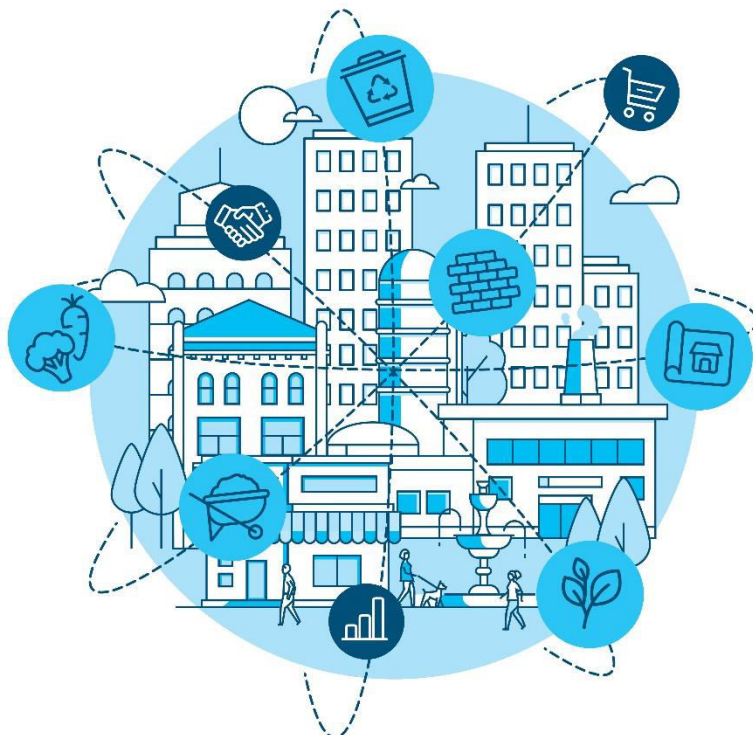




Material banks and marketplaces in Apeldoorn

Extract from the Demonstration Report

Apeldoorn, The Netherlands



Contents

Handling/Physical material banks _____	2
Developing material depots _____	2
Online Marketplace _____	6

This text describes Apeldoorn's experience in developing and using physical material banks as well as their research and choice of a digital marketplace. The sections come from Apeldoorn's CityLoops demonstration report available [here](#).

Handling/Physical material banks

Developing material depots

For many years the municipality of Apeldoorn already has been experiencing the advantages of deploying a soil and sand site along the Terwoldseweg to temporarily store multiple qualities and different quantities of soil and sand. This site operates as a depot, where the quality of soil and sand also is assessed. These experiences were laid down in a research report (please have a look at Entrop, 2021). The soil and sand depot in Apeldoorn fulfills its role with verve (see Figure 4.6 and 4.7). It offers temporarily space for soil and sand in times that supply and demand are not well aligned. The added value of the soil and sand depot can be found in the space it has to offer to store and to combine batches, to facilitate AP04 inspection procedures and the immediate availability of this important resource. There are in general not extra services being offered.



Figure 4.6. Sand stored at the soil and sand depot of the municipality of Apeldoorn (by courtesy of Robert Rouwenhorst).

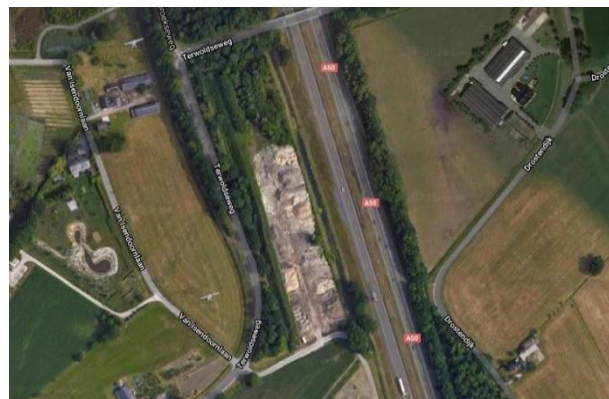


Figure 4.7. Sand site of Apeldoorn as can be viewed from south to north at Google Maps (by courtesy of Aerodata International Surveys).

