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This text describes Apeldoorn's experience in circular procurement for the renovation of the residential road of Griffiersveld. The sections come from Apeldoorn's CityLoops demonstration report available [here](#).

Circular procurement

Most of the CDW activities were concentrated around the residential road renovation project of Griffiersveld in Apeldoorn. Already quite quickly after the start of the CityLoops project, this renovation project was spotted as a potential candidate for the much-needed demonstration actions. Only one main research sub-project had started prior to the definitive case selection, namely that one in which the sand and soil site of the municipality was being studied. It turned out that all phases of initiating, designing, preparing and executing the Griffiersveld renovation project nicely fit between start and finish of the CityLoops project, as is shown in Figure 1. On site, actual construction activities took place between July 2022 and December 2022. In nine phases of approximately two weeks each, the hindrance for residents regarding accessible was tried to reduce to a minimum. However, due to shortages of personnel some delay did take place, resulting in little activity for a few weeks during the project.

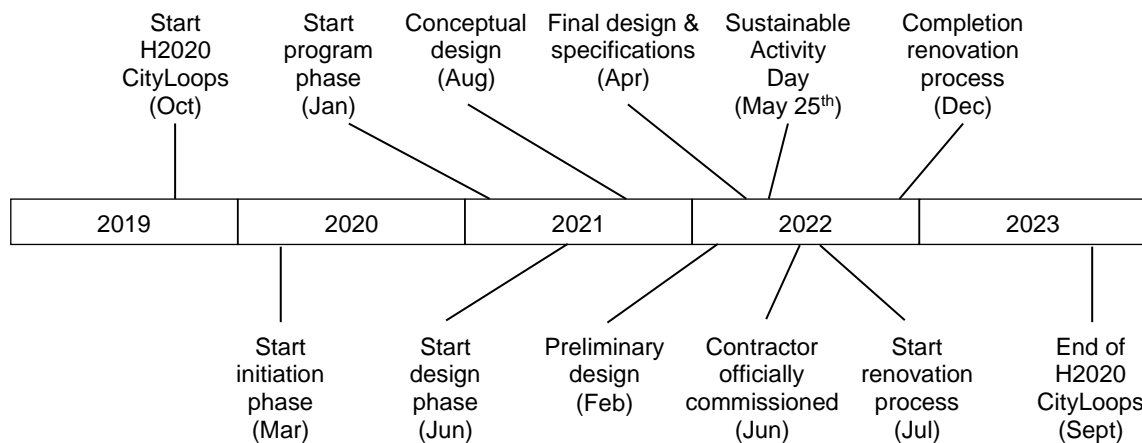


Figure 1. Timeline for the renovation project of the residential road Griffiersveld.

This project represents a situation that is very recognizable for many municipalities in the world on an annual, monthly, or even weekly basis, namely the renovation of a paved residential road. Constructed in the late seventies, it is a street that is paved with concrete pavers and small 30 cm by 30 cm concrete slabs. When planning, designing, and executing a road renovation project, multiple departments within the municipal organization, as well as different external organizations, need to collaborate. To the stakeholders involved in this project, circular material usage was introduced as a new specific sustainable objective. However, traditional constraints like time and costs still exist to come to a new renovated residential road. Therefore, circular objectives were introduced and discussed through a set of interventions.

Challenges regarding contractual agreements

Before setting out how procurement took place in this project, it is important to mention the contractual agreement the municipality of Apeldoorn has with a supplier of concrete products.

This agreement is laid down in a framework contract, which is a document that outlines the terms and conditions for an ongoing business relationship between De Hamer and the municipality of Apeldoorn. When it comes to public open space construction projects, any contractor working for the municipality will be confronted with the sand the municipality has available at their soil and sand site and the agreement the municipality has with this material supplier De Hamer.

An interview with a financial expert of the municipality of Apeldoorn on the 20th of December 2021, taught us that the contract was concluded in 2019 and would run until the end of 2021. Although there is some debate on the effectiveness of the contract and which elements should be altered how, it was extended till May 2023. In January 2023 it was carefully mentioned that the agreement might be terminated after this due date and that new projects will comply with a basic overruling set of specifications, partially developed with the help of platforms <https://bouwcirculair.nl> and <https://moederbestek.nl>.

One important article in the current agreement that aims to close material loops at least to a certain extent, is formulated, as follows: *The tenderer agrees with the following and confirms that his tender complies with it.*

In connection with the desire for circularity, the minimum requirement in above-ground concrete products for secondary aggregate is 15% (volume percent). The circularity requirement does not apply to the requested concrete street paver coloured through and through.

The secondary aggregate used in concrete must have a CE marking based on EN 12620. The aggregate must also meet other existing quality requirements for use in concrete as described in BRL2506-1, BRL 2507 or BRL 2502.

