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Innovation in Waste Management Policies

SMART WASTE

Interreg Europe

Action Plan

 **Apeldoorn**

Municipality
of Apeldoorn



Table of Contents

Introduction & General information	3
Policy context	4
Details of the Action Envisaged	5
Signature	14

General Information

Project : SMART WASTE

Partner organization : Municipality of Apeldoorn

Country : the Netherlands

Region : Gelderland

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Introduction

SMART WASTE wants to improve public policy instruments supporting innovation within waste management procedures. The project evaluates to what extent current national, regional and local policies have promoted successful innovation in waste management. It then proposes interregional solutions to address policy weaknesses.

The project aims to understand the real impact that innovative policy measures have on the effectiveness and sustainability of waste management procedures. Each project partner chooses one policy instrument to be assessed and improved. The policy instrument of the municipality of Apeldoorn is Recycle Service 2025.

Within SMART WASTE we exchanged all our experiences around waste management, being things like :

- All the elements of our waste management policy and the evaluation results;
- The actions we take to minimize dumping and placements near the containers;
- The events we are planning on food waste and a Zero Waste week;
- The way we handle diapers – recycle (thermal pressure hydrolysis) at ARN BV and a pilot with reusable diapers;
- The deposit system we have for large bottles and recently extended to small plastic bottles. On 31 December 2022 there will also be a deposit on cans.

What we learned within the project was the structured way to evaluate our waste management policy and identifying the stakeholders. Also very helpful was identifying our own failures and best practices and matching them with the best practices of our partners. During bilateral and trilateral meetings we identified extra best practices to use and improve our waste management policy, such as implementing a fill level sensor in containers in order to determine the fullness or identify obstacles preventing the valve to work properly.

Policy context

In Apeldoorn waste is separately collected at the source since many years. We separate and recycle glass, organic waste, textile, plastic, metal, drinks cartons, paper/cardboard, diapers, e-waste and residual waste. With our policy instrument Recycle Service 2025, people have to bring their residual waste to the nearest underground container in order to stimulate their separation behavior. For every garbage bag they throw in the container they pay a certain fee. The goal is 30 kg of fine residual waste generation per capita in 2025 and a separation rate of 75% in 2025. In 2050 we have to be fully circular – meaning no residual waste at all. In 2018 the enrollment of the new policy started and the effects are already visible :

- The residual waste went from 115 kg per person per year in 2018 to 60 kg in 2021
- The separation rate went from 68% per person per year in 2018 to 81% in 2021

Every municipality in The Netherlands is obligated to collect separated household waste. This is determined in the National Environmental Protection Act (art. 10.22). Every municipality is free to determine how they want to organize the way of collecting: the waste management system, the service level, environmental impact and costs.

Together with 8 other municipalities, Apeldoorn owns the public waste collector Circulus. Circulus executes the municipal policy, collects the household waste and contracts (via tenders) waste treatment centers and recycling stations in the Netherlands.

The key elements of the new policy instrument are : reversed collection with a high service on resources that are separated at the households, low service on fine residual waste and pay-as-you-throw for residual waste. If people choose for a higher service on fine residual waste (wheelie-bin at home), they pay a higher waste fee (service fee) and it can be emptied at notice.

Apeldoorn has curb side collection via wheelie-bins for food- and garden waste (1x 2 weeks), packaging waste (1x 2 weeks) and paper/cardboard (1x 4 weeks). Fine residual waste is collected via underground containers and pay-as-you-throw. Around 20% of the low-rise houses chose for a 140 liter (37 gallon) wheelie-bin at home, which can be emptied at notice every 2 weeks for a higher service fee. Apeldoorn also introduced free diaper collection (baby and adult diapers) via underground containers. Around 10% of the households make use of this free service. Packaging glass, PMD, paper/cardboard and textiles are collected via underground containers, mostly near shopping centers. 3 times per year, books, electronics, toys and textiles are collected at the curb side. All year round, people can bring reusable items, resources, bulky waste, hazardous waste, construction and demolition waste and large garden waste to the recycling station. People have to pay for large bulky waste and each year each household gets the first 400 kg's for free.