The study showed that it is already rather complex to properly record the quantity and quality of soil and sand (Entrop, 2021). Currently most civil engineering works and buildings are mainly being composed of linear end-to-life components, products and materials. This should alarm us about the efforts needed to be undertaken, when it comes to investigating and administrating the historical background, former usage and current state of all other circular resources needed in construction. These processes will be time-consuming, prone to errors and costly. Logistic systems necessary to have all components, products and materials in place at the site in time are complex. Being a local depot, a soil and sand depot is able to operate as a node in the logistic system of the soil and sand market where supply and demand can converge. However, there will be a need for a new kind of depot for a circular construction industry in a new sort of logistic system. A system that is supported by automated sensors and a proper digital infrastructure linked to databases.

Since the start of CityLoops, Apeldoorn was expressing her ambition to also store other materials needed in her public civil constructions. Internally, a feasibility study (Kaal, 2020) was conducted to learn more about the basic requirements for a material depot at Kerkeveld (see Figure 4.8 and 4.9). This location has a total surface of 5458 m². Effectively, this site can offer 2750 m² to store materials outside, while it was assessed that approximately 1600



m² was needed. They laid eyes on three locations for a second depot. Licenses were being obtained and zoning plans were brought in line with the new designated usage. At the same time, students of Saxion University of Applied Sciences were designing possible site layouts for the depot at the Laan van Zodiak in Apeldoorn (see Figure 4.10, Poutianen et al., 2020).



Figure 4.8. The actual start of the material depot at Kerkeveld (photo by courtesy of Ryan Kaal).

Figure 4.9. Different sections of the material depot at Kerkeveld will be storing specific kinds of materials