The municipality does not demand a higher percentage because this is not recommended due to insufficient availability of suitable secondary aggregates on the one hand and possible negative consequences for sustainability on the other.

A nationwide exemplary set of specifications provides a product sheet on concrete paving stones (BSS) and the 15% is also mentioned therein. This has been available since 20-09-2016. The circularity requirement in Article 1.1.2 in the contract does specifically not apply to a concrete paving stone (in Dutch: betonstraatsteen or BSS for short) coloured through-and-through, as the designer and project leader envisaged in the case of Griffiersveld. The circularity requirement means that otherwise 15% secondary aggregate is used. A higher percentage is not required because there is too little material to use as secondary aggregate and on the other hand because of alleged negative consequences for sustainability in the sense of the technical lifetime of the concrete paving stone. The mentioned Environmental Costs Indicator (in Dutch: Milieu Kosten Indicator or MKI for short) of 25 euro/m³ has been changed in various product certificates since the agreement of 1 October 2021 to 23 euro/m³, which is a lower and therefore even more environmentally friendly value.

However, enforcement of the minimum 15% requirement must take place. This is a challenge on paper and in practice. A recent past project in the municipality of Apeldoorn did not show the desired results. Although online information can be found that the redevelopment of the park-like neighbourhood 'De Parken' in Apeldoorn is the very first civil engineering project in the Netherlands to be designed and executed in a circular manner, there was not enough secondary material available in that project. At the time, the control of the aforementioned minimum 15% volume percentage was not to actively pursued.

Circularity in the demonstration project

On the 14th of February 2022 at Saxion in Apeldoorn a workshop was provided by Rijkswaterstaat, the Netherlands executive agency of the Ministry of Infrastructure and Water Management, dedicated to promoting safety, mobility and the quality of life. In this workshop information and guidelines were provided and thoughts were discussed enabling civil servants of the municipality of Apeldoorn to improve the inclusion of circularity in their procurement activities. The guideline 'procurement in eight steps' (Van Oppen, Croon and Bijl de Vroe, 2018) was addressed and explained. For the particular case of Griffiersveld, the result of this workshop was for the principal and project leader to put more effort in coming to a team already including a contractor to guarantee constructability of the project, and efficient and effective material use and reuse in the project.

One week later, on the 21st of February, a tender guideline with instructions for interested contractors to renovate Griffiersveld came publicly available. Financial and time constraints were given in this guideline. In this guideline the municipality of Apeldoorn asked, among others, the contractors to come up with ideas to improve circularity. The better the vision on the process, time management and circularity were, the lower the costs of the project would be assessed by the principal, with a maximum of € 7.500 per topic.

In April 2022 it became clear that the contractor, had prepared three concise documents as his plan of action. As requested in the guideline, one document was about the vision of the contractor, a second one on time management and the third one was about circularity. This third document was translated in English and can be found in Annex A. The contractor suggested to apply six measures to improve the level of circularity and offered for additional payments three extra options, which could be considered for adoption by the principal.

- Measure 1: to organize a circularity session with multiple participants.
- Measure 2: to work out a reuse inventory for Griffiersveld.
- Measure 3: to apply released materials from this project to other projects using DuSpot.
- Measure 4: to break released concrete products into rubble for foundations.
- Measure 5: to repave the street completely on a foundation of sand.
- Measure 6: to directly reuse sand in other projects without transporting it to the soil and sand site first.

- Option 1: to reuse trees elsewhere in the municipality.
- Option 2: to palletize used concrete paving stones for reuse.
- Option 3: to set up a material passport for the project.

Measure 1 about organizing an internal session on circularity, was implemented on the 25th of April, when the principal, the project leader and the H2020 CityLoops demonstration manager of the Municipality of Apeldoorn, together with the director and project leader of Pannekoek GWW and a researcher of Saxion UAS sat down to discuss how circular this project could be executed. Measure 2 was covered by the municipality of Apeldoorn by means of providing drawings specifying which materials were available where in what quantities. Therefore, the contractor did not need to implement this measure anymore. In regard to Measure 3 the contractor communicated the availability of materials through DuSpot. However, at the time no interest was shown by those who were connected to this matching tool. The contractor still made it possible to reuse much of the concrete paving stones in projects at local farms. In the end only 225 ton, instead of 1150 ton, ended up being crushed. Although storm water infiltration was facilitated, no values regarding traced volumes or weights of 0/4 or 4/40 fractions as addressed in Measure 4 were communicated. Measure 5 was applied significantly reduced to number of sands from and rubble loads to the project site. Because only little sand was needed, due to Measure 5, Measure 6 was not actively implemented; sand transport went through the soil and sand site of the Municipality of Apeldoorn. Besides the willingness of the contractor to collaborate with the municipality of Apeldoorn on the topic of circularity and the CityLoops project, the three options that had been offered, were not implemented.

