

Detailed paper for Tinos conference

Reversed Waste Collection system stimulates households to separate waste.

Very good results in city of Arnhem (Netherlands)

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Abstract

January 2014 marked the launch of the 'Reversed Waste Collection' system by the municipality of Arnhem in three city districts (8,000 households). Goal: to significantly increase the amount of domestic waste collected separately for recycling and to reduce the annual costs of waste collection and treatment. The philosophy underlying the system is to make it easier for residents to offer separated waste and more difficult to offer residual waste.

A year after introducing the new system the amount of paper and plastic packaging material collected separately increased by almost 20 % (paper) and some 300 % (plastic). The amount of residual waste declined by approximately 14 %. And 82% of the residents indicated that they were quite satisfied with the new system.

Important elements in the project were all the efforts undertaken to inform and assist residents effectively to get used to the new system. Among this was the introduction of four waste coaches in each trial district, who were trained to advise residents on waste separation and to identify problems.

In May 2015 the municipal council will decide whether to roll out the Reversed Waste Collection system across the entire city. The costs and benefits will be factored into the equation. It is expected that the net costs will ultimately be lower than those of the old waste collection and treatment system. However, the goal is not to make a profit, but to reduce costs and obviously to obtain more materials which can be re-used, utilized or recycled.

It is Tuesday morning. A resident of Lieshoutstraat in Arnhem rolls his two mini containers from his yard to the street. One is nearly full and contains paper; the other is full and contains green waste. The waste collection service will empty the containers within an hour. He leaves the mini container for plastic where it stands behind the shrubs; it will be collected next week. As he gets on his bike to cycle to work, he grabs the small bag of residual waste. It can go in the underground container on the corner. He checks his wallet. Yes, he has his special waste card needed to open the underground container.

'Let's make it easy for residents to offer separated waste, and slightly more difficult for them to get rid of their residual waste. This provides a good incentive to separate more waste.' The municipality of Arnhem (The Netherlands, population 150,000) launched the innovative Reversed Waste Collection system for collecting waste on 1 January 2014 with this idea in mind. Starting on a trial basis, the municipality implemented the system in three different districts with a total of nearly 8,000 households. One district consisted mostly of low-rise buildings; the second featured a lot of high-rise buildings; and the third district is considered a 'priority district', with a mix of high-rise and low-rise buildings, residents representing different nationalities, and a relatively high number of unemployed.

In this paper, we will briefly examine the concept of Reversed Waste Collection and its implementation in practice. We will also look at the results and conclude with a few points to consider.

The concept

The word 'reversed' indicates a change in direction: instead of collecting residual waste from homes as usual, the municipality instead will collect types of waste that are offered separately and are reusable. Residual waste now has to be brought to underground containers in the district by residents themselves. Reversed Waste Collection is not an entirely new system in the Netherlands. However, Arnhem's project represents the first ever large-scale implementation and involves a very diverse group of diverse districts. Consequently, Arnhem was awarded a subsidy of €775,383 maximum from the European Union Life+ Fund.

Arnhem wants to use the new system to encourage the recycling of household waste and reduce the amount of residual waste, and reduce CO₂ emissions in the process. 'Waste? Let's make something of it!' is the motto of the municipality's waste policy. With the introduction of Reversed Waste Collection the municipality also aims to lower the costs of waste collection and processing. On the one hand, less will be spent on processing

(incinerating) residual waste, and, on the other hand, the reusable waste (raw materials!) will bring in money.

In the Reversed Waste Collection system, low-rise building occupants use three mini containers: one for paper and cardboard; one for plastic packaging materials; and one for green waste. They take their residual waste to underground containers in the district. These are located within a walking distance of 100 to 150 metres.

High-rise building residents use the underground collection containers next to their flat: one for residual waste; one for plastic (packaging materials); and one for paper and cardboard. They can voluntarily collect their kitchen waste for collection in a small green pail (Fig. 1).

The municipality's plan assumed one underground container for residual waste for every 100 households, with collection scheduled for two to three times a week. In the high-rise district, there is always one container for paper/cardboard and one for plastic packaging materials for every 100 to 150 households. These underground containers are emptied once a week.



Figure 1: Old waste collection system and the Reversed Waste Collection system

Preparations

The success of a project that asks people to modify certain behaviour – in this case waste disposal – depends entirely on good communication. Consequently, the residents of the three districts were actively involved in the project and informed from the start. Contacts

were established with residents' associations in the districts at the outset and a communication campaign was set up.

In order to be able to reliably track the project results for the entire initial year, the municipality also designed an extensive monitoring programme. Insight into the project results allows Arnhem's municipal council to take an informed decision on whether to introduce Reversed Waste Collection city-wide after the first year.

At the same time, a great deal of thought was put into the enforcement of the new rules for waste disposal prior to project commencement. There was a possibility that waste materials would be deposited beside underground containers and waste dumping would occur. The municipality reviewed all of the best practices for enforcement in the Netherlands and one of the conclusions drawn was the fact that that enforcement must be paired with the provision of information. Accordingly, Arnhem appointed four 'waste coaches' for each district, a unique phenomenon in the Netherlands. These waste coaches maintain a daily presence in the district (including evenings and weekends) to answer questions on waste separation, provide information and identify problems. They work closely with the municipality's enforcers. The waste coaches are people with limited chances on the labour market who have been trained in order to fulfil their role in the districts. The idea is also for them to get work experience and subsequently be able to find regular jobs.