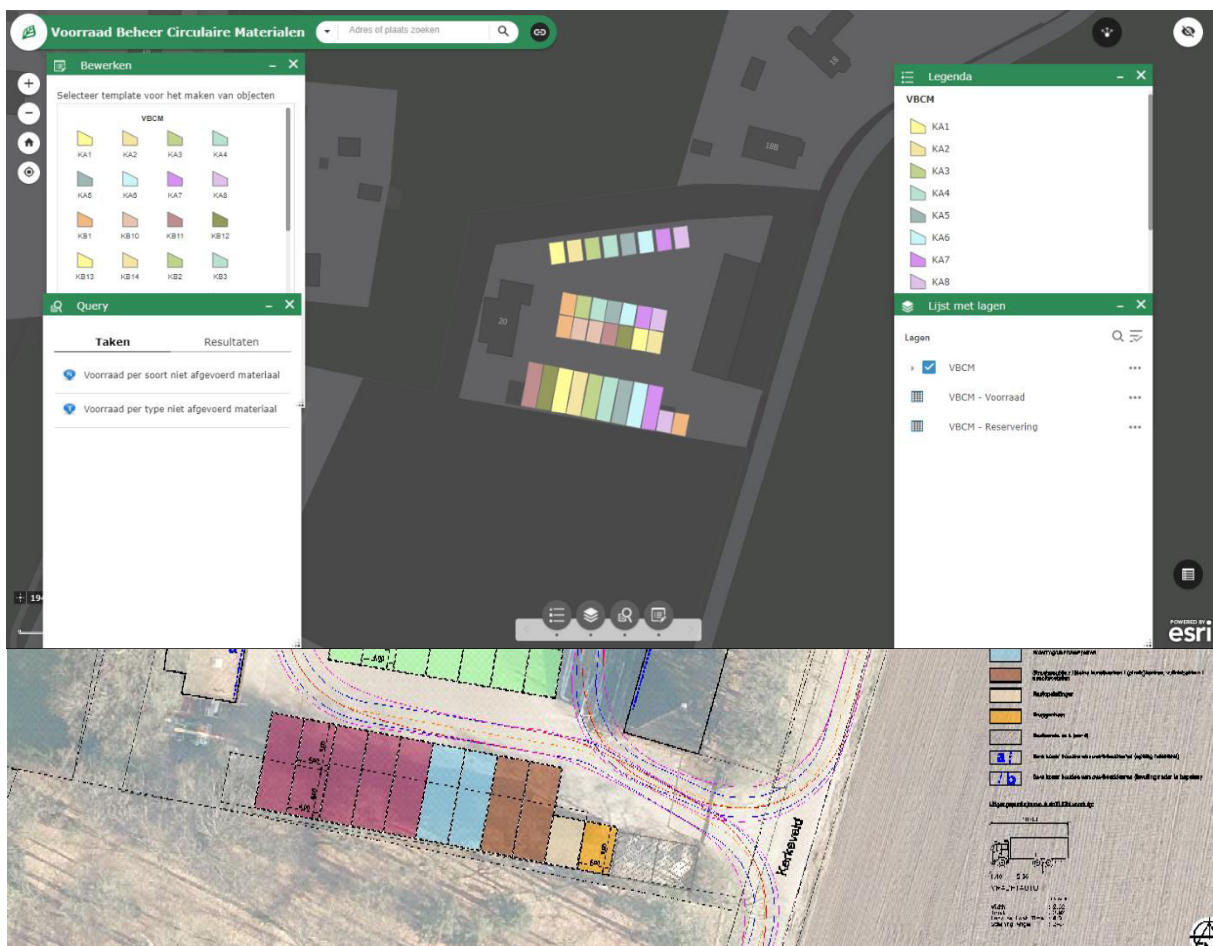


Figure 4.10. 3D design for a possible depot at the Laan van Zodiak in Apeldoorn (Poutiainen, et al., 2020)

Figure 4.11. Screenshot of the database managing the material streams at the Kerkeveld depot.

The efforts of the municipality resulted in the opening of a material depot at Kerkeveld. At this depot products, like pavers and concrete products, are being stored that are planned to be reused within one year. Due to the depots limited size, broken or to be broken materials that can be reused in the production of new concrete are not stored at this site. Figure 4.11 shows a screenshot of the materials stored in the depot. With the arrival of the online matching tool DuSpot, this database became redundant. In 2022, a second material depot opened at Laan van Zodiac (see Figure 4.12 and 4.13). This second material depot is also familiar to the contractor working at Griffiersveld. Often materials are brought to and taken from this depot by this contractor.



Figure 4.12. Materials stored at the Laan van Zodiac depot of the municipality of Apeldoorn (by courtesy of Bram Entrop).



Figure 4.13. Materials stored at the Laan van Zodiac depot of the municipality of Apeldoorn (by courtesy of Bram Entrop).

Impact

Expected outcome: Improved innovative products and services in CE practices within municipal organisations

Indicator	Baseline result	Intermediate result	Final result
3. New tools for better mapping of resources and their location: Qualitative description	Zero. New tool analysed according to its functionality and usefulness. Measuring tool in use internal	1 Material-depot were developed Kerkeveld and is in use. The second Material-depot Laan van Zodiac is planned Municipality works with a digital platform based on warehousing principle, allocate and store material in the physical depot at both.	3 Material banks realised and running. (1) soil and sand site along the Terwoldseweg (2) Material Depot Kerkeveld and (3) Material Depot Laan van Zodiac. The pilots with DUSPOT resulted in a full roll out and implementation of DUSPOT, making the database (warehousing principle) redundant.
Outcome review: the number of physical material banks increased from 1 to 3 in the lifetime of this			

project, and the contractor reconstructing Griffiersveld made use of the 3rd one throughout the implementation phase. Further it became apparent that the database in use by the municipality became redundant with the use of DuSpot.

Online Marketplace

The urge exists to develop and use tools that enable us to operate road materials retaining their highest utility, quality and value. Here we share our experiences in using online marketplaces to close material loops. These matching tools assist those offering used materials -or an unanticipated surplus of materials- are linked to those in need of materials. Results will be shared regarding the experiences of Apeldoorn in three ways 1) setting up a completely new digital marketplace, 2) collaborating with an existing digital marketplace in an early phase, and 3) partnering up with an online matching tool for future projects.

