



WINPOL

Interreg Europe

Waste Management
Intelligent Systems and Policies



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Good Practices Guide

Promoting innovation to improve
waste management at the local level



European Union
European Regional
Development Fund

List of abbreviations

API	Application programming interface
CAS	Civic amenity site
CLO	Compost like output
CTO	Chief Technology Office
DtD	Door-to-door
EU	European Union
FUSIONS	Food Use for Social Innovation by Optimising Waste Prevention Strategies (http://www.eu-fusions.org)
GDPR	General Data Protection Regulation
GHG	Greenhouse gas
GIS	Geographic information system
GPRS	General Packet Radio Service
ICT	Information and communications technology
IT	Information technology
KAYT	Know-as-you-throw
PAYT	Pay-as-you-throw
PET	Polyethylene terephthalate
PMD	Plastic bottles, metal packaging and drink cartons
RFID	Radio-frequency identification
UCO	Used cooking oil
WEEE	Waste of electrical and electronic equipment

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The content of each Good Practice is under the responsibility of the WINPOL partner who identified this practice and was in charge of compiling information. This guide has been prepared by ACR+ in October 2020. Discover ACR+ on www.acrplus.org

Introduction

Technology is revolutionising how waste is collected and treated. But the degree of adoption of innovative equipment and practices varies significantly from one territory to another. By bringing together public authorities from across Europe, WINPOL offers to bridge the technology and information gap and to mainstream associated best practices and policies related to waste management, thus contributing to waste minimisation in European cities and regions.

WINPOL in short

WINPOL is a European project, funded under the Interreg Europe programme, that fosters the use of intelligent equipment and policies in municipal waste management. Since June 2018, nine partners across Europe – eight public authorities represented by the municipalities of Antwerp (BE), Drobeta Turnu Severin (RO), Heraklion (GR), the county of Mehedinti (RO), the region of Crete (GR), EMULSA (ES), Snaga (SI), ERA (MT) and ACR+ (BE) as advisory partner – are cooperating in this four-year-and-a-half project.

It is organised in two phases:

- 1. Interregional learning (2018-2020):** partners identify and exchange good practices, conduct study visits and incorporate the knowledge into concrete action plans;
- 2. Implementation (2020-2022):** partners put into action the knowledge acquired, monitor their results, and share solutions with other European cities and regions.

The Good Practices

Three thematic seminars took place during the first phase enabling project partners and their local stakeholders to identify and exchange relevant good practices, either existing on their territories or coming from external public authorities thanks to the input of ACR+. The seminars tackled three main topics:

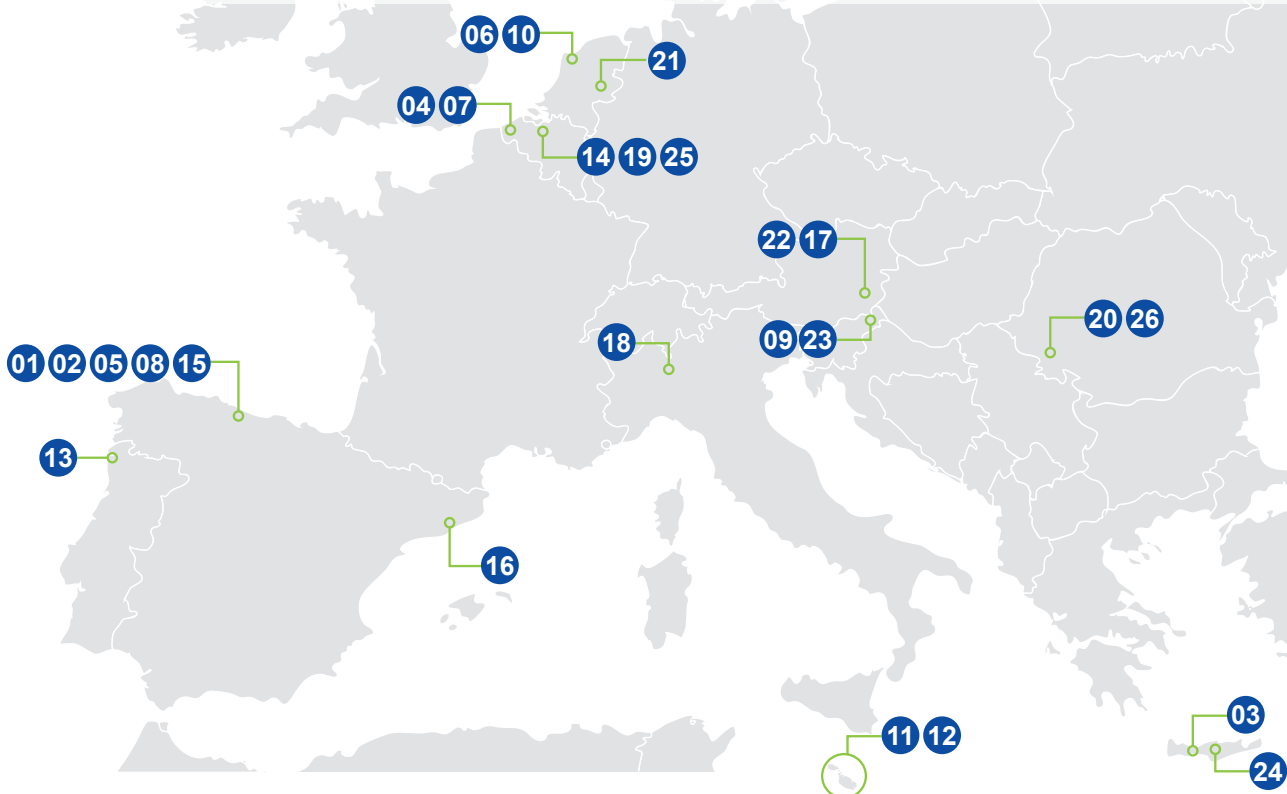
- Collection and use of information to optimise waste management (May 2019);
- Innovative models for waste collection, prevention, and reuse and recycling (November 2019);
- Innovative tariffication (June 2020).

This guide gathers all the good practices selected by the WINPOL partners, separated into two categories: “Use of data and technologies to optimise systems” and “Innovative models”. We invite you to explore these good practices either by geographical location or by the theme(s) associated to it. They are also available online on the WINPOL website (www.interregeurope.eu/winpol/good-practices).



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	Awareness raising and communication	Civic amenity site	Collection	Data management platform	Eco-event	Equipment	Feedback to citizens	Fly-tipping clearance	Food and organic stream	MBT plant	Mobile app or online tool	Monitoring and decision making	Prevention	Recycling	Reuse	Spatial analysis	Tarification
01 Civic Amenity site access control		●										●					●
02 Connecting online with users: Citizen app, Sustainable businesses map and Reusapp								●			●				●		
03 Container sensors for optimized waste collection			●			●											
04 Customer portal for collected bulky waste at civic amenity sites		●					●					●					
05 Electronic closure on waste containers and use of information						●						●					
06 Information-based waste collection								●									●
07 Mobile app on bulky waste for reuse and recycling							●				●				●		
08 Operating aid system and waste collection weighing		●				●											
09 Route optimization for waste collection			●														●
10 Sharing data on waste and resources with the public				●								●					
11 Smart bins to recycle anytime, anywhere			●				●										
12 Solar compact waste bins			●			●											
13 Waste management datacenter			●	●								●					
14 Waste management data warehouse				●								●					

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17 G'scheit feiern – Reducing waste of events and festivals					●								●		●		
18 Pay-as-you-throw to reach 80% recycling							●										●
19 Pop-up civic amenity sites	●		●											●			
20 Raising awareness on plastic waste with the CAPS Contest	●												●	●			
21 Recycleservice 2025 – A reversed waste collection system for residual waste			●				●										●
22 Reuse Box – New collection scheme for reusable items	●		●													●	
23 Second Chance – Reuse on marketplaces	●				●											●	
24 Smart collection system to optimise used cooking oil to the biodiesel value chain			●						●								
25 The Collection – Improving textile waste collection			●											●	●		
26 Treatment of biodegradable waste										●				●			

Legend



Awareness raising
and communication



Civic
amenity site



Collection



Data management
platform



Eco-event



Equipment



Feedback
to citizens



Fly-tipping
clearance



Food and
organic stream



MBT plant



Mobile app or
online tool



Monitoring and
decision making



Prevention



Recycling



Reuse



Spatial
analysis



Tariffication



*Organisation which implemented
or in charge of the practice*



Implementation timeframe



Use of data and technologies to optimise systems



01

Civic amenity site access control



Monitoring and decision making



Civic amenity site



Tarification



➤ **“Implementation of technological systems to control the access of citizens and SMEs, and to know frequencies as well as quantities and waste typologies in civic amenity sites”**



EMULSA

Municipal Company of Urban Environment Services of Gijón



May 2013 – March 2014

THE PRACTICE

The practice consists in the installation of access control mechanisms and deposit registration in a civic amenity site (CAS). The system enables to control access using an identification card. In addition, users must register the waste to be deposited as well as its quantity.

This process does not necessarily have to be located at the entrance of the CAS but it can be considered in the place where residues are deposited, especially in the CAS where the entrance is separated from the place of deposit. Likewise, validation mechanisms of the data entered will be considered; either verifying them at a later date by the operator or being introduced by the user after supervision. But in no case the user will record the deposit without supervision.

All collected data are stored in a single joint database for further exploitation.



RESOURCES NEEDED

EUR 34,000 are needed to cover: access barrier, screen crozier, license plate reader, card reader, operator device, and software.

EVIDENCE OF SUCCESS

With this practice EMULSA gets information on the number and typology of CAS users, schedule access, the frequency, and the quantities deposited per user.

An increase in the income has been noticed as it enabled to spot companies that were paying as a citizen.

It also helps to avoid overreaching the excess amounts allowed.

CHALLENGES ENCOUNTERED

Improve blocking procedure;

Update to new WEEE regulation (traceability).



POTENTIAL FOR LEARNING OR TRANSFER

In order to be able to control entries to civic amenity sites and the deposits of citizens and companies, it is necessary to set up an access control system. In this way, there is a control of what is delivered, by whom and how often. This allows blocking access to users misusing the service. In the future, it could facilitate the implementation of a pay-as-you-throw system.

Another advantage of the model is that the implementation cost is low.



INFO

info@ecocomputer.com



02 Connecting online with users:
Citizen app, Sustainable businesses map and Reusapp

- 
 Mobile app or online tool
- 
 Fly-tipping clearance
- 
 Reuse



➤ *“An app for citizens to report on problems they might spot in Gijón, another one to promote reuse, and a map indicating where sustainable businesses are located”*

EMULSA
 Municipal Company of Urban Environment Services of Gijón

 **March 2012 – May 2018**

THE PRACTICE

EMULSA has developed two free mobile apps for the city of Gijón - the Citizen app and the Reusapp – and a sustainable businesses map as part of its Strategic Business Plan and the Municipal Waste Management Plan of Gijón. The main goal is to achieve the 50% of reuse and recycling target set by the European Union for the year 2020. These three projects also prevent miscommunication with citizens.

Thanks to the Citizen app, citizens can communicate with EMULSA by signalling problems that they find in town related to the cleaning and maintenance of the urban space and the environment in general. Upon receiving these notifications, EMULSA organises them by types and refers them to the relevant service to resolve the problems.

In one of its civic amenity sites, EMULSA has placed a space where citizens, after being granted the permission, leave the objects that they do not want to use but which are still in good condition and could be used by someone else. These objects are uploaded by EMULSA to the Reusapp where people can pick them up without any cost. The majority of the objects are electric and

electronic devices, childcare material, toys in an adequate state so they can be reused. This app addresses two main problems: the fact that only objects in good condition are accepted and the frequent thefts in the space where the objects are stored.

The Sustainable businesses map is a webpage indicating where stores related to reuse, second hand products, repairing and arrangement, fair trade and in general with the circular economy principles are located.



RESOURCES NEEDED

Citizen app (problems and news) (2012): EUR 12,000

Sustainable map (2018): EUR 7,000

Reusapp (app and space) (2018): EUR 22,500

EVIDENCE OF SUCCESS

- Citizen app: 1,500 Active Users (5,000 downloads); 2,206 problems reported via the app; 4 days for resolution and response (75% of problems reported);
- Reusapp: 802 items exchanged; 4,356 kg of materials sent to reuse instead of landfilling.

CHALLENGES ENCOUNTERED

- Expand facilities (Reusapp);
- Not only good condition objects (Repairing).

POTENTIAL FOR LEARNING OR TRANSFER

All the apps are free, easy to manage.