All of the required infrastructure was acquired through tender procedures: a total of 74 underground containers, access control systems for the residual waste containers, waste passes, over 5,000 mini containers, and various monitoring equipment.

The underground containers were installed in the three districts at the end of 2103. In order to determine the appropriate locations, the municipality established criteria in advance with input from the administrators, residents' associations and organisations for senior citizens and the disabled. Consulting with the latter two groups was important because some of their constituents may have difficulty disposing of waste on their own. The municipality also organised evening meetings to give all residents an opportunity to respond to the proposed locations. There was a huge turnout, and various locations were subsequently adapted to the satisfaction of the majority of residents. The consultation exercises were very time-consuming, as was the process of finding suitable locations due to the fact that not all of the underground cables and mains were registered. In some cases, they were only revealed during excavation and new locations for the containers had to be found.

Households received a special waste pass for opening the underground residual waste containers and user instructions by post.

The launch

The new system was launched on 1 January 2014. The alderman led the kick-off during a special waste game hosted by three primary schools in the trial districts. By then all residents had been informed about the waste disposal behaviour that was expected from them, and why. They subsequently received information through newsletters delivered to their homes, and a dedicated website for residents. Furthermore, a dedicated email address and telephone number were set up to ask questions and file complaints. Schools, Facebook pages and large notice boards were used to communicate with district residents, too. The notice boards show the amount of separated waste collected by residents. And of course the waste coaches were posted on the streets from the start, ready to provide solicited and unsolicited advice to residents.

Results

All of the monitoring data provided a detailed picture of the results booked with Reversed Waste Collection during the first year. The amounts of separated waste collected were weighed after each collection round and then compared on a regular basis with the amounts prior to the trial. This showed that the volume of separated waste deposited quickly increased in all three districts, by nearly 20% for paper/cardboard and approximately 300% for plastic packaging materials. This result remained more or less constant for the entire year. The amount of residual waste decreased by approximately 14 percent. All of the goals related to this point set by the municipality were achieved after 12 months (Table 1).

Table 1: Amount of paper and plastic collected separately 12 months after introducing Reversed Waste Collection (kg per resident on an annual basis).

Trial district	Recyclable material / waste material	Goal	Result after 12 months
<i>Over het Lange Water (high rise)</i>	<i>Paper / cardboard</i>	<i>35</i>	<i>43</i>
	<i>Plastic packaging materials</i>	<i>12</i>	<i>17</i>
<i>De Laar-West (low rise)</i>	<i>Paper / cardboard</i>	<i>43</i>	<i>60</i>
	<i>Plastic packaging materials</i>	<i>17</i>	<i>22</i>
<i>Malburgen-O-N (priority district)</i>	<i>Paper / cardboard</i>	<i>35</i>	<i>36</i>

	<i>Plastic packaging materials</i>	6	18
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An external agency monitored the waste deposited beside all of the underground containers in the trial districts twice a week. Within a matter of months the amount of waste next to the containers was limited in all three districts. The quality of the public space was at a high level everywhere. During the final quarter, the amount of waste deposited beside the containers increased slightly, partly due to the absence of several waste coaches; however, the quality remained at a higher level than expected.

In addition, an external agency canvassed thousands of households to get feedback from residents on the new system. This was done at three different times – before, during and after the first year – using digital surveys and several group interviews. The last measurement indicated that 82% of the people were either neutral or positive about Reversed Waste Collection. This is more favourable than the residents themselves had initially anticipated. To them, the most significant advantages of the system are being able to deposit their residual waste whenever they choose; the mini containers are easy to use; and the system helps the environment. Approximately 18% of residents are still negative; they struggle most with the obligation to dispose of their residual waste themselves. This complaint is expressed primarily by people with mobility issues (the elderly and the disabled). Approximately 14% of the residents surveyed had been in contact with a waste coach.

The costs and benefits of Reversed Waste Collection were registered, too. The total costs of the project in the three trial districts were originally estimated at approximately € 1.77 million (Table 2). According to the latest information, the project costs are about € 1.5 million.

The largest expense was the realisation of the infrastructure. The municipality anticipates that the net costs associated with collecting and processing household waste, including the capital expenses, will be lower than the current net costs approximately five years after rolling out Reversed Waste Collection. After all, the costs of processing residual waste are decreasing, and the separately collected materials bring in money. Thanks to this decrease in costs, the waste collection levy charged to residents can be lowered in the future.

Table 2. The estimated costs of the Reversed Waste Collection project

Tender procedures:	€ 15,000
Research:	€ 15,000
Containers	€ 750,000
Monitoring	€215,000

Enforcement/waste coaches:	€275,000
Communication/dissemination	€245,000
External audit:	€30,000
Project management:	€ 110,000
Overhead:	€ 115,000
TOTAL	€ 1,770,000

Follow-up

Arnhem's municipal council will decide in May 2015 whether to roll out Reversed Waste Collection Arnhem-wide. They will base their decision on a detailed evaluation report.

Clearly, Reversed Waste Collection can make an important contribution to a circular economy in which the exhaustion of raw materials and fossil fuels is prevented as much as possible. Thanks to Reversed Waste Collection, a significantly larger amount of household waste is recycled.

- Arnhem shares its experiences at www.arnhem.nl/rewaco