CIRCULAR PROCUREMENT

In the procurement trajectory, contractors interested in the project were not only given financial and time constraints in a guideline but were also challenged to work out their vision on the process, time management and circularity. The better the vision on the process, time management and circularity were, the lower the costs of the project would be assessed by the principal, with a maximum of € 7.500 per topic.

Lessons learned

Three contractors made an effort to clearly explain what vision they have regarding the renovation process, time management and circularity in the renovation of Griffiersveld. The winning contractor offered in total nine measures to improve circularity. By actively implementing three out of nine measures the environmental impact was significantly reduced. When the project is being executed, it is important that the principal stays in close contact with the contractor to make sure that all measures are being implemented. The sunny side in this project was that by applying two measures very successfully, namely the reuse of concrete paving stones nearby and the reuse of sand as a foundation, two other measures were hard to implement.

Book Oppen, C. van, Croon, G., Bijl de Vroe, D., 2018. Circular procurement in 8 steps.

Impact

In renovating Griffiersveld 225 tonnes of debris came available consisting of old concrete curb stones, old broken concrete paving slabs and stones, and leftovers by means of cut new concrete paving stones. This debris will be crushed and will be reused in the foundation of new projects. In total, an estimated 925 tonnes of materials were being reused within the project itself or in its proximity.

Expected outcome: By the end of the project, procurement of circular products related to Griffiersveld have increased by 10% in volume, due to awareness raising activities within Municipality of Apeldoorn.

Indicator	Baseline result	Intermediate result	Final result
12. Circularity requirements in procurement beyond existing levels	Zero	To ensure to optimize all circular solutions, the procurement process was organised differently. Usage was made of a so-called Bouw team. The bouw team is a partnership in which the contractor is involved in the design phase of the construction project. In this way the construction team together with the contractor can think through all circular options to implement during the execution of the construction process.	The final result of this process is that the road renovation of Griffiersveld has conducted in a circular way. Traditional construction procurements do not by default entail circular aspects. This is completely depending on the person in charge. This has to do with the bouwteam method, which was implemented, through the bouwteam method the offer of the constructor provided circular basic principles and optional additions for the municipality. From the evaluation session it became apparent that although auditions were offered, none of the additions were implemented and only the basic principles were implemented
16. Procurements making use of stakeholder dialogue to strengthen circularity: Qualitative description	Zero	8 steps guideline for circular procurement. RWS has organised a webinar for Apeldoorn internal stakeholders and an in-person workshop for internal stakeholders. Organise a market dialogue of construction companies. Procurement team consolidated; project started. Publication of the Tender for 'Design & Engineering'. Procurement process is implemented.	In the evaluation session on the procurement process, it became apparent that several of the copper 8 guideline on circular procurement have been followed, none the less not all. Reasons for this was partly due to timing of the instrument in relation to the Bouw team discussions. Nevertheless, during the evaluation workshop held, the internal stakeholder of the municipality of Apeldoorn did underline the importance of the steps in relation to the procurement workshop and are also eager to work with this more in the coming years.

References

Oppen, C. van, Croon, G., Bijl de Vroe, D., 2018. *Circulair inkopen in 8 stappen*. Copper8 / Rijkswaterstaat, Amsterdam

Annex A: Procurement

This annex shows how the contractor responded to the request of the municipality of Apeldoorn to encompass one page of information about how circularity will be taken into when executing the renovation of Griffiersveld. Together with an overall vision on the process, a narrative on time management and the cost specifications the appropriate contractor was selected.

Section 1 Measures that contribute to circularity

The current design offers possibilities in the field of circularity on several aspects. The following measures are directly applicable within the target budget.

Measure 1: Organize circularity session: immediately after the project start-up (PSU), we organize a circularity session, to which we invite employees from CityLoops in addition to the permanent project team. The session will basically consist of brainstorming ideas about circularity and how this can be implemented specifically in this project, but also in future similar projects. Experience from the work 'Circular Waste Water Treatment Plant (WWTP) Terwolde' (on behalf of Water Board 'Vallei en Veluwe'), where we have also applied this, teaches us that such a session is very valuable for the integration of circularity within a project.

Financial consequence: none, is included in the construction team costs.

Risks: none, is purely a brainstorming session. Outcomes that are applicable are incorporated in the elaboration of the design.

Measure 2: Reuse inventory: during the construction team phase, we draw up a reuse inventory. Here we provide insight into which materials that need to be removed are suitable for reuse. This gives a complete overview of the type, quantity and condition of these materials.