These applications allow a direct channel of communication between citizens and the company. In the case of the Citizen app, it allows to reduce the response time to incidents, and gives the opportunity to send information to citizens about the service provided.

The Reusapp project gives another life to products and allows people to receive for free a product that they might not afford.



INFO

www.emulsa.org/

<http://gijoncircular.emulsa.es/>





Puedes descargar gratis ReusApp en Google Play para dispositivos Android y en App Store para iPhone y iPad.

Antes de tirar algo...
piensa si puede servirle a alguien.

Súmate al Re

Reusando y Reciclando ayudamos a conservar el medio ambiente.

Y en el Mapa Gijón Sostenible y Circular encontrarás 92 comercios de reparación y venta de segunda mano de Gijón.

gijoncircular.emulsa.es





EMULSA
medio ambiente | mediu ambiente

Gijón | Ixión

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03 Container sensors for optimized waste collection



➔ **“Egarbage, an ICT tool to optimize waste collection methodologies”**

Chania, Crete

DEDISA
Intermunicipal Company for Solid Waste Management in the Region of Chania

July 2014 – March 2017

THE PRACTICE

The goal of EGarbage, implemented in the framework of the LIFE EWAS project funded by the LIFE+2013 programme, was to reduce the frequency of collection routes to collect only full waste containers and through this reduce the resources required for waste collection.

For this, a network of sensors was installed in waste containers for the collection of glass packaging, paper and other recyclable packaging. The sensors were sending data of filling level of each container through GPRS. The data were processed and projected online in a web-based interface to the waste manager, providing him with real-time information on the condition of sensors, containers, the waste materials quantity and the route efficiency.

The pilot scale implementation took place in northern Chania supported by the existing fleet management system E-TRACK with GPRS, used by DEDISA.

It tackled two main aspects:

- Reducing the necessary routes of collection truck in remote areas, hence reducing fuel consumption, by monitoring the filling level of waste

containers for recycling.

- Altering routes in touristic areas with high seasonal population fluctuations between summer and winter to adapt the collection of the container for paper and recyclable packaging (plastics, paper, metals and aluminium) and the container for glass packaging.



RESOURCES NEEDED

- The resources needed cover the installation costs and use costs
- Sensors Cost: EUR 220 per sensor (purchase cost)
- GPRS: EUR 4.70 per connection per month (mobile phone network operation)

EVIDENCE OF SUCCESS

- The pilot carried out in the northern Regional Unit of Chania by DEDISA has shown very good results (reduction of 30% of yearly collection costs of glass packaging and reduction of 30% of collection costs of paper and other recyclable packaging in winter);
- These results have created a lot of interest for the replication of the experience in other routes;
- Widely accepted by stakeholders and citizens;
- No sensors were destroyed during the program due to vandalism or fire.



POTENTIAL FOR LEARNING OR TRANSFER

Energy efficiency, reduction of GHG emissions, noise and traffic congestion during waste collection, and costly waste collection are common challenges that European regions face. EGarbage could be interesting for other regions willing to improve current waste management practices.



To improve similar tools and current waste management practices, some points could be further discussed, such as the technology used, the cost and resources needed, the implementation difficulties and how to overcome them, potential negative aspects and the results of the pilot application in each regional transport geography etc.

Furthermore, know-how transfer activities, training and special forums could be developed in order to ensure knowledge transferring on those innovative practises.



INFO

life-ewas.eu/el/

The LIFE EWAS project has been funded by the LIFE+2013 programme.



04 Customer portal for collected bulky waste at civic amenity sites



Monitoring and decision making



Civic amenity site



Feedback to citizens



➤ **“An innovative data collection system on recycle patterns of citizens with specific focus on bulky waste at civic amenity sites”**



IMOG

Intermunicipal co-operation for waste treatment in the region of South-West-Flanders



September 2017- October 2018

THE PRACTICE

In the last decades the costs for waste management increased and “the polluter pays” system is applied. At IMOG – an intermunicipal waste collection organisation for 11 municipalities in South West Flanders – different tariffs were introduced to differentiate between expensive and less expensive types of waste with the aim of encouraging everyone to prevent residual waste. Residual waste is often not suited for recycling and can then only be incinerated or landfilled. For both handling types strict environmental norms have to be fulfilled and high-technology control systems need to be applied. Therefore, this is a very expensive type of waste.

The different waste types, brought to the civic amenity sites, are weighed and costs are directly charged. This way, everyone is stimulated individually to produce less waste and to separate as much as possible. However, not every waste is subject to a charge. Only waste types with high/expensive handling costs, such as bulky waste are subject to a charge.

To increase the amount of collected bulky waste suitable for recycling, IMOG developed an innovative data

collection system on recycle patterns of citizens with specific focus on bulky waste. The data of this URBANREC customer portal are collected on the city amenity sites (CAS). Based on these data, targeted educational programs and awareness raising actions will be developed. Furthermore, the effect of pilot actions can be measured and valuable input provided for the revision of current policies.



RESOURCES NEEDED

About 12 months of development: EUR 160,000 for materials and EUR 40,000 for staff costs. The H2020 URBANREC project provided 100% funding.

EVIDENCE OF SUCCESS

The URBANREC customer portal has been implemented in October 2018. Awareness raising actions and educational programs have been set up and developed during spring and summer 2019. The effects have been communicated via the URBANREC newsletter and website.

POTENTIAL FOR LEARNING OR TRANSFER


The URBANREC customer portal has been implemented in October 2018. Awareness raising actions and educational programs have been set up and developed during spring and summer 2019. The effects have been communicated via the URBANREC newsletter and website.



INFO

<https://urbanrec-project.eu/>





Maak uw keuze

<p style="text-align: center;">€0,04/kg</p> <ul style="list-style-type: none"> • Boomstronken • Niet-recyclebaar hout • Gips • Cellenbeton • Recyclebaar bouw- en sloopafval 	<p style="text-align: center;">€0,20/kg</p> <ul style="list-style-type: none"> • Recyclebaar grofvuil • Brandbaar grofvuil • Te storten grofvuil • Niet-recyclebaar bouw- en sloopafval
<p style="text-align: center;">€0,04/kg met vrijstelling</p> <ul style="list-style-type: none"> • Zacht groenafval 	<p style="text-align: center;">€0,20/kg met vrijstelling</p> <ul style="list-style-type: none"> • Asbestcement







05 Electronic closure on waste containers and related use of information



Equipment



Monitoring and decision making



➔ **“Electronic locks on waste containers located on the street to control deposits, minimize wrong waste and obtain pattern in waste deposit”**



EMULSA
Municipal Company of Urban Environment Services of Gijón



March 2015 - ongoing

THE PRACTICE

The municipality of Gijón is implementing two projects to equip waste containers with electronics locks, aiming to improve its performances and services. Two fractions are targeted:

1. Biowaste

The aim of this project is to improve the purity of the waste collected as it is crucial for the subsequent treatment process. The container is permanently closed. Users need a citizen card to open the container and deposit their biowaste bag (the same than the one used in public transport, public libraries, public sport facilities, etc.). The lock on the container stores the location, the day, time and the user-code of the person using the container.

Six phases led to the equipment of 1,400 containers with electronic locks across the urban area since 2015:

- 2015: 10,000 inhabitants benefitting from the service;
- 2017: 35,000 inhabitants;
- 2018: 70,000 inhabitants;

- 2019: 140,000 inhabitants (1st semester);
- 2019: 172,000 inhabitants (2nd semester);
- 2020: 245,000 inhabitants.

2. Residual waste

In 2019, a new project began in a small neighbourhood of 700 inhabitants. The objective was to extend the use of electronic locks to residual waste containers. Seven street containers areas have been equipped with this technology, using the same lock as for the biowaste container.



RESOURCES NEEDED

The projects required approximately 1,400 containers equipped with electronic locks for biowaste and 10 for residual waste with a cost of EUR 1,100 per container. A RFID antenna and tablet truck on board are also needed to send the data stored in the locks to the server.

EVIDENCE OF SUCCESS

- High purity and low vandalism for the biowaste containers;
- Insight in the pattern in the biowaste deposit (frequencies, hours, etc.);
- Increase in waste separation from 10% to 50% after the installation of locks in containers for residual waste (in combination with other measures).

POTENTIAL FOR LEARNING OR TRANSFER

Waste is a common problem for all the regions in Europe and over the world. Municipal waste management is a complex task with many variables which directly affects the daily life of citizens and for which a solution must be sought that combines the quality of the service provided and citizens' satisfaction with the improvement of the environment, reduction of waste generation and optimization of natural resources.

The use of new technologies in the field of waste collection is a fact that is increasingly implemented in the most avant-garde municipalities in Europe and that can facilitate an improvement in the service delivered and in the minimization of problems derived from the generation debris closely linked to the progress of civilizations.



CHALLENGES ENCOUNTERED

The main challenges faced and/or to solve are:

- Reducing the maintenance costs of locks (batteries);
- Reducing vandalism and sabotage of locks on residual waste containers;
- Extend the implantation of locks in residual waste containers to other neighbourhoods;
- Use the information collected to improve service and to get more control to avoid bad use.



INFO

www.emulsa.org/



06 Information-based waste collection



Fly-tipping clearance



Spatial analysis



→ **“Developing and testing the mechanism of object detection to recognize the littering of waste and take a decision on how to solve the detected issue”**



Municipality of Amsterdam



January 2018 - ongoing

THE PRACTICE

Amsterdam copes with a difficult waste system. Roughly 90 % of the residual waste is collected by underground waste containers, of which Amsterdam has 13,000. Although the system is efficient when it comes to logistics, the system also comes with great littering. A big city as Amsterdam is anonymous and diverse, which unfortunately makes the waste containers an easy target for pollution. Object detection is applied in this context.

Object detection is used for (a) a fast and just recognition and response on littering (around waste containers) and (b) optimizing the logistics for operational services involved in collecting waste (i.e. waste department and law enforcement).

Amsterdam is developing and testing the mechanism of object detection meaning that:

- Images of all appliances are collected;
- Images are labelled with characteristics (e.g. “garbage bag”);
- Labelled images are classified and transferred to

working orders, which in turn are divided and sent to the right execution service (e.g. “garbage route 1”, “garbage route 2”, “law enforcer 1” etc.).

The practice is still in an experimenting phase.

The main stakeholders and beneficiaries are the public services involved in maintaining the public space, such as waste services, law enforcement and street sanitary service. The system is developed by CTO (Chief Technology Office) Office Amsterdam and the universities of Amsterdam.

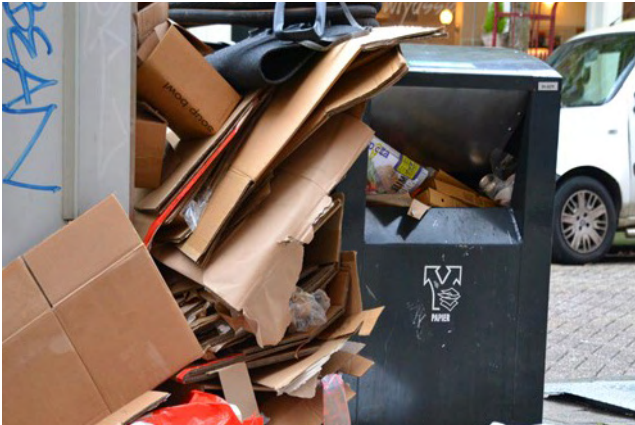


RESOURCES NEEDED

In addition to data (images and videos), resources needed include model development and hardware (cameras, servers).

Expenses for the first experiment phase (4-6 months) are estimated to be EUR 20,000.

For the second development phase there was a budget of EUR 800,000 for a development team of developers, designers, analysts and a product owner. In production phase (2021 onwards) the costs are limited to primarily operational costs for the server and maintenance.



EVIDENCE OF SUCCESS

Until 2019 the practice was in an experiment phase, consisting of model development and a small number of tests.

From early 2020 a more dedicated team (Ontwikkelt-eam Openbare Ruimte) started to work on the productive and upscale use of the Objectdetection-Kit. This started with the deployment of Objectdetection-Kit in an approach to reduce and prevent the littering of waste around waste containers. In one neighbourhood there is a daily scan on waste. This neighbourhood has 300 locations with waste containers and it lasts 2 hours to scan everything. This provides insights in the littered locations. At this moment Amsterdam uses the data of multiple weeks to define the most problematic locations. These locations are then subject to concrete measures such as extra campaign or street coaches.

