cities.

Solutions are focused on several areas: intelligent lighting; monitorisation and Energy Optimization: waste management; leakage management and quality of the drinking water; Intelligent management of urban parking; open government and citizen participation: quality of life.

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