In a circular economy it is still possible, just like in a linear economy, that materials, products and components change hands. Although some circular movements focus on letting the right of usage prevail above ownership, online matching platforms are by many seen as a useful instrument to let ownership change from one person or organisation to another, while maintaining high user value. When it comes to trading used materials, products and components, the website <http://www.marktplaats.nl>, established in 1999, is one of the best-visited websites in the Netherlands; namely 8 million unique visitors each month out of a population of 17.8 million. All kinds of small and large consumer products, but also professional trades and even building materials are offered on this website. However, as a municipality or company in the construction industry, it is not easy to upload your used materials, products or components completely and quickly. It takes quite some effort to correctly express their quantity and quality.

The Municipality of Apeldoorn looked for opportunities to let her road materials experience the best next usage possible by collaborating with existing trading platforms and by giving a try with a newly designed website. Students of Saxion UAS designed a website with specific categories of materials, products and components useful to the construction industry (ten Brinke et al., 2021). Furthermore, a new function to date availability was introduced. This date addresses when a certain building material, product or component might come available and can be harvested on-site. However, setting up a completely new site means that you will start at zero regarding visitors and, therefore, potential buyers. It will take time and money to attract visitors to your new website (see Figures 4.21 and 4.22).

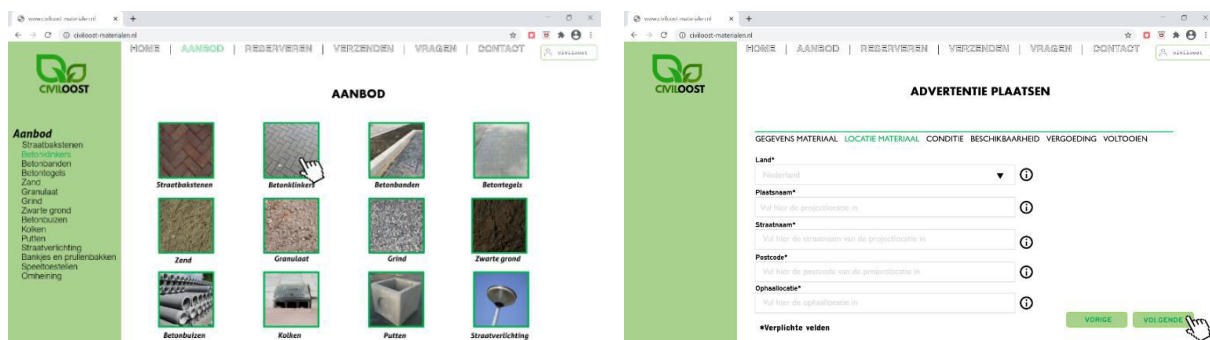
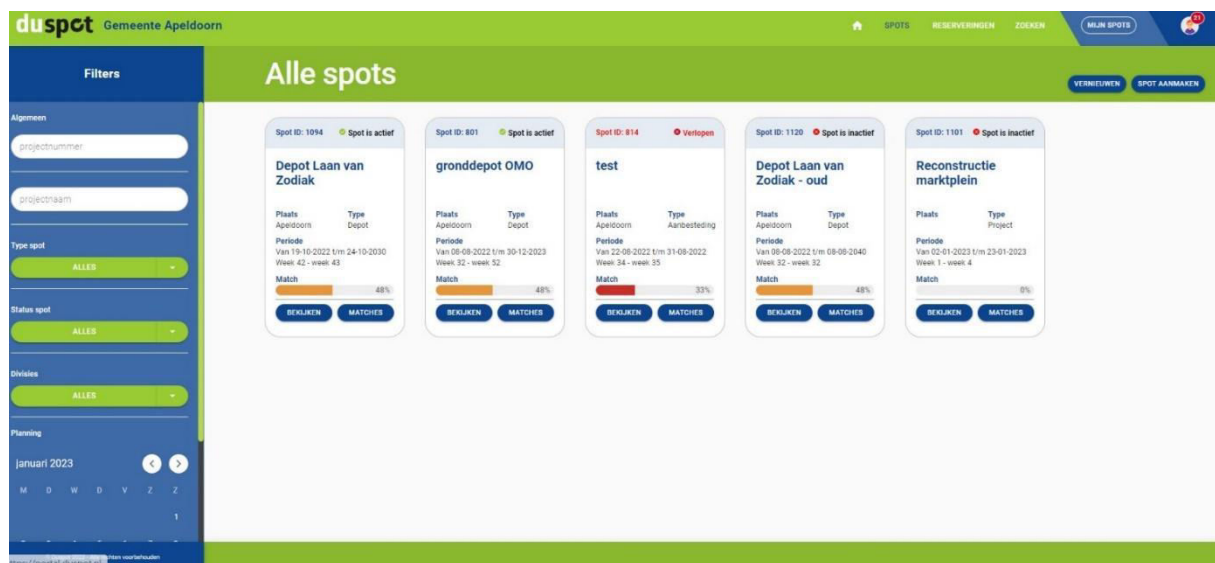