For a better focus 5 waste objects are now detected: cardboard, garbage bags, bulky waste, mattresses, and (big) appliances. They were chosen because of (potential) separate collection and recycling.

By the end of 2020, the development of this part is finished. The result will be a working infrastructure where any mobile phone can be used to scan objects. The 'machinery' is working automatically.

From then, Amsterdam will upscale the method of working to the rest of the city. In parallel, the municipality is adjusting its planning systems in order to receive tasks from the Objectdetection-Kit. The goal is to then dynamically collect detected garbage.

POTENTIAL FOR LEARNING OR TRANSFER

The experiences, success and fail factors of the experiment can be shared as well as the model structure.

All the software and code development used by Amsterdam Municipality is open source, with the source code and more information available on GitHub.

Firstly, processed data will be available to the municipality. In the future, historical data will be available through open data platforms. Amsterdam Municipality is working together with Vereniging Nederlandse Gemeenten (the Association of Dutch Municipalities) to make relevant data accessible through the NLX platform. Future plans are also to make the machine learning capabilities accessible through this network, so a collaboration on training models together with other municipalities and universities is possible.

This project adheres to the personal data framework of the Municipality of Amsterdam and GDPR. Thus, a specific privacy policy for it is under construction and will be published online on www.odk.ai.



INFO

www.odk.ai

<https://zwerfafval.rijkswaterstaat.nl/actueel/nieuws/nieuws/2020/monitoring-zwerf-afval-camera/>

<https://github.com/maartensukel/urban-object-detection>



07 Mobile app on bulky waste for reuse and recycling



Reuse



Mobile app or online tool



Feedback to citizens



“Especially devoted to bulky waste reduction and recycling, this app fills the gap between the re-use centre, inhabitants, and the waste collection provider”



IMOG
Intermunicipal co-operation for waste treatment in the region of South-West-Flanders



June 2017- January 2018

THE PRACTICE

A lot of bulky waste items, such as furniture, carpets, mattresses, etc. are brought to the city amenity site and becoming waste, while still re-useable. IMOG – an intermunicipal waste collection and treatment organisation for 11 municipalities in South West Flanders – developed in cooperation with the re-use centre a mobile app that fills the gap between the re-use centre, citizens, and IMOG. The aim is to increase the re-use and recycling of bulky items by educating citizens about the problem, helping them to recognize the best way for the bulky item that they want to get rid of, and linking them to the services of the re-use centre and IMOG in an easily accessible way. Within the URBAN-REC app, the citizens find tips and tricks about re-use and recycling, a price calculation model, and can easily make reservations on demand, request the dismantling service and other services from the re-use centre or IMOG.

The re-use centres are partly financed by the IMOG and the municipalities. All partners work closely together for increasing re-use and recycling of bulky waste.

In the coming years, IMOG will continue to promote the app, stimulating the citizens to use the price calculation model and the instant-request function for the pick-up- or dismantling service of re-usable or recyclable bulky items. Furthermore, targeted notifications will be sent to the app-users for special activities.



RESOURCES NEEDED

About 6 months of development: EUR 15,000 external services for development, hosting and licenses to run the app. The Horizon2020 URBANREC project provided 100% funding.

EVIDENCE OF SUCCESS

The URBANREC app has currently 370 active users in the region of South-West-Flanders after 1 year of implementation. A survey among the population of the IMOG region revealed a high satisfaction rate of app users.



POTENTIAL FOR LEARNING OR TRANSFER

The app contains

- Clear and detailed information for plenty different bulky waste fractions about how to recognize whether the bulky item is re-usable or recyclable and what to do with the bulky item/ where to bring it;
- An easily accessible tool for requesting the pick-up or dismantling service;
- The possibility to send targeted notifications (if the user is willing to receive them).

The app is developed in such a way that it is easily transferable to and adaptable for other municipalities. The source code is available from IMOG.



INFO

<https://appadvice.com/app/urbanrec/1325046696>





08 Operating aid system and waste collection weighing



Collection



Equipment



➤ **“A technology that gives full information about the waste collection and allows to take control over the weight collected”**



EMULSA

Municipal Company of Urban Environment Services of Gijón



June 2010 – October 2018

THE PRACTICE

The waste collection service in EMULSA produces an overdose of information that needs to be controlled and automated. This is the main reason behind this project. It was conducted in two phases. The first one consisted in setting an operating aid system monitoring in real time the position of the waste vehicles and the location of all the containers. The technology implemented on board of the vehicles enabled to obtain the historic of the routes the trucks did with the containers that had been collected or washed. The task could be then optimised and the service planned properly. Thanks to this, EMULSA has a full knowledge on when and which containers have been collected or washed, the kilometres and hours done by the trucks, and the speed or irregular manoeuvres.

In a second phase, a weighing system was added in three trucks. The main objectives were to improve the security by knowing the weight the truck is collecting at each time. As a consequence, EMULSA reduced the risk caused by an overweight

and optimized the task since overweight situations or underused were reduced.



RESOURCES NEEDED

- Software development: EUR 121,400;
- On board equipment, IT equipment and control room: EUR 185,000;
- Weighing system: EUR 15,000.

EVIDENCE OF SUCCESS

Full knowledge about the tasks done, number of containers collected and washed, the time when they were collected or washed, the weight at the moment that the container was collected, the route the truck made, the speed of the vehicle, irregular manoeuvres the driver could have done.

CHALLENGES ENCOUNTERED

- Complete installation in all collection trucks;
- Reduce breakdown damage (rural zone).

POTENTIAL FOR LEARNING OR TRANSFER

Nowadays, waste collection services generate a large volume of information that lacks control. Having data facilitates decision making.

In the case of EMULSA, it helps to plan routes more efficiently, minimize fuel consumption, optimize routes and resources (people, vehicles), minimize incidents, reduce service costs. In short, it made the service more efficient.





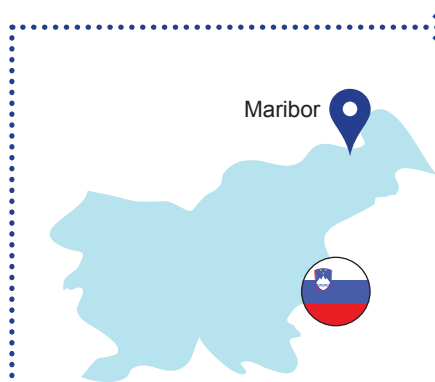
09 Route optimization for waste collection



Collection



Spatial analysis



➤ **“Waste collection is very complex logistics solution with a lot of stops, extreme dynamics in transport and challenging service through different patterns”**



Snaga d.o.o.
Company for Waste Management and Other Utility Services



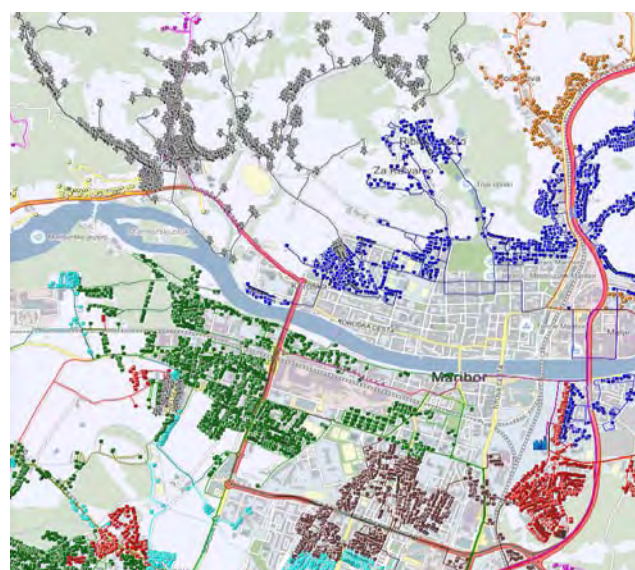
July 2019 - ongoing

THE PRACTICE

The method of collecting waste depends on the density of the population of a certain area, quantity of waste, the habits of people, legal regulations, traffic and urban planning. Within type of waste stream exists incredible complexity which makes it difficult to maintain a lean and efficient operation and tricky exceed customer expectations. The goal of optimizing the collection of waste is to reduce logistics costs and environmental impacts through an efficient use of vehicles in eight hours of work and supply of different collection areas. The best results are achieved using an optimization tool that uses mathematical algorithms. If the collection and disposal of waste is carried out optimally, the costs are lower and the company that carries out this activity operates more economically.

In 2017, Snaga optimised the collection of packaging for the municipality of Maribor, (1,189 locations). In 2018, it optimised the collection of paper for the municipality of Maribor (1,689 locations) and also of organic waste for all municipalities (15,738 locations). The main stakeholders are citizens. The interest of

the municipality is to provide the most economical and ecological collection processes for its citizens.





10 Sharing data on waste and resources with the public



Monitoring and decision making



Data management platform



➔ *“Sharing publicly data on waste and resources is an important part of circular economy”*



City of Amsterdam



2017 - ongoing

THE PRACTICE

Amsterdam wants to be a circular city by 2050, where valuable materials and raw materials are reused and no waste produced. Being committed to reuse, means creating more local jobs in the repair and processing sector. At the same time the city invests in its digital position. Digitalisation offers endless opportunities in every area from improving the quality of life in the city to creating equal opportunities on issues such as the circular economy.

The waste department of Amsterdam is using a digital shell where data are shared with external stakeholders. It cooperates with other departments specialised in either IT, data and customer service. Together they try to work on a basis where Amsterdam provides data about and for Amsterdam: findable, reliable, safe and usable. For the sake of transparency, development and management of these products, they record information about the data sources. This means they publish datasets (via API's), and share the coding – to let people know what the data means.

The aim is to:

- Empower locals: the more datasets are opened

up, the more transparent and accessible the economy is since anyone can see resources available in the region;

- Foster economic development e.g. geospatial data can be used to improve private sector business models. Also, jobs done by the government can easily shift to local initiatives;
- More digital commodity: it not only leads to better and more robust government decision making, but new functionalities will also pop up in your city.



RESOURCES NEEDED

The current budget of the Waste & Resources department is EUR 275.000 per year (with the addition of a significant budget from cooperating departments) to cover:

- Digital infrastructure e.g. servers, web connectors, gutters, documentation, interface;
- “Data” workers e.g. developers, engineers, managers.

EVIDENCE OF SUCCESS

Amsterdam has an open and real-time data portal for waste. It has an agreement with each supplier that the data collected belong to the public, is accessible and understandable. Stakeholders and suppliers easily derive necessary data. Amsterdam achieved valuable data for different workers in the city: e.g. city planners, law enforcers, social workers. They all can use the data to enhance their activities.

CHALLENGES ENCOUNTERED

Opening data is the first step: the real challenge is to use them. How to encourage (local) initiatives to use data and see waste as a resource in the wrong place. It can be done by creating resource passports of products, buildings, recycling centres or other areas and derive and share (circular) data.

POTENTIAL FOR LEARNING OR TRANSFER

Data and software have become the core of nowadays organizations. It is fundamentally important to deal differently with data. A professional department specialised in data is needed in the future waste organizations.

The Open Data vision hints more towards a philosophy than as being an activity. Amsterdam believes open data helps the circular economy. Insights provided through open data can improve the decision-making of the efficient use of resources as data can predict certain trends (e.g. market, weather, demographics) of future supply and demand. Open data is important to empower consumers and public buyers throughout the whole Europe.

It is mentioned in the European data portal that Open data contribute to the management of resources and optimizing waste: insights from (geographical) open data can improve the recycling process of waste. Especially, the process of waste separate collection and using the full capacity of the recycling plants can be improved with (open) data insights.