Details of the Action Envisaged

Title of the Action

Technology innovation to prevent waste dumping and improve waste collection

Policy Need Addressed

Despite the successes of our policy Recycle Service 2025, we still struggle with some issues, such as :

- the placement of waste near the containers, due to full containers or to valves stuck;
- the need to optimise waste collection processes, reducing CO2-emissions and achieving effective use of resources and a high service level.

A citizen evaluation carried-out in fall 2020 gave us the insight that :

- In total 32% of the people (respondents) were confronted with a full container (5% often and 27% sometimes).
- This happened mostly with paper containers and textile/clothing ones.

The reasons for dumping of waste materials next to the containers are various. However, the most common causes are because the container is full or because the valve got stuck.

Other reasons include citizens who do not want to pay garbage taxes, those who do not know where to bring bulky waste or that experience other obstacles in bringing bulky waste to the recycling station.

Moreover, waste dumping next to the container can have a multiplier effect on negative behaviors: it has been observed that if there is already garbage next to a container, other people are less afraid to place their waste next to it too.

Waste dumping near containers results in various negative impacts, like degradation of the neighborhood and extra waste collection costs. Furthermore, we know that the challenge towards 30 kg per person per year residual waste included among Recycle Service 2025 targets, requires extra effort in terms of waste prevention and re-use.

Therefore, addressing these issues is a priority for the Municipality.

Overview of the Policy Improvement that this Action refers to

To address the needs identified above, the Municipality of Apeldoorn has developed one Action based around two technology innovation measures: equipping containers with fill level sensors and building up a dynamic route planning. This falls under policy improvement Type 1 – Implementation of new projects.

The two measures that are part of the action are strongly interrelated and help us to duly address our needs. In particular, by measuring how full the container really is, our waste collector (Circulus) is able to plan waste collection in a dynamic way (dynamic route planning), ensuring that containers can be emptied on time, thus making an effective use of personnel and trucks.

This action consists of 3 steps (described in details below) :

1. we piloted fill-level sensors on a small number of containers;
2. upon successful completion of the pilot, we equipped all containers of the municipal area with fill-level sensor;
3. we developed dynamic route planning, using data coming from fill-level sensors.

The first step started in February 2020, when the Municipality of Apeldoorn decided to start the pilot on fill level measuring of the containers, which ran from July 2020 until the end of 2020.

This was a direct result from the SMART WASTE project, thanks to which (as described in section “Background” below), we learnt about fill level measurement.

The pilot consists of 23 containers of which 1 textile, 7 paper and 15 PMD. The fill level sensor is a robust system provided with 3 ultrasound sensors at which the battery and communication module is integrated. The battery is replaceable and the lifespan is about 5 year at three measurements a day.

Each of the 3 sensors emits ultrasonic sound from different angles scanning almost whole the container. The sensors can determine the fullness of the container and determine if there are any obstacles preventing the normal usage of the valve. The data is communicated three times a day or with a higher frequency if necessary. The data is sent to the logistic system of our waste collector using open communication standards. At the logistic department information is read and when necessary an extra truck is send to empty the container.

The benefits and improvements of this system are to :

- Know (almost instantly) when a container is full or when an obstacle sticks the valve.
- Be able to act quick on such matters in order to prevent extra placements or dumping.
- Be able to inform the customer – via the service desk – with the correct information. ‘Correct’ in terms of what is the issue and what (and when) will be done about it.

The results are that the information is technically reliable in such a way that it can be used by our customer service to check if the container is actually full when a customer calls. On some peak locations the trucks drive more often, but eventually our waste collector will switch to dynamic planning of waste collection.

The pilot with fill level measurement was successful and so, in March 2021, the Municipality decided to equip all containers of the municipal area with this new technology and to make one step forward, by integrating them within a dynamic planning system.

Dynamic route planning means that the route planned by the waste collector for their trucks is based on the containers that are almost full and need to be emptied. Dynamic route planning in Apeldoorn will be achieved by using data produced by the fill-level sensors. This ensures that only necessary miles are driven, only (almost) full containers are emptied and resources (vehicles and employees) are used efficiently and effectively. The information about the fullness of the containers is transmitted via a mobile connection to the central container information system of the waste collector. This system shows information on each container and the user of the system can determine by which fill level the container needs to be emptied. The IT-system calculates the best route for collecting waste using the information of the fullness of all containers.