Figure 4.21. An impression of the online marketplace for public space materials and products as designed by the students (ten Brinke et al., 2021)

Figure 4.22. An impression of how a product can be uploaded at the designed online marketplace (ten Brinke et al., 2021)

To cope with the problem of the number of users, the municipality of Apeldoorn tried to collaborate with the more established online matching platform Excess Materials Exchange (EME). This technology company has the ambition to find new high-value options for materials or (waste) products by showing their financial and ecological value. By means of four instruments 1. Resource passports, 2. Tracking and tracing, 3. Valuation and 4.



Matchmaking (<https://excessmaterialsexchange.com>, visited December 6th, 2022), the used materials available in Apeldoorn could have been linked to new users. However, after a first inventory of the environmental impact of some of the old materials in Griffiersveld by EME, the company lost interest and the collaboration came to hold.

Figure 4.23. An impression of how a set of spots in the municipality of Apeldoorn look like in DuSpot (courtesy of Mart Mensink)

The third trajectory that started and is sealed by an agreement, is the collaboration between the municipality of Apeldoorn and DuSpot. DuSpot is also an online matching tool and it specifically focuses on matching materials in civil construction projects (see Figure 4.23). Materials coming available in different stages of a building project are offered in a user-friendly, organized and comprehensible way. This is being achieved by making use of the standardized way specifications for civil construction projects are organised (<https://duspot.nl>, visited December 6th, 2022). As its name implies DuSpot enable a user to make a building project or depot online visible as a spot where products and materials are offered and needed for certain users (see Figure 4.24 and 4.25). The user can select who will be able to see this spot. By this means DuSpot is used to facilitate the reuse of materials needed and coming available in Apeldoorn's construction projects in public space. To facilitate circular material loops DuSpot also shows the inventories of the material depots Apeldoorn is operating.