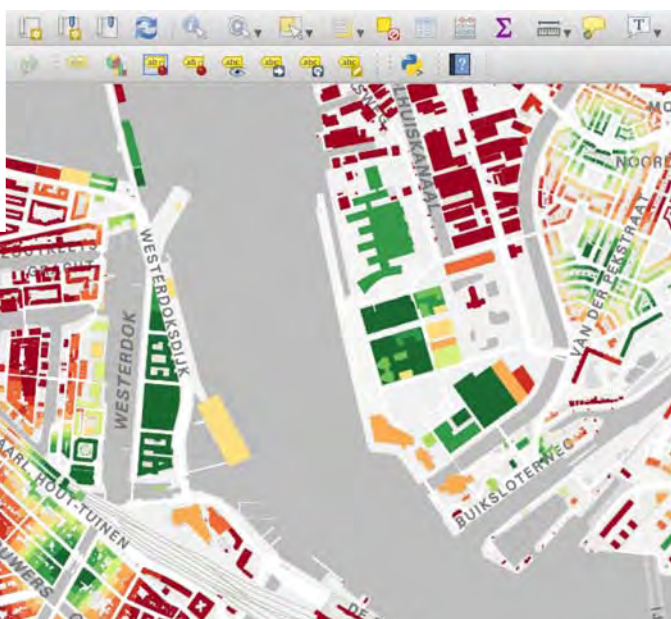
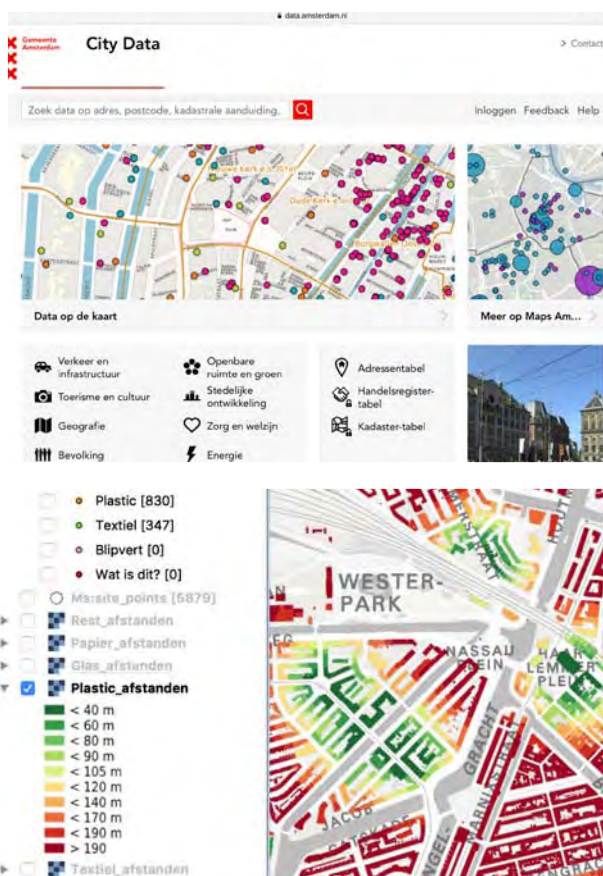


INFO

data.amsterdam.nl

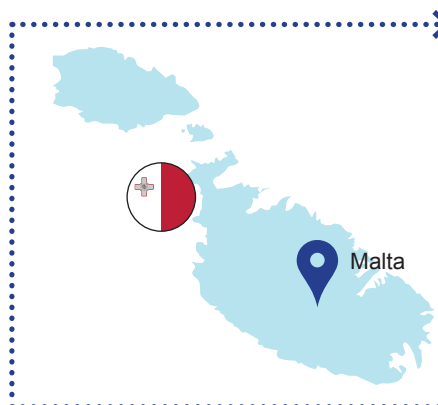
https://assets.amsterdam.nl/publish/pages/938231/agenda_digital_city-eng-1.pdf

www.amsterdam.nl/bestuur-organisatie/volg-beleid/ambities/gezonde-duurzame-stad/amsterdam-circulair-2020-2025/





11 Smart bins to recycle anytime, anywhere



➔ **“An evolution of the concept of separate collection thanks to the use of the ‘Internet of Things’ technology to monitor waste levels and feed info”**

GreenPAK COOP

May 2013 – March 2014

THE PRACTICE

GreenPak COOP has recently improved the concept of separate collection by introducing intelligent bins. Using next generation ‘Internet of Things’ technology, iBiNs are capable of monitoring waste levels and feed information back to a central system. This enables GreenPak’s recycling service to prioritise and customise collection routes in the 41 localities it currently serves across Malta and Gozo. A total of 800 bins have been introduced in the early months of 2019 with the aim of enabling citizens to recycle 24/7 and put an end to overflowing bring-in sites.

The project addressed several issues:

- Public frustration when recycling bins found full;
- Better scheduling by providing emptying service according to recycling bins usage and not a fixed schedule;

- Limited data availability on public use and interaction;
- Slow reaction time to adjust collection service following changes in public behaviour;
- Aging waste management infrastructure.

It is based on the involvement of the following main stakeholders:

- Municipalities willing to install iBiNs;
- Public acceptance and participation;
- Reliable supplier of iBiN and IoT technology;
- Reliable provider of a communication network;
- Reliable waste management company.

RESOURCES NEEDED

- Reliable supplier of iBiN and IoT technology;
- Reliable provider of a communication network; and
- Reliable waste management company.

EVIDENCE OF SUCCESS

The 36% increase in public participation showed that the project was successful. In addition, the following objectives were reached:

- Increased yield and quality of collected packaging waste from street containers;
- Improved Planning - Data to plan & deploy collections;
- Reduction of Unnecessary Collection Trips; and
- Improved Deployment - Focused on when and where service is needed. It also helps to avoid over-reaching the excess amounts allowed.

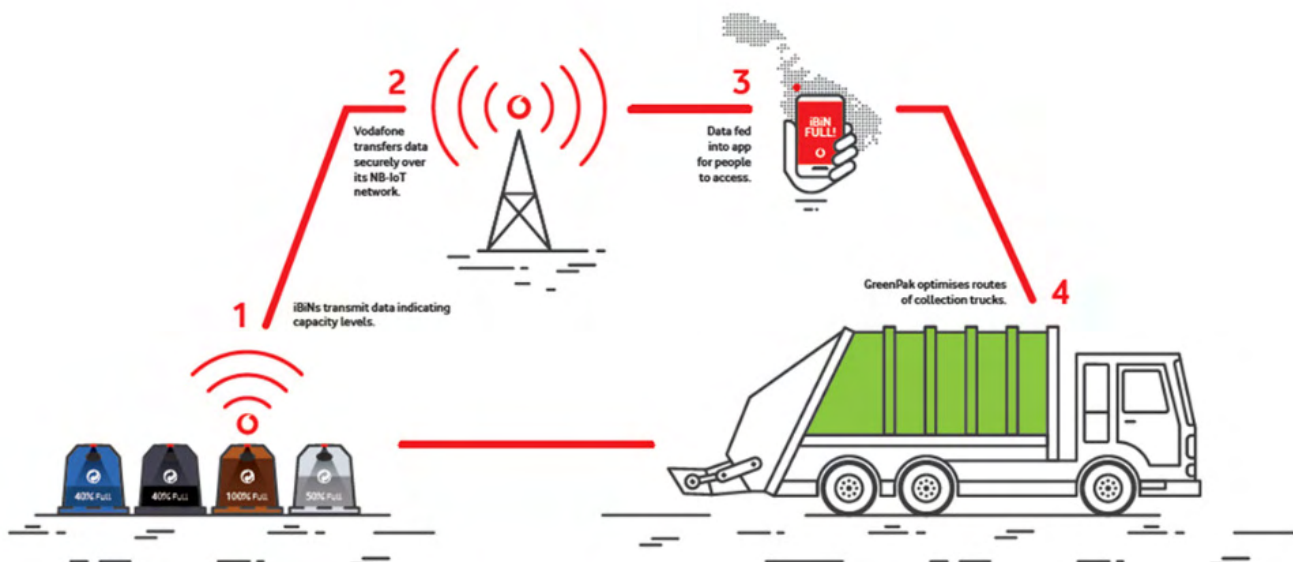
POTENTIAL FOR LEARNING OR TRANSFER

iBiNs are very suitable for regions with community collection bins for the separate collection of recyclables, such as 'bring-in sites', to avoid having overflowing bins, as well as improve the collection route for increased efficiency and less carbon dioxide emission.



INFO

www.greenpak.com.mt/smart-ibins





12 Solar compact waste bins



Collection



Equipment

➔ **“A solar-powered compact bin that is smart, sensor-equipped, and compact waste automatically whenever full”**



Ta' Xbiex



Ta' Xbiex Local Council



May 2019 - ongoing

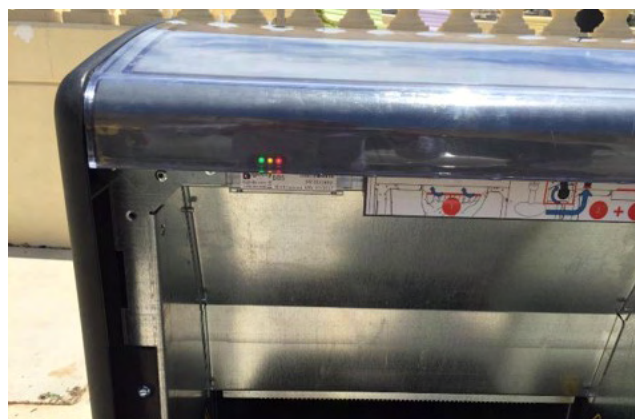
THE PRACTICE

Parks and beaches are the best assets in many communities, but their maintenance is not easy at all, requiring many resources. Ta' Xbiex Local Council introduced, for the first time in Malta, innovative bins that run on solar energy and compact trash when full. These bins can fill up to five times as much as a normal trash bin, thus creating space and reducing the chances of bins overflowing with waste.

Ta' Xbiex Local Council has always promoted environmentally friendly measures in order to have a cleaner and safer environment. Each unit is smart and sensor-equipped. Such systems are viable since there will be less collections and hence less trucks, which also means no overflows or visible waste. Collection crews spend time on more meaningful work with up to 80% fewer collections.

The cloud-connected and web-based platform delivers actionable insights into waste operation. Offered as a turnkey system, each fleet is customizable and modular based on capacity, waste stream, and accessory needs. The solar bins offer much more than smart waste. In addition to modernizing the locality, Ta' Xbiex

Local Council is receptive to change and considers experimenting and adapting in additional technologies. It took advantage of required public waste infrastructure as a holding place for other technology, applications, and equipment. Multi-purposing the smart waste system eases logistics, declutters the streetscapes, and further enhances the community experience with improved services, streamlined operations and collection efficiencies.



EVIDENCE OF SUCCESS

- Reduce collections by 70-80%, liner usage, labour hours, vehicle wear, fuel consumption, carbon footprint and air pollution;
- Informed decision making and operational planning with real-time data in CLEAN Management Console software;
- Increased productivity and route efficiency: optimized collections, reduced truck traffic, noise and reallocated resources to other projects;
- Cleaner public spaces and improved quality of life: eliminate visible waste, windblown litter, overflows and critter access.

POTENTIAL FOR LEARNING OR TRANSFER

This practice can be easily applied to regions with a high level of tourism since these bins can hold five times more waste than a normal bin ensuring that there are no overflowing bins and the city remains clean.

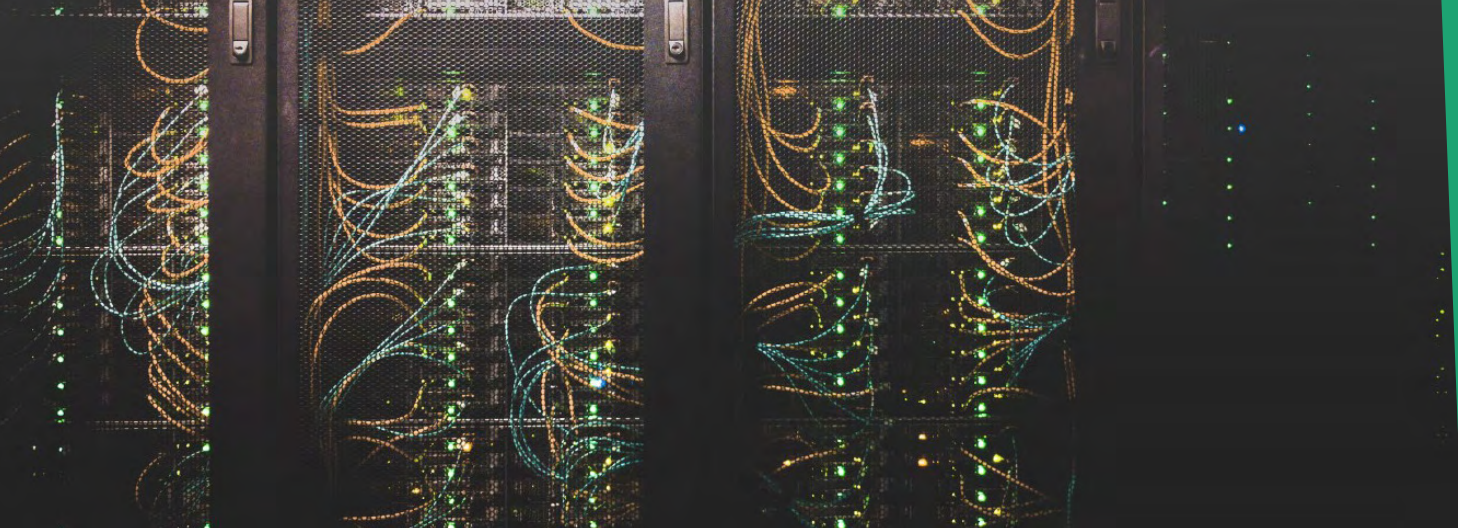
CHALLENGES ENCOUNTERED

The biggest challenge encountered is the initial cost. The bins are expensive to buy, but will be cost-effective in the long-term. Another challenge is the general public educational factor: since this is something new, vandalism or misuse of such bins will be detrimental to such a positive initiative.