All containers have a fill level measure or the fullness is being measured by clicks (openings with the citizens pass) which makes it possible to actually do dynamic routing for waste collection. At first we started with a small area, learn from it and expanded it to whole Apeldoorn in the end. Phase 2 will be used to monitor the experience with this dynamic planning and improve it so can be used in whole Apeldoorn operationally.

Thanks to this policy improvement, the Municipality of Apeldoorn will enhance the quality of local waste management services, with positive impacts on collection processes and cost effectiveness. This improvement will benefit the citizens and the local environment, triggering positive behavioral changes, with positive repercussions on waste littering and dumping prevention in Apeldoorn.

Background

Participation in SMART WASTE provided us with new knowledge and input to design and implement this improvement with the resources and inspiration on how to minimize placements next to the containers. Input came from both local discussion with stakeholders and from interregional exchange with SMART WASTE partners.

Thanks to local evaluation in SMART WASTE we addressed the successes of our policy Recycle Service 2025 and were able to get information from our citizens in order to determine the issues they care about. One of the main issues is the fact that there is garbage near the container instead of in the container. The evaluation method helped us identifying all the stakeholders involved in our waste management policy.

In the SMART WASTE interregional meetings, we addressed dumping and placements as a failure and the solution and our partners gave food for discussion and thinking. We did this both during full consortium meeting (mostly online, due to the COVID-19 emergency) and in the occasion of bilateral / trilateral meeting with sub-groups of partners in 2021. Moreover, from the very beginning of the project, we established a particularly fruitful collaboration with the Municipality of Kolding, whose policy context and needs have various common points with ours and with whom we have (virtually) met regularly from the autumn of 2019.

Interregional exchange provided us with many learnings that have been regularly transferred to and discussed with our local stakeholders.

Thanks to the exchange process, we could understand better that, although many solutions to address waste dumping and to improve collection processes exist, not all are applicable, because every country has their own rules and situations. For instance, equipping containers with cameras came up as a logical and very common solution, but that would be difficult in our case due to our privacy law. A technical solution such as measuring the fullness of a container was considered as much easily applicable to our case.

In this regard, we learned within SMART WASTE that Florence uses measuring the fullness in small bins. The main waste collection company in Tuscany, Alia, uses a patented system for IT controlled bin and containers. After the kick-off meeting, we have been regularly in touch with the LP to gather more specific information on this system. We have learnt that it contains several features, such as a press system, solar panel driven, wireless 3.0 connection, GPS for remote location of the bin position and temperature and overturning sensors. These characteristics were considered particularly interesting and useful to develop dynamic route planning.

Once our action started to take shape, we used the small groups meetings with partners in 2021 to share the steps being undertaken and we could gather useful feedback and hints to further improve implementation.

Another interesting experience that has been carefully evaluated with our local stakeholder group is the Good Practice (GP) from the Municipality of Kolding "24-hour service for handling in hazardous waste". We first learnt about this GP during the study visit in Kolding (January 2020). Following the meeting, Kolding provided additional information on this GP, which was also discussed in the occasion of the trilateral meetings that we had with our lead partner and Kolding on 3 September 2021. We are particularly interested in this GP, as it could help us improving the service and performances of our recycle station, in the framework of the Municipal strategy to prevent waste and boost re-use. We discussed with our waste collector how to integrate this GP within our Action in SMART WASTE, but unfortunately this would require extra facilities that cannot be implemented within the timeframe of SMART WASTE. However, we plan to continue working on this in the near future. So, it is a very important learning that came from the project.

Regional / Local input, including input from SMART WASTE Stakeholder Group

Apeldoorn boasts a solid group of stakeholders in SMART WASTE, which have been involved in local activities from the very beginning of the project.

Circulus is our waste collector, who collects waste for 9 municipalities (Apeldoorn, Bronckhorst, Brummen, Deventer, Doesburg, Epe, Lochem, Voorst and Zutphen). Throughout SMART WASTE, there has been a periodical exchange with all 9 municipalities and Circulus. In one of these exchange meetings we learned that the municipality of Bronckhorst had started working with fill level sensors only for PMD (Plastic, Metal and Drinking cartons) containers. They are having a large capacity problem with the underground PMD containers and are also installing extra containers. Therefore, we integrated interregional learning from SMART WASTE with the experience being observed in this neighboring municipality. We further on exchanged information with bilateral meetings and agreed upon with Circulus that Apeldoorn would also start a pilot with fill level measurement. The experience of Bronckhorst with fill level measurement is the same as in Apeldoorn. The pilot works technically. The next step, starting with dynamic planning, has been started in Apeldoorn. Bronckhorst also has a strong need to start with dynamic routing and collection, but they have to tackle some IT-issues first.