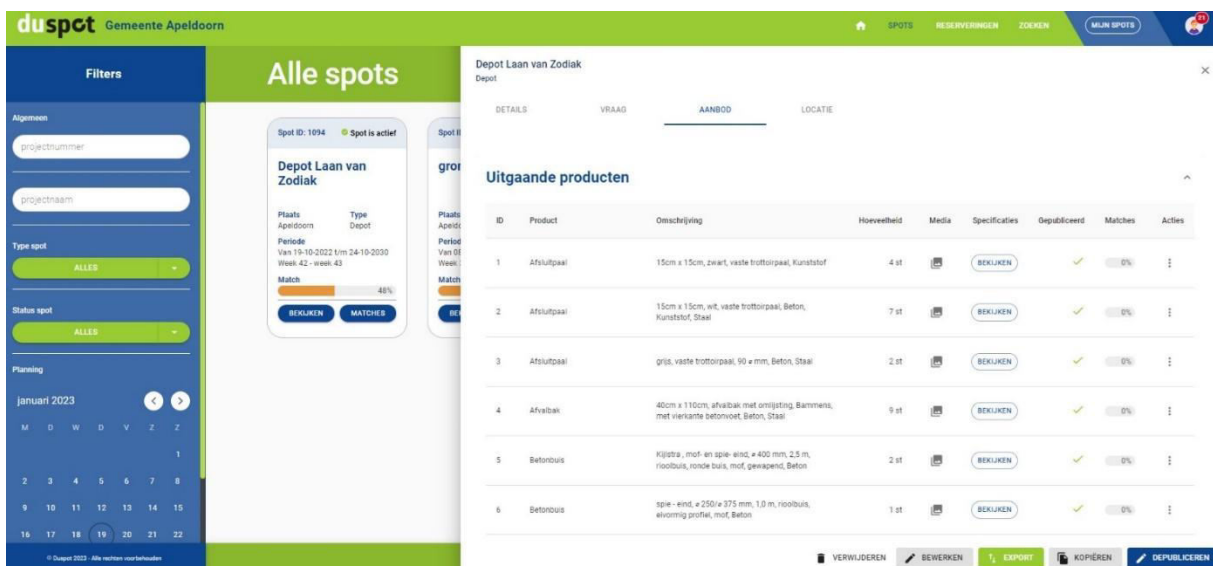
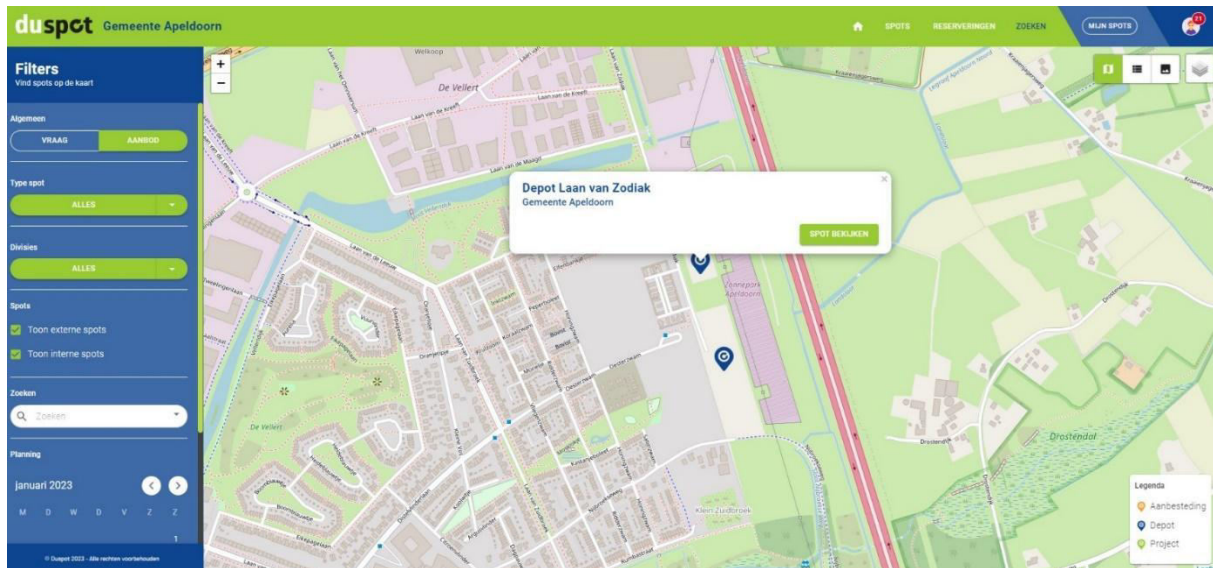


Figure 4.24. The location of the material depot at the Laan van Zodiac as shown in DuSpot (courtesy of Mart Mensink)

Figure 4.25. Some of the products and materials that are offered at the depot at the Laan van Zodiac as shown in DuSpot (courtesy of Mart Mensink)

By analysing these three demonstration actions, it was found that the rates of effectiveness and efficiency by which the main service was offered, hence the matching process, strongly differ. Differences can be found in input, throughput and output. Handling costs of the products offered are a traditional point of concern. The ease with which one can upload the

specifications of materials onto the platform is being tackled in different ways. Insights in the environmental costs and benefits of reusing materials are not yet provided by every platform.