INFO

<https://lovinmalta.com/lifestyle/technology/maltas-first-solar-bins-that-compact-trash-and-notify-local-councils-when-they-get-full-rolled-out-in-ta-xbiex/>



13 Waste management datacenter



Monitoring and decision making



Data management platform



Collection



“A waste management platform to contribute to the optimization of logistics, especially monitoring waste flows through wireless communication technologies”



LIPOR

Intermunicipal Waste Management Service of Greater Porto



June 2016 - ongoing

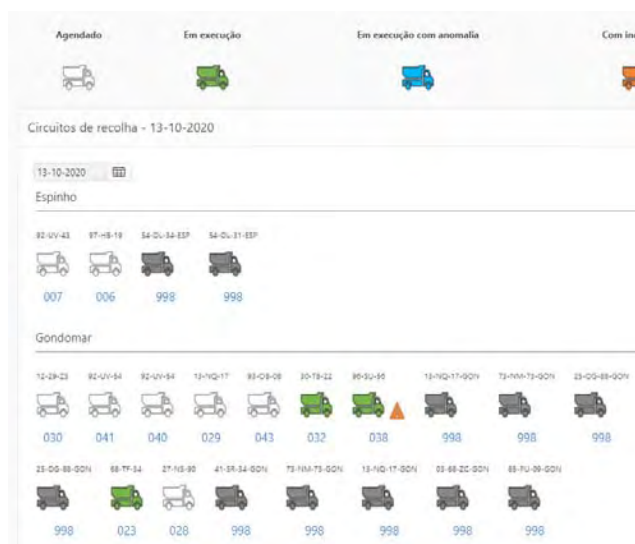
THE PRACTICE

While maintaining as a priority the compliance with its Strategic Plan, LIPOR – the intermunicipal waste management service of Greater Porto - gives a special emphasis to the enhancement of the recovery of materials by selective collection, to the reduction of landfill disposal for biodegradable urban waste and to increasing the preparation of materials for reuse and recycling. To achieve such targets, LIPOR has been developing several projects on the selective collection of waste, articulated and developed in close relationship with the Associated Municipalities.

With the investment in selective collection systems, it is imperative to monitor the projects implemented and for this, it was necessary to create a digital platform.

LIPOR’s Datacenter allows the monitoring of the projects implemented with greater precision and changes the paradigm from an analysis showing its results globally by zone to a system where it is possible to quantify the levels of participation and to estimate the quantities delivered per customer. Only then it is possible to act close to the citizen and keep them as an integral part of the project.

Being an intermunicipal system as previously referred, the project has been developed in partnership with the municipalities that are part of the organization and an outsider consultant from a Portuguese university (TecMinho).



RESOURCES NEEDED

An IT development team, responsible for the creation of the page, and a development team, determining the functionalities that the platform should contain to support the projects, were created. In addition, it requires a team responsible for analysing data and providing technical support.

EVIDENCE OF SUCCESS

Prior to the system, LIPOR had collaborators spending as much as 1,068 hours per month to analyse information written manually by the collection teams. The new platform eliminated the operation. It represents a monthly saving of approximately EUR6,000. Within the project an automatic weighing system was installed at LIPOR's facilities. This system allowed the reduction of the average weighing time by about 75% and made it possible to reduce mistakes by approximately 80%.

POTENTIAL FOR LEARNING OR TRANSFER

With the new EU waste targets, it will be necessary to implement numerous projects in the area of selective collection. The creation of a proprietary digital platform to manage all these processes can be vital in the optimization of the services offered by the waste management system. A proof of this is already the existence of requests by another system in Portugal to use LIPOR's Datacenter.

In the development of the platform, several difficulties and other development opportunities have been identified that will surely arise to other systems that try to develop something similar, so the possibility of information sharing is enormous in a project like this one. Since, as referred, all systems have to manage and report their data and many are starting to develop something similar, so all these projects can, ultimately, merge into creating a shared European Digital Waste Management Platform.



14 Waste Management Data Warehouse



Monitoring and decision making



Data management platform



➔ **“A ‘Waste’ data warehouse to increase insights in waste management and improve the waste policy of the city of Antwerp”**



City of Antwerp



October 2016 - ongoing

THE PRACTICE

The way the Waste Department of the City of Antwerp collected data was old fashioned (handwritten notes, insufficient use of Excel, pdf, etc.) There was a lack of guidelines and overall policy to collect data in a standardized way. Also, the way it managed its data was unstructured and non-transparent; it had no global overview. The data sets the Department was working with were enormous. The trigger for introducing a data warehouse was the fragmented internal data landscape, the limited access to waste data and the limited data sharing between systems. There were no linked data or crossovers, the reporting was separate for each data set. The City of Antwerp did not make use of the important added value data can have to drive and support policy decisions.

The objective of the data warehouse is to increase insight in the waste management of the city. Another aim is to disclose waste management data to different stakeholders, as automatically as possible to increase transparency.

To achieve these objectives, the Waste Department had to connect with all types of data (real-time e.g. sensor

data, static, historical, geographical e.g. track and trace, ...); Especially considering the evolution of the Internet of Things, it is important to have a uniform and standardized way to collect and store data.

The Waste Department also wanted to visualize its geographical data in GIS (Geographical Information System) and be able to analyse these data in visual dashboards. The main stakeholders involved are local policy makers, local administration, waste processing companies, citizens and researchers.

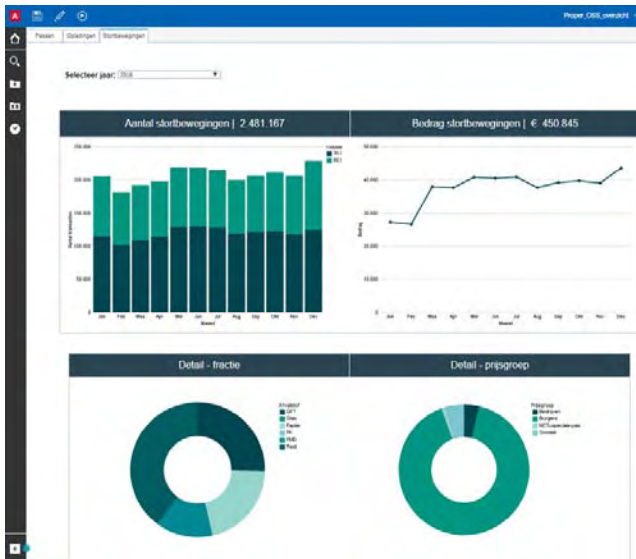
RESOURCES NEEDED

Financial resources: approximately EUR 100,000 were spent to consult expert analysts and licenses for software. The software in particular consists in a business intelligence tool (Cognos) and a dashboard creator (Cumul.io).

Human resources: a dedicated team of six data experts are involved in this case.

EVIDENCE OF SUCCESS

As a result of the implementation of the data warehouse waste, data from different sources is uploaded in an automated way. Antwerp is now able to deliver dashboards on a meta-level. Through this process, it was able to get more insight in the operations of its data suppliers and to allocate costs more accurately. The waste data warehouse delivers added value to Antwerp's various stakeholders: increased transparency, time efficiency, cost efficiency, a reliable source for researchers, etc.



Dashboard underground waste containers

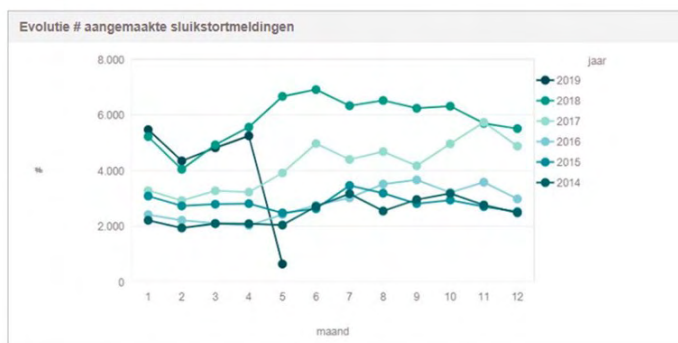
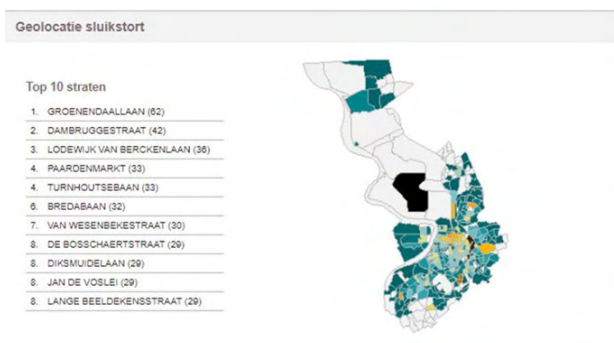
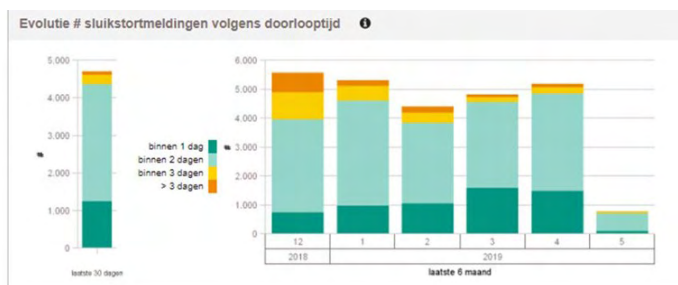
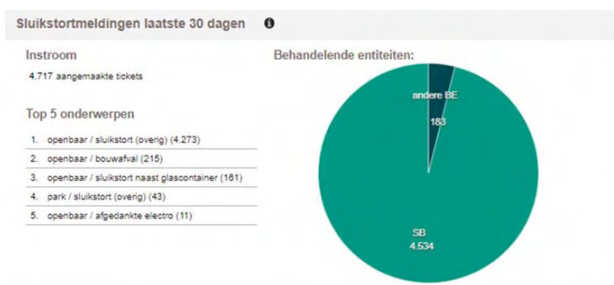
POTENTIAL FOR LEARNING OR TRANSFER

The key success factors that can be used as an inspirational benchmark for other regions are:

- Improved data quality;
- Data supply to improve operations;
- Better insight in costs, better financial control;
- No more stand-alone systems;
- Dynamic dashboards.

CHALLENGES ENCOUNTERED

- There is still some manual input left. Not all data suppliers are able to automate their process;
- Difficulties to disclose geographical information (GIS) in the same database;
- General challenges related to General Data Protection Regulation 2016/679 (GDPR).



Dashboard illegal dumping



Innovative models




15 COOMIDA – Reducing surplus food waste and food needs

- 
 Prevention
- 
 Food and organic stream
- 
 Mobile app or online tool



➔ **“An innovative technological and cooperative tool to facilitate food donations (including surplus food), thus reducing food waste production”**

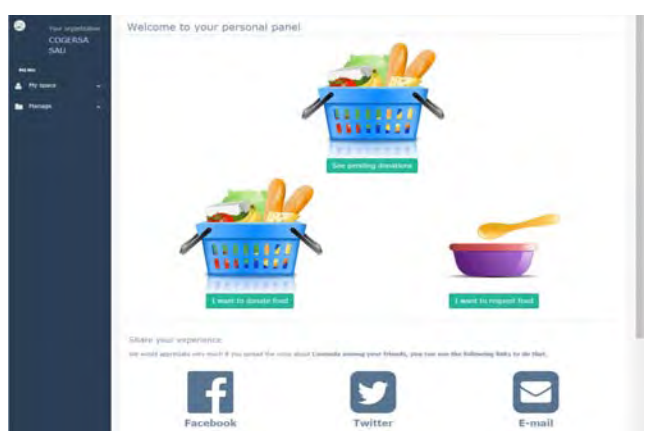
COGERSA SAU
 Consortium for Solid Waste Management of Asturias
 **January 2016 - ongoing**

THE PRACTICE

In 2017, there were 112.8 million people in the EU-28 who lived in households at risk of poverty or social exclusion, equivalent to 22.4 % of the entire population. In 2017, 6.6% of the population in the EU-28 were severely materially deprived. On the other side, around 88 million tonnes of food are wasted annually in the EU, with associated costs estimated at EUR143 billion (FUSIONS, 2016). Together, in 2018, the European Food Banks provided 781,000 tonnes of food - equivalent to 4.3 million daily meals - to 45,700 charitable organisations for the benefit of 9.3 million deprived people. Regarding the traditional donations, there are also a number of bottlenecks. On the one hand, donors and charities must go to the Food Banks, consuming time, resources and increasing fuel emissions. On the other hand, as the resources of Food Banks are limited, they usually focus on large donations, so little or remote surplus donations are often lost.