Other local stakeholder groups are of course the citizens and the people living around the hotspots. They are not informed about the pilot itself and the next step of dynamic planning, because that's too early. But of course we know from reports by citizens about the problems and the hotspots. Besides the technical solutions, such as fill level measurement, we are also working together with the neighborhood regarding waste placements near the container.

Specific Activities and Timeframe

September 2019

Exchange at the SMART WASTE kick-off meeting highlighting the differences and similarities of the partners policies.

End 2019 – Mid 2020

Evaluation of our policy with different stakeholders using the SMART WASTE evaluation method helping us to identify the real issues (our failures).

Beginning 2020

Email exchange with lead partner on experience with fill level measurement

Spring 2020

Preparing the pilot with fill level measurement

July – End 2020

Carry out the pilot with fill level measurement

April – June 2021

Bilateral/trilateral meetings with SMART WASTE partners sharing several experiences and exploring in what areas we could learn from one another

Begin 2021

Evaluation of the pilot and sharing the results with the SMART WASTE partners.

March 2021

Official go for enrolling fill level measures for all containers

August – December 2021

Enroll fill level measuring for all containers within the municipality of Apeldoorn so all containers in Apeldoorn have a fill level sensor or the fullness being measured with so-called clicks (citizen using his/her pass to open the valve and get rid of their waste).

January – July 2022

Introduce dynamic planning and start working with it with a small group of containers.

July – December 2022

Refine dynamic planning in order to enroll it for all personnel.

Stakeholders involved

Name of Organisation / person (where possible)	Role in Action Plan
<p>Circulus</p>	<p>Project management is done by Circulus meaning they had done the pilot, evaluated it and extended the number of containers equipped with fill level measures. The existing IT system was examined in order to see if it could handle the dynamic planning properly. Some adjustments were done.</p>
<p>Municipality of Bronckhorst</p>	<p>The municipality of Bronckhorst is one of the municipalities Circulus services and they first started with a pilot of fill level measurement so they would be able to share their experiences with the rest of the municipalities.</p>

Costs and Funding Sources

Costs	Funding Sources
<p>306 Fill level measures each €350 including installation (total €107.100 investment). The lifespan of a sensor is about 15 years.</p> <p>Data communication costs €120 per year per container (€36.720 per year)</p>	<p>The funding was provided by the operational budget of Circulus. Circulus is a non-profit organization for nine municipalities. Each municipality yearly contributes the amount needed to collect waste and do projects to improve/innovate all in favor for the goal of the circular economy (no waste in 2050).</p>

Risk and Contingency Plans

Description of Risk	Level of probability (High, Medium, Low)	Description of Contingency Plan
Faulty measurements	Low	The software shows the problem like a clamping valve or supply voltage error. The proper action will then be taken.
Problems with the acceptance of the new system	Medium	Change gives resistance as usual. It is important to have all drivers involved, explain how the system works, why it is implemented and that they can always overrule it. Listen to the issues the drivers bring up and pay attention to it.

Monitoring

Self-defined Performance Indicators		
Indicator	Target	Means of Verification
Number of new or improved actions leading to cross-cutting innovation / circular economy in Apeldoorn	2	During the project Smart Waste we introduced two innovative actions: one is the fill level measurement and the second one is the usage of this information to do dynamic route planning and waste collection.
Output Indicators		
Indicator	Target	Means of Verification
CO2-reduction because of less miles driven	10% ¹	The experience of the first half year of 2022 will determine what a realistic amount of reduction is. Mileages and time for collecting waste is registered in the systems of Circulus.
Less garbage placements near the container caused by a full container.	75%	Garbage placements near the container are registered by the Call Center or the employee of Circulus doing maintenance.

¹ This 10% is based on the first experiences in Apeldoorn: 4 hour reduction in 1 week.

Signature

Institution _____

Name of Signatory _____

Position _____

Date _____

Stamp (if available)

Signature





Apeldoorn