Financial consequence: none, is included in the construction team costs.

Risks: none, is purely an inventory. Outcomes that are applicable are incorporated in the design elaboration.

Measure 3: Apply released materials to another work: the contractor is affiliated with DuSpot. This is an online platform intended for trading materials that are released during reconstruction work, for example. We place the materials that are released during the demolition work on this platform, so that other parties (governments, contractors, private individuals and/or gardeners) can reuse these materials one on one within their project.

Financial consequence: by trading the released materials on DuSpot, they will generate money and no dumping costs have to be charged. In the construction team phase, the expected yield is included in the detailed budgets to be drawn up by us.

Risks: none, released materials are transported according to regular working methods.

Measure 4: Breaking released stones into concrete rubble with a size of 4 to 40 mm to be used in water-storing foundations: If it appears that the released pavements are (partly) of insufficient quality for reuse, we propose to break them (outside the work area) into concrete rubble 4/40, so that we can use this one on one for the water-storing foundations to be installed. We use the fine fraction 0/4 that remains, just like the sand released from the existing foundation (after we have sieved it), as a paving layer. In order to have concrete rubble 4/40 immediately at the start of work, we propose to collect material from other works in Apeldoorn (including the Schoutenveld work) during the construction team phase and then break it up.

Financial consequence: (partially) no new concrete rubble / new street layer has to be supplied and the paved surfaces that are released do not have to be removed. On the other hand, breaking the exposed pavement does entail additional costs. However, it is expected that this measure will yield more than it costs. The financial benefits are included in the detailed budgets to be drawn up by us during the construction team phase.

Risks: nuisance to local residents due to the use of a rubble crusher. Control measure: During the construction team phase, we look together with you for a suitable location in the vicinity for the rubble crusher. At this location, material can already be collected from other works in Apeldoorn during the construction team phase, so that material is available immediately upon execution.

Measure 5: Paving completely founded on sand: experience from the nearby project 'Revitalisation Schoutenveld' teaches us that the current street layer is founded on sand. For this reason, we propose to base the paving entirely on sand. We are currently applying this to various works. Foundation on sand is general policy at the municipality of Nunspeet, as well as among some other municipalities.

Financial consequence: foundation on sand means less supply and removal of material, which directly results in cost reduction.

Risks: subsidence/rutting of paving. Because the current foundation has been there for years, it is so well compacted and the fact that no sewer is replaced, no subsidence / rutting of paving is to be expected when we apply this. It is also not expected that the traffic load will increase in the neighbourhood in the coming years. If it turns out in the construction team phase that a rubble foundation is desired/necessary, we can still optimize by using 150 mm rubble instead of 250mm.

Measure 6: Reuse released sand from existing foundation: The reuse of released sand is nothing new in the infrastructure. However, this can be done more efficiently by taking it directly to the place of reuse without placing it in a depot in the meantime to carry out the necessary inspections. We do this by carrying out an AP04 inspection in-situ. Given the location and our experiences from the area, we do not expect any deviating results here. We can reuse the released sand 1 on 1 in one of our or perhaps one of your current projects. Due to the efficient reuse, this results in a significant CO₂ reduction in view of the reduction of transports.

Financial consequence: less transport means a reduction in costs.

Risks: the AP04 inspection results could indicate that non-applicable (polluted) soil is present, resulting in project delay. Control measure: experience from a comparable project 'Revitalisation Schoutenveld' and given the location of the residential area indicate, that this kind of result is not to be expected.

Section 2 Circular opportunities not included in the target budget

Option 1: Reuse trees elsewhere in the municipality: we see opportunities to transport trees that have to be removed elsewhere to this work and to replant them here. During the construction team phase, we want to make an inventory of this together with the principal.

Option 2: Palletizing stones for reuse: to make reuse within other projects more attractive, we can palletize the paving materials that are released. Palletizing stones is more expensive (and takes more time) than breaking up, transporting and dumping elsewhere. If necessary, we can use the buffers included in the time planning for this.

Option 3: Set up materials passport: we would like to draw up a material passport for this work in consultation with you. In this we jointly determine which materials (existing / new) are located where in the completed construction. We work this out in an integral 3D model. The passport contains information about the quality, origin and location of materials and provides insight into the material, circular and financial (residual) value of products. We see this material passport as a pilot for you as principal. If you like the set-up, you can further apply this concept within all infrastructure projects, so that you can provide digital insight into your infrastructure step-by-step and can easily see where which materials are located where and how they can be reused (in the context of the circular economy). This is a project-transcending opportunity and does not affect the lead time of implementation of this project.

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), Mikkelí (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.

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