COOMIDA connects local donors, food banks, volunteers, and charities through a collaborative network for an efficient and sustainable management of food donations. COOMIDA allows donors and charities to keep contact directly; therefore, it can reduce time, emissions and expenditure. COOMIDA also allows to recover little and remote donations that otherwise could exceed the Food Bank capacity.

COOMIDA is an innovative technological and cooperative tool aimed to ease food donation (including surplus food), thus reducing food waste generation.



RESOURCES NEEDED

COOMIDA was developed as part of a bigger ICT project (SmartWasteCollection - SWC). The total investment for SWC development reached EUR 600,000, out of which EUR 150,000 were allocated to COOMIDA's development.

New regions should consider around EUR 3,000 for COOMIDA's adaptation and hosting.

EVIDENCE OF SUCCESS

In 2018, COOMIDA recovered 6,000 kg of surplus food.

COOMIDA has been included in the REFRESH Community of Experts.

COOMIDA has been recognised as a best practice by the Spanish strategy "Más alimento, menos desperdicio" (More food, less waste).

CHALLENGES ENCOUNTERED

Local authorities (Social as well as Environmental affairs) must be involved during the implementation. Local food banks must be the core of the system (administrator of COOMIDA) promoting its use among charities (food recipients) and potential donors (food shops, supermarkets, restaurants, etc.).

POTENTIAL FOR LEARNING OR TRANSFER

COOMIDA meets the Directive 2018/851 on waste, which encourages Member States to facilitate food donation and take into account charities.

COOMIDA is helping Asturias to reduce locally wasting of surplus food, as well as to fight food needs of people at risk of poverty.

As food waste and food needs are common problems to be solved across Europe, COOMIDA could be replicated through the existing Food Banks, encouraged by their respective local authorities involved in Social affairs as well as Environmental affairs.



INFO

<http://coomida.com/en/>





16 From door-to-door collection to pay-as-you-throw



Collection



Tarification



➔ **“A door-to-door collection, implemented in 2004, gave way in 2010 to a successful PAYT system with pre-paid standard bags for citizens and commercial activities”**



Argentona City Council



Since 2010 - ongoing

THE PRACTICE

Argentona introduced a Door-to-Door (DtD) collection in 2004 and later in 2010 decided to apply a Payt-As-You-Throw (PAYT) with pre-paid standard bags for citizens and commercial activities. The DtD system including the PAYT has been extended to all suburban areas in 2016.

The PAYT has been implemented using an initial participation process, an information campaign and an initial test period. The permanent staff and the attention office follow how the systems function and users' performance. They are key tools for the success of the system.

The PAYT scheme relies on the introduction of pre-paid standard bags for residual waste (red bags) and light packaging (yellow bags), initially introduced for both businesses and households. In 2013, the yellow bags were eliminated for citizens. The PAYT is also applied for the organic fraction (food and kitchen waste) produced by businesses.

The household tax comprises 1. a progressive fixed part that is modulated depending on the number of residents/household and 2. a variable part that is a function of the number of residual waste bags used. Until

2012, users initially bought all the bags. After a change in the system, the municipality provides a number of bags that are included in the fixed part of the tax (1, 2 or 2.5 packs depending on the number of household members). Additional bags have to be purchased at collaborating shops at a cost of EUR 0.65/17L bag.

Businesses have to pay a fixed tax, calculated based on the surface of their premises and the type of activity they carry out, and a variable part based on the number of standard bags used for residual waste (EUR 2.5/65L bag) and light packaging (EUR 1/100L bag).



RESOURCES NEEDED

- Implementation: costs of the communication campaigns and participation processes;
- Monitoring: costs of the annual distribution of bags (included in the fixed part of the tax), cost of permanent mentor/educator staff, environmental information office and website;
- Very economical material using plastic standard bags (cost EUR 0.03), no need for costly technologies.

EVIDENCE OF SUCCESS

Between 2008 and 2018, the amount of waste generation per inhabitant per day decreased by 26% to reach 1.27 kg. During the same period, the rate of separate waste collection increased from 52.8% to 87.6%. Residual waste dropped by 15% between 2009 and 2013 and packaging waste by 16%. The quality of the separately collected waste has remained high. The use of the municipal collection centre has increased. The system has been widely accepted by the majority of the population and was the subject of a broad political consensus.

CHALLENGES ENCOUNTERED

- Recalculation of the fixed part of the tax (including set of bags) to avoid deficit;
- High cost for the annual distribution of standard waste bags;
- Incorrect use of the emergency area, so it was transferred to the municipal collection centre;
- Incorrect use of street litter bins or illegal disposal and waste tourism (initially).



POTENTIAL FOR LEARNING OR TRANSFER

The DtD services associated to PAYT systems have high results in terms of participation in separate collection and high quantity and quality of separate fractions collections.

The monitoring activities to follow the system functioning and the users' performance are key tools for its success

The initial participation process, the information campaign, and the initial test period are key elements for the introduction and success of the system.

The pre-paid standard bags are very economical elements for the introduction of PAYT systems and there is no need for the introduction of costly technologies.

The control and sanctioning of the incorrect use of the system and other bad practices like illegal disposal or waste tourism are very important instruments for the proper functioning of the DtD+PAYT scheme.

This best practice has been highly visited by other Catalan and Spanish municipalities and the technicians have participated in several conferences and courses. Additionally, this best practice is included in the "PAYT and KAYT Catalogue" (July 2020) of the LIFE-RethinkWASTE project.



INFO

<http://argentona.cat/residus>
www.rethinkwaste.eu/



© A14

17 G'scheit feiern - Reducing waste of events and festivals



Prevention



Reuse



Eco-event

➔ **“Under the heading “G’scheit feiern” (party smart) about 200 festivals are held in Styria per year, meeting criteria for waste prevention and regional origin of the food”**



Steiermark

 **Waste department of the Province of Styria**

 **January 2001 - ongoing**

THE PRACTICE

In the past, places in Styria where festivals and celebrations took place were heavily polluted by disposable plastic. This resulted in high costs for cleaning and disposal. For this reason, the waste department of the Province of Styria initiated the campaign “G’scheit feiern” (party smart) and developed criteria for the sustainable organisation of festivals. Financial support was offered for festivals that met the criteria.

A network of 43 waste consultants from the waste management associations act as “G’scheit feiern” regional advisors, advising organisers and checking compliance with the “G’scheit feiern” criteria. They always initiate excellent showcase projects. Since 2017, “G’scheit feiern” is part of the Austria-wide “Green Events Austria” network. It is also intended to network organisers, producers and service providers thanks to the “Infothek Green Events Styria”, a new web-based information portal for a sustainable event industry.

During “G’scheit feiern” events only reusable crockery and cutlery as well as glasses or reusable cups may be used. Only regionally produced drinks and food may be offered, if possible, from organic farm-

ing. Furthermore, a sustainable journey to the event, e.g. carpooling or shared taxis, is supported.



RESOURCES NEEDED

Within the framework of a stakeholder process, criteria for eligibility for funding were developed. An information campaign with logo and web portal was developed. Waste consultants were responsible for regional support. To date, the Province of Styria has spent more than EUR1 million on promotion.

EVIDENCE OF SUCCESS

90 % of waste could be reduced per event. Since 2001, around 4.5 million visitors saved 4,000 tonnes of waste and EUR 45 million went directly to Styrian producers. "G'scheit feiern" influences other types of events (e.g. running races) to use reusable cups instead of single use cups. The City of Graz published guidelines for events on public areas stating that reusable crockery and cutlery must be used. An intensive networking of waste advisers working in waste management associations was established.

CHALLENGES ENCOUNTERED

The stakeholder process to determine the criteria involved intensive discussions, as different interests had to be reconciled. Many organisers were sceptical, as the use of reusable tableware was more expensive and offering regional drinks and food was also more labour-intensive.



POTENTIAL FOR LEARNING OR TRANSFER

Festival events usually lead to a large amount of waste and pollution of the festival grounds. The implementation of such sustainable events also attracts groups of participants who are not normally open-minded and environmentally aware citizens. In this way, waste prevention can be practically demonstrated and a new low-waste festival culture can be conveyed. At the same time, the consumption of regionally and biologically produced beverages and products is promoted, so that the money spent remains in the region. "G'scheit feiern" is a long-standing and successfully implemented practice so other waste associations in Europe can build on this experience. This will be particularly important in the implementation of the new European directive on single-use plastics.



INFO

www.gscheitfeiern.steiermark.at/



18 Pay-as-you-throw to reach 80% recycling



Tarification



Feedback to citizens



➔ *“When PAYT allowed to make the “final jump” towards the impressive rate of 80% of separate waste collection”*



Municipality of Seveso



May 2017 - ongoing

THE PRACTICE

Citizens of Seveso have a quite high environmental consciousness which dates back to the famous chemical disaster of 1976.

The Municipality has been a pioneer in separate collection of waste since late '90s, and again in 2017. Then, in the framework of its participation in Waste4Think, a European-funded project, it decided to introduce pay-as-you-throw (PAYT) in order to further improve the very high baseline in terms of separate collection (75%). The objective was to get above 80%.

The system introduced is based on transparent bags for residual waste, with RFID tag. Citizens get them through automatic vending machines which identify the users and give them a custom roll of bags. Collection vehicles are equipped with an antenna and the invoicing system is centralized.

This system has to go along with a parallel information system, the so-called know-as-you-throw (KAYT), that is key in order to let people be aware of

their waste generation, savings and individual behaviour compared to the average.

This last concept was started in Seveso by using some of the IT tools developed by the Horizon2020 Waste4Think project, but it is currently ongoing in other trials; the most relevant one being tested from late 2020 by the LIFE-REthinkWASTE project.



RESOURCES NEEDED

Seveso invested about EUR 5 per capita per year for the implementation of the RFID automated bag delivery, measuring and invoicing.

2-3 people were dedicated to the activities of support to the municipal tax office, plus other resources related to the sensitization campaigns of the Waste4Think project.



EVIDENCE OF SUCCESS

Seveso reached a separate collection rate of about 85%.

After some initial challenges, PAYT went on smoothly. The system is currently being replicated in many other municipalities in Lombardy and in Italy, with a specific national Decree supporting this scheme.

CHALLENGES ENCOUNTERED

Introducing PAYT when the baseline is already high is tricky. The variability between the “good guys” and the “bad guys” is limited, so the incentive effect of the variable part of the tax is actually low. Economic benefits related to more recycling were lower than the additional costs.

POTENTIAL FOR LEARNING OR TRANSFER

A good guidance is needed for municipalities willing to introduce a pay-as-you-throw system. Technology is important but there are preliminary steps not to be neglected, in order to avoid possible problems (littering, etc.) and unbalances that make the new supposedly “fair tax” not so fair in some cases.

Most importantly, the KAYT concept has to be introduced with PAYT, by using simple and effective individual communication tools. Otherwise the risk is to spend a lot in technology forgetting how to deliver constant and positive feedback to citizens.



INFO

<https://www.youtube.com/watch?v=Myzqdz4GQo>

www.rethinkwaste.eu



© City of Antwerp

19 Pop-up civic amenity sites



Recycling



Collection



Awareness raising and communication



→ **“A great opportunity for citizens of different neighbourhoods to dispose of their waste for free without having to go to the civic amenity sites”**



City of Antwerp



April 2017 - ongoing

THE PRACTICE

The pop-up civic amenity sites were implemented in 2017 in Antwerp, in cooperation with local clean-up actions. The main goal of the pop-up civic amenity sites is to increase the accessibility for citizens to civic amenity sites and to lower the threshold of the size of items collected. The city counts eight civic amenity sites which can be difficult to access for people without a car or transport. Furthermore, there is some misunderstanding about the fees charged in the recycling stations. Although only bulky waste and rubbles are charged, many citizens think that they must pay for all fractions. The pop-up sites help to inform people and communicate a clear message on the service. In addition, cultural differences, language issues and other barriers make it difficult for some citizens to find their way to the civic amenity sites. Civic amenity sites come to the citizens now, instead of citizens coming to the civic amenity sites.