ONLINE MATCHING TOOL DUSPOT

DuSpot is an online matching tool e.g. for governments, contractors, and engineering offices. It is hosted centrally as Software as a Service (SaaS). When a spot is a building project, the data-input can consist of project specifications aligned according to the Netherlands commonly used 'Rationalisatie en Automatisering Grond-, Water- en Wegenbouw' (RAW)-system, which encompasses juridical, administrative and technical requirements. When a spot is representing any kind of depot, the inventory of the depot can be shown. One can select who is able to see what is offered or needed at a certain spot when. An organisation using DuSpot pays an annual fee for the number of users, that have access to and will be using DuSpot.

Lessons learned

Within CityLoops, the municipality of Apeldoorn introduced the residential area Griffiersveld, part of the relatively large neighbourhood De Maten, as a casus to test tools and to come to circular road renovation. The online marketplace and experiences with EME presented in this tool factsheet were focusing on this demonstration project. When it was noticed that DuSpot has some advantages compared to these two, a trial period not limited to Griffiersveld was started, which ended in December 2022. After that, the matching tool is now widely available to enable material loops in municipal projects to be closed. The material depots of the municipality also became available as spots in DuSpot.

Tool factsheet "Matching platforms for construction materials"

Company website of DuSpot, <https://www.duspot.nl/>

Impact

Expected outcome: Improved innovative products and services in CE practices within municipal organisations

Indicator	Baseline result	Intermediate result	Final result
Indicator 30. New digital material databank / market place: qualitative description	Zero	Pilot was run and experiences were obtained with EME . Trail with DuSpot started with a scope beyond Griffiersveld	DuSpot now widely available within the municipality and the material depots became available as spots in DuSpot.

Outcome review

Through the purchase of DuSpot, the municipal has not only obtained improved innovative products and services, but also enhanced it CE practices. This because the two material spots became available as spots on DuSpot.

References

- Brinke, R.J. ten, Hal, T.J.L. van, Jong, P.G.J. de, Lintelo, G.H.J. te, Podt, G.B., Revenberg, M., Ros, B., and Thijert, B., 2021. *Designing and realizing circular urban road renovation* (student report 3S-project). Saxion UAS
- DuSpot, 2022. *Vrijkomende bouwmaterialen hergebruiken binnen projecten en aanbestedingen*. Retrieved from <https://www.duspot.nl> visited on December 6, 2022
- Entrop, A.G., 2021. Developments to come to a circular construction economy; experiences in facilitating a local soil and sand depot. *IOP Conf. Ser.: Earth Environ. Sci.* 855 012005
- Excess Materials Exchange, 2022. *About us*. Retrieved from <https://www.excessmaterialsexchange.com> visited on December 6, 2022
- Kaal, R., 2020. *Circulair materialendepot Kerkeveld; startdocument*. Gemeente Apeldoorn.
- Marktplaats, 2022. *Over Marktplaats*. Retrieved from <https://www.marktplaats.nl> visited on April 22, 2022
- Poutianen, S., Willoughby, N., and Otten, B., 2020. *Designing a material bank to facilitate a circular construction industry* (student report minor-project), Saxion UAS

CITYLOOPS

CityLoops is an EU-funded project focusing on construction and demolition waste (CDW), including soil, and bio-waste, where seven European cities are piloting solutions to be more circular.

Høje-Taastrup and Roskilde (Denmark), Mikkeli (Finland), Apeldoorn (the Netherlands), Bodø (Norway), Porto (Portugal) and Seville (Spain) are the seven cities implementing a series of demonstration actions on CDW and soil, and bio-waste, and developing and testing over 30 new tools and processes.

Alongside these, a sector-wide circularity assessment and an urban circularity assessment are to be carried out in each of the cities. The former, to optimise the demonstration activities, whereas the latter to enable cities to effectively integrate circularity into planning and decision making. Another two key aspects of CityLoops are stakeholder engagement and circular procurement.

CityLoops started in October 2019 and will run until September 2023.



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 821033.

Disclaimer: The sole responsibility for any error or omissions lies with the editor. The content does not necessarily reflect the opinion of the European Commission. The European Commission is also not responsible for any use that may be made of the information contained herein.