The pop-ups are free of charge (except for bulky waste), open only to citizens on foot or by bike (no cars allowed), a maximum of 2m³ waste can be deposited, and some fractions are not allowed (rubble, asbestos, ...).

There is a real focus on local neighbourhoods. The focus

is not exclusively on social neighbourhoods and problem areas, but it also covers richer areas, student quarters, housing projects, apartment buildings and car free zones. The pop-up is always linked to an existing project of a local neighbourhood clean-up.

The main stakeholders are:

- Citizens;
- Communication department;
- Social services;
- Recycling companies for some fractions: wood, textile, small electrical devices, small hazardous waste.



© City of Antwerp

RESOURCES NEEDED

- Investment in an extra truck to transport the material needed for the pop-up;
- Staff: 3 to 4 persons for each pop-up (presence during the pop-up) and 1 person for the planning and preparations;
- Charges for recycling companies (placing containers, processing waste, ...).

EVIDENCE OF SUCCESS

By November 2019, Antwerp City Council organised 66 pop-ups, visited by 16,000 users, and collected 500,000 kg of waste.

CHALLENGES ENCOUNTERED

- Education of the staff: knowledge of the fractions and sorting;
- Find open spaces in the city to organise the pop-up (small streets, populated areas, etc.)
- Being strict to citizens who try to enter with a car (the pop-up do not have the capacity for collecting big amounts of waste).

POTENTIAL FOR LEARNING OR TRANSFER

This good practice has already been transferred to other cities in Flanders. This means that this model will work in different cities and regions.





20

Raising awareness on plastic waste with the CAPS Contest



Recycling

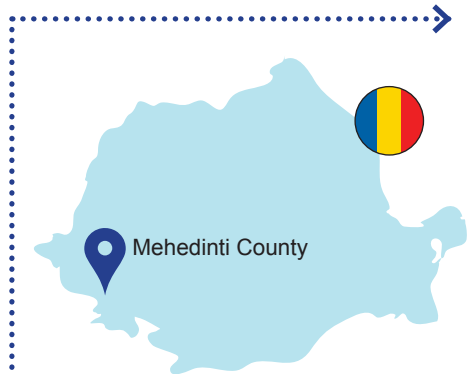


Awareness raising and communication



Prevention

→ *“Pupils in grades V-XII gathered as many PET caps as possible to make mosaics with them”*



Mehedinti County



Mehedinti County Council



August 2013 – December 2015

THE PRACTICE

The Mehedinti County Council carried out a large campaign of information and awareness in the county about waste and environmental protection in general. This campaign targeted various audiences but paid special attention to the young generation. They were involved in a series of creative actions and educational competitions such as the CAPS contest. Pupils in grades V-XII across the county were challenged to gather as many PET caps as possible. Afterwards, mosaics were made out of the caps collected to raise awareness of the harmful effects of PETs on the environment. At the end of the competition, all the caps were delivered to a recycling bin for processing.

The CAPS contest was part of a bigger project, implemented by the Mehedinti County Council, which also included the following:

- Collection of domestic household waste, commercial waste, industry and public institutions similar to household waste, garden and park waste, market waste and street waste;
- Transport of municipal waste collected at the four

transfer stations to be built, then at the new waste management center in Malovăț. There, the recyclable waste selectively collected will undergo a new sorting for recovery and recycling;

- Obtaining compost from wet (biodegradable) fractionation at the new Malovăț station and individually in rural households;
- Removal of residues at the existing landfill in Drobeta Turnu Severin and closure of three existing non-compliant landfills.



RESOURCES NEEDED

- Budget: EUR 8,300;
- Involvement of the country schools and their students.

EVIDENCE OF SUCCESS

The teams collected over 5,000 caps and created mosaics in different locations of the competition.

CHALLENGES ENCOUNTERED

Such public events are meant to provide answers to the questions of the various target audiences, motivate citizens, and measure their responses. It is very important that these events are organized taking into account the specifics and expectations of each target audience.

POTENTIAL FOR LEARNING OR TRANSFER

The purpose of the contest was to raise public awareness on waste, especially PETs. It focused on two important themes that can have the potential to be transferred to other projects or initiatives:

- PETs can remain hundreds of years in nature if they are littered;
- PET bottles can be very hard to process for recycling if they are dumped at the maximum volume and with the lid closed.





21 Recycleservice 2025 – A reversed waste collection system



Collection



Tarification



Feedback to citizens



➔ *“Reversed waste collection with pay-as-you-throw on residual waste and high service on sorting resources for less residual waste and high rate of recyclables”*



Municipality of Apeldoorn



April 2018 – April 2020

THE PRACTICE

In 2018 – 2020 Apeldoorn implemented its new policy instrument Recycleservice 2025, in collaboration with the local waste collector Circulus-Berkel.

With Recycleservice 2025, the city council adopted the national policy goals: 100kg of fine residual waste per capita in 2020, 30kg of fine residual waste per capita, a separation rate of 75% in 2025, and a circular economy in 2050. Every municipality in the Netherlands is obligated to collect waste but is free to determine how to organise the way of collection: the waste management system, the service level, environmental impacts and costs.

The key elements of Recycleservice 2025 are: reversed collection with high service on separated resources and pay-as-you-throw for residual waste. Reversed collection means high service on recyclables (curb-side collection via wheelie-bins) and low service on residual waste (people bring it to drop off points). If people choose a higher service on fine residual waste (wheelie-bin at home), they pay a higher waste fee and it can be emptied at notice.

A special collection service is offered to people who are physically unable to bring their waste to underground containers and financial compensations are for those who have medical waste (e.g. dialyses waste, ostomy bags or adult diapers).

Recycleservice 2025 was a breakthrough innovation for Apeldoorn citizens. A strong communication effort, including organized mailing and meetings with citizens, was key to its successful implementation.



RESOURCES NEEDED

Apeldoorn does not benefit from an external funding regarding financial resources. The total waste management service is funded directly by citizens through waste taxes. Apeldoorn has a non-profit cost-coverage principle: the full costs of running the waste management policy and organization are fully taxed to citizens.

EVIDENCE OF SUCCESS

The first results, after the implementation of the new policy in only half of Apeldoorn, are very promising. Coming from 123kg fine residual waste per capita and 66% separation rate in 2017, going to 89kg fine residual waste per capita and 74% separation rate. The national and local goal is 100kg by 2020, 30kg by 2025, a separation rate of 75%, and a circular economy in 2050. Reaching the 30kg per capita will require innovation and other interventions.

CHALLENGES ENCOUNTERED

The local and political situation and long-term investments are important factors. Stakeholder engagement and a communication strategy should also not be neglected. It is necessary to think about the financial structure of incoming taxes.



POTENTIAL FOR LEARNING OR TRANSFER

If this total package works for Apeldoorn, it might be different depending on local objectives and contexts. Each city is unique. The local and political situation and long-term investments are important factors. This is why it is not recommended to simply transfer or copy-paste this total system. This works in a waste management system where packaging materials (PMD) are separated at the source (households). This system works well in a medium-large city, which has already implemented and experimented with elements of the total system. The separate elements are also individually interesting and can lead to significant results.



INFO

www.circulus-berkel.nl/apeldoorn/minder-afval/

AFVAL SCHEIDEN

ZO DOET U DAT!

<p>OPGEHAALD AAN HUIS</p> <div style="margin-bottom: 10px;"> <p>GFT Groente-, fruit- en tuinafval 1 keer per 2 weken</p> </div> <div style="margin-bottom: 10px;"> <p>PMD Plastic verpakkingen, metalen verpakkingen en drankpakken 1 keer per 2 weken</p> </div> <div style="margin-bottom: 10px;"> <p>Papier 1 keer per 4 weken</p> </div> <div style="margin-bottom: 10px;"> <p>BEST - tas Boeken, elektrische apparaten, speelgoed, textiel 3 keer per jaar</p> </div>	<p>BRENGT U NAAR DE (ONDERGRONDSE) CONTAINER</p> <div style="display: flex; justify-content: space-around; margin-bottom: 10px;"> <div style="text-align: center;"> Restafval</div> <div style="text-align: center;"> Luiers</div> <div style="text-align: center;"> Glas</div> </div> <div style="display: flex; justify-content: space-around; margin-bottom: 10px;"> <div style="text-align: center;"> Kleding</div> <div style="text-align: center;"> PMD</div> <div style="text-align: center;"> Papier</div> </div> <p>BRENGT U WEG NAAR HET RECYCLEPLEIN</p> <div style="display: flex; justify-content: space-around; margin-bottom: 10px;"> <div style="text-align: center;"> Grofvuil</div> <div style="text-align: center;"> Klein chemisch afval</div> </div> <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> Oud ijzer</div> <div style="text-align: center;"> Snoeiafval</div> </div>
<p>OPTIONEEL</p> <div style="margin-bottom: 10px;"> <p>grijze container voor restafval 140 liter € 25,- aanschafkosten € 7,58 per lediging Legen op aanmelding</p> </div>	<div style="margin-bottom: 10px;"> <p>Service voor medisch geïndiceerden Recycleservice Medische bijdrageregeling</p> </div>



22 Reuse Box – New collection scheme for reusable items



Reuse



Awareness raising and communication



Collection

➤ **“A new collection system for reusable small goods which often end up in the residual waste containers or whose material is only recycled”**



Steiermark

 **ARGE – Association for Waste Prevention**

 **January 2014 - ongoing**

THE PRACTICE

Households often contain objects no longer used by their residents. These items often end up in the residual waste bin or are recycled. On the other hand, the reuse shops complain about a too small amount of reuse goods, because they could sell significantly more of them. As part of the Interreg Central Europe project CERREC, which promoted the formalisation of the accredited Reuse and Repair Centres proposed by the European Waste Framework Directive, ARGE - Association for Waste Prevention - set up a stakeholder group on reuse both in the city of Graz and in the province of Styria. Within this stakeholder group, the idea of a new collecting tool for reuse goods was implemented.

Reusable items such as books, crockery, tools, toys, sports equipment, electrical appliances etc. are collected in a box, the so-called Reuse Box. It is similar to a moving box, but its size has been optimised so that the filled boxes do not become too heavy. During the introduction of the Reuse Box, several serviced issue and return points were published. In the beginning, 40,000 boxes were produced with the support of the CERREC project and the city of Graz, which soon

found their users. Later on, additional boxes were produced. As a result, an additional 500 tonnes of useful items could be collected and sold in the reuse shops. This not only made a significant contribution to waste avoidance, but also helped the socio-economic operators of the reuse shops to preserve jobs and create new ones.





23 Second Chance – Reuse on marketplaces



Reuse



Awareness raising and communication



Eco-event

➔ **“Small marketplaces in the city are dying. Maribor needed a re-use centre. Two minus make a plus: Second Chance as a reuse activity on small marketplace”**



Snaga d.o.o.
Company for Waste Management and Other Utility Services



April 2019 - ongoing

THE PRACTICE

On the one hand, small marketplaces in cities are dying because of the arrival of shopping centres. Small food producers hardly sell their products. People want healthy food, but they want also events and happenings. On the other hand, the city of Maribor needed a place to store usable bulky waste collected (on-demand service) by Snaga, some of the items being in pretty good condition. The place should be reachable for customers – to achieve re-use. How to solve these challenges?

Snaga started to organise the so-called Second Chance events where people are invited to small marketplaces to sell the goods that they do not need anymore. But this is not enough to catch citizens' interest. So, Snaga always adds other specific thematic to these events. On such events, people can learn how to repair things (such as bicycles, curtains, etc.), how to make something new from old stuff (such as jeans, shirts, curtains, etc.). The sell-table has a symbolic price: EUR 1.5 for half a table and EUR3 for the whole table. In addition, children receive lessons on how to sell and manage money. Exchanges of experience is also happening between people as there is also some-

one who knows how the event or the selling process works and who is helping others.

The idea came from an employee of Snaga who is responsible for marketplaces. Together with the City council and others, they organised the first Second Chance event in April 2019. It was established on a small marketplace named Tabor in city of Maribor. The most important stakeholders are citizens especially from multi-storey buildings and block of flats in the surrounding of small marketplaces. People are enjoying these events and coming back. Also, small food producers find a business opportunity and come back again to sell on small marketplaces.



RESOURCES NEEDED

No special resources were needed to start the project, just the good will from employees and other small material. The money earned from selling the tables was used for people, to offer hot tea for example.

EVIDENCE OF SUCCESS

The six events organised so far gathered over 500 sellers, including over 80 children. Over 2,500 kg of goods found a new user. The fact that not only people come back to this small marketplace but also small food producers to sell their products on this small marketplace show that it is a successful event. People are pleased to buy food from the neighbourhood, parents come there with their children. The number of people attending the Second Chance events is increasing.

CHALLENGES ENCOUNTERED

The biggest challenge currently is to find a place in the city of Maribor where to store big items like furniture, EEE and similar goods for reuse.

POTENTIAL FOR LEARNING OR TRANSFER

Because of the shopping centres small marketplaces are dying almost in all cities, thus potentially any city might be interested and implement this practice. On the other hand, reuse “market” could and should be a new way of preventing waste in urban areas. The model implemented by Snaga was successful and already has good results. There is no specialty in Maribor conditioned the success of the practice so it could be transferred to other places around Europe. The key element for such a system to survive is that people and families are visiting.



INFO

www.snaga-mb.si/še-zadnja-priložnost-letos-druga-priložnost.html





24 Smart collection system to optimise used cooking oil to the biodiesel value chain



Collection



Food and organic stream



➤ **“An optimised used cooking oil collection system combining smart sensors and real time monitoring through a web-based platform”**



Technical University of Crete - Renewable and sustainable energy systems lab in collaboration with the municipality of Rethymno



October 2018 - ongoing

THE PRACTICE

Improper used cooking oil (UCO) disposal in drainage raises energy consumption of wastewater treatment and is highly toxic to sea, streams, lakes and other ecosystems. Recycling UCO to biodiesel is a sustainable alternative to exploit a problematic waste, transforming it to energy resource. Aiming to increase the waste management efficiency and promote clean fuels, the Renewable and Sustainable Energy Systems Lab of Technical University of Crete, in collaboration with the Municipality of Rethymno and local stakeholders (Waste Management Dpt, Enterprise of Water and Sewage, Inter-Municipal Waste Management Company, UCO collectors), defined an operational scheme for a local UCO-to-biodiesel chain.

A new “smart” UCO collection system was launched in 2018; 30 collection points with “smart” bins integrating sensors with GSM technology and a web-based platform. The platform allows real-time monitoring of bins’ filling level and optimisation of the collector drivers’ routes. It sends alerts at selected fill rate, temperature raise, low battery level, unauthorised movements or

vandalism incidents. Through the smart management system, the collection efficiency is increased and operational costs are reduced. Fewer collection trips mean less fuel consumption and less greenhouse gas emissions. Targeted communication activities increase the UCO recycling rate and enhance its proper disposal. A small-scale biodiesel production unit demonstrates the UCO transformation to a clean fuel.



RESOURCES NEEDED

- 30 smart UCO bins equipped with sensors and the web platform: EUR 22,000;
- Installation and system maintenance staff cost;
- Promotional campaign: EUR 5,000;
- Small scale biodiesel production unit to transform UCO to clean fuel: EUR 12.000.

This pilot project has been co-funded by the Interreg MED COMPOSE and the Horizon2020 CIVITAS DESTINATIONS projects.

EVIDENCE OF SUCCESS

- 3,500L of UCO have been collected so far thanks to the 30 bins installed in selected outdoor sites and 20 bins installed at schools;
- 40,000 people reached by awareness-raising activities;
- Ensured sustainability due to public-private sector collaboration;
- Memorandum of Understanding signed between the Technical University of Crete and Inter-Municipal Waste Management Company in Crete, to examine potential expansion to other municipalities;
- 6 Municipalities in Greece and in the EU expressed interest to replicate the model;
- Case presented, after abstract review, in 10 workshops and conferences at European level.

CHALLENGES ENCOUNTERED

- Engage citizens in proper disposal of UCO;
- Strategic set-up of collection bins;
- Regulations hindering small-scale biodiesel production licensing and self-consumption;
- Financial limitations for maintenance (keep clean bins/location); system to be self-financed by collected UCO volume.

POTENTIAL FOR LEARNING OR TRANSFER

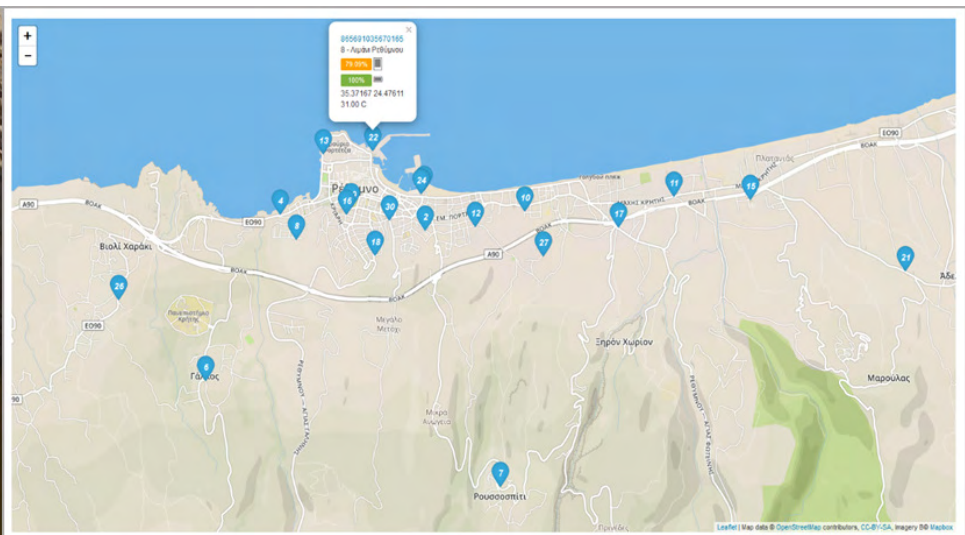
The transferability potential of this good practice is high. The tested approach for the recycling of UCO produced by households and the efficient management of UCO collection, through smart IT solutions, real time monitoring, optimum UCO bins positioning and behavioural change practices can be easily replicated in other municipalities. The smart UCO collection scheme can be also extended to other types of waste within Rethymno municipality and of course in other Municipalities, offering several environmental as well as financial benefits.

A number of Greek municipalities have expressed interest to replicate the scheme and the InterMunicipal Waste Management Enterprise, which supported the pilot development, examines potential replication of the collection scheme to other municipalities in Crete, by signing an MoU. The fulfilment of a “UCO to biodiesel” value chain locally with a small-scale production unit have great potential, when used by entities that have access to inexpensive feedstock (UCO).



INFO

<https://reselplan-toolbox.eu/case-studies/from-uco-to-biodiesel.html>





25 The Collection – Improving textile waste collection



Collection



Recycling



Reuse

→ **“Finding a better solution for textile waste through The Collection, a collaboration with 5 organisations”**



De Kringwinkel vzw

October 2016 - ongoing

THE PRACTICE

In 2015 the city of Antwerp wanted to have a better solution for textile waste. Until then, the textiles were collected in containers on the public domain. This caused a lot of illegal dumping in and around the containers. The collected clothes were also mostly shipped to developing countries.

In 2015 the city started a collaboration with non-profit consortium “The Collection”, a collaboration of 5 non-profit organizations. Following this, The Collection collects textiles, clothing, shoes and leather goods at home or gives inhabitants of the city the chance to bring them in to one of the many delivery points in the city of Antwerp.

The textiles are sorted and locally sold as much as possible.

A concession agreement was made with these objectives:

- Collection: clearly communicated and structured;
- Processing: maximum local reuse, encouraging the collection and sale of reusable textiles;
- Reporting, follow-up and adjustment: indicators.

The agreement runs for 5 + 3 years and stipulates that The Collection gets the right to collect all textile waste in the city. Collection is done by:

- Home to home collection;
- By appointment;
- Textile containers in recycling parks;
- Network of delivery points.

The Collection has a unique combination of goals and charities:

- Social workplaces;
- Local charity for children, people in need, ...;
- Global charity projects, in particular with developing countries;
- Voluntary work.

RESOURCES NEEDED

Once the agreement was made, the cost for the city of Antwerp is zero. All collection, sorting and selling is done by The Collection.

EVIDENCE OF SUCCESS

In 2017, the inflow of textile was 1,200 tonnes (+ 10% compared to 2016). The target by 2021 (based on a research by OVAM) is 4,000 tonnes.

The key elements to this success are:

- The Collection has a clear mission and vision;
- Increase in textile collection;
- Develop a broad network;
- Delivery points;
- Creative reuse.

CHALLENGES ENCOUNTERED

General: collaboration between different partners, combining various charities.

Inflow textile: private players continue to collect textiles, expansion network of delivery points.

Outflow textile: increasing sorting capacity, reuse and recycling options, working with transparent buyers.

POTENTIAL FOR LEARNING OR TRANSFER

The project is easily transferable to other cities. The advantages being less litter and illegal dumping, better output for collected textiles in local second hand shops.



INFO

www.dekringwinkel.be/centrum/2/page/decollectie.html





26 Treatment of biodegradable waste

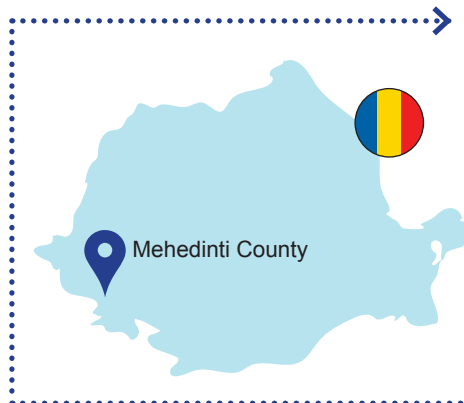


Recycling



MBT plant

→ **“A system to address all elements of waste management: from waste prevention and waste collection to disposal of residues”**



Mehedinți County Council



July 2013 - ongoing

THE PRACTICE

Mehedinți County Council implemented the project “Integrated Solid Waste Management System in Mehedinți County”, with the aim of resolving the significant environmental and operational problems related to waste generation and management and developing an integrated waste management system in the County.

One of the most important activities was the treatment of biodegradable waste in a bid to reduce landfilling. Thus, Mehedinți County Council developed a simple mechanical biological treatment (MBT) / biostabilization plant for the biodegradable fraction of waste including market and garden waste near Drobeta Turnu Severin with a capacity of 54.843 tonnes per year. The treatment includes mechanical pre-treatment (shredding, recovery of ferrous metals and screening), biostabilization of the humid fraction, and refining and maturation.

After a mechanical pre-treatment and biostabilization, the humid fraction has lost about 25% of the incoming mass, resulting in a low-quality compost called Compost Like Output (CLO).

A market for this low-quality compost is not developed yet. However, these products could be used in the landfill as cover material or in the environmental clearance of existing landfills, non-compliant landfills and other contaminated land in the county. Considering the fact that nearby there is the slag and ash deposit of a closed power plant and that it is a frequent polluter in the area, it was decided that this CLO should be used to cover this deposit.



RESOURCES NEEDED

Overall budget: EUR 21,097,421, covering:

- the environmental agency;
- power plant operator;
- local authorities.

EVIDENCE OF SUCCESS

Using the CLO to cover the slag and ash waste produced by the thermo power plant reduces on the one hand the quantity of waste deposited on the landfill and, on the other hand, it eliminates the pollution with slag and ash in Mehedinti main city and adjacent communes and villages. About 100,000 inhabitants will not only benefit from a better air quality but also from bio-products. Indeed, vegetables and fruits produced in the nearby vegetable gardens and orchards will be available on the local markets.

CHALLENGES ENCOUNTERED

- Obtaining a connection rate to sanitation services in urban and rural areas of 100% (there is no compost without the biodegradable fraction);
- The beginning of an optimized separate collection of waste (packaging waste vs. biodegradable fraction).



POTENTIAL FOR LEARNING OR TRANSFER

The solution is relatively simple and available to everyone. Considering that this CLO cannot be used in agriculture, it can easily be used for the landfill as cover material or in the environmental clearance of existing landfills, non-compliant landfills and other contaminated land in the county.

The proposed solution was also accepted by stakeholders:

- The environmental agency noticed the progress of local authorities in implementing environmental protection measures;
- The tasks of the power plant operator became easier by eliminating a pollutant;
- Local authorities appreciated that a problem of local communities has been solved.



WINPOL

Interreg Europe



European Union
European Regional
Development Fund



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[@winpol_EU](https://twitter.com/winpol_EU)

