



GREEN DEAL
CIRCULAR
CONSTRUCTION



FINAL REPORT
**GREEN DEAL
CIRCULAR
CONSTRUCTION**



Final report on the Green Deal for Circular Construction,
an initiative by Circular Flanders, the Public Waste
Agency of Flanders and
Embuild Flanders between 2019 and 2022.

Date of publication: February 2023

CONTENTS

1. INTRODUCTION 6

- 1.1. Underlying motive6
- 1.2. Purpose8
- 1.3. Participants10

2. BUILDING BLOCK 1: The process & output 11

- 2.1. Learning network activities12
- 2.2. Circular Construction Living Lab Activities.....18
- 2.3. Recommendations for organising a learning network20
- 2.4. Pursuing the Circular Construction Strategic agenda.....22

3. BUILDING BLOCK 2: The content & outcome 23

- 3.1. Circular Construction competencies24
- 3.2. Circular Construction in current affairs25
- 3.3. Lessons learned regarding Circular Construction.....26
 - 3.3.1. Communities of Practice26
 - 3.3.1.1. Material and Building Passport26
 - 3.3.1.2. The synergies for circular business models.....27
 - 3.3.1.3. A demolition inventory as a starting point for more and better urban mining.....28
 - 3.3.1.4. Circular procurement, from support to tailored demand28
 - 3.3.1.5. The effectiveness of change-oriented (re)construction.....30
 - 3.3.2. Construction process31
 - 3.3.2.1. Design31
 - 3.3.2.2. Construction and assembly.....32
 - 3.3.2.3. Urban mining and demolition.....33
 - 3.3.2.4. Reuse34
 - 3.3.3. Levers35
 - 3.3.3.1. Policy35
 - 3.3.3.2. Circular purchasing36
 - 3.3.3.3. Innovation & entrepreneurship37
 - 3.3.3.4. Financing.....38
 - 3.3.3.5. Research39
 - 3.3.3.6. Collaboration as an enabler40

- 3.3.3.7. Jobs & skills40
- 3.3.3.8. Communication & raising awareness41
- 3.3.4. Levels of scale42
 - 3.3.4.1. Component.....42
 - 3.3.4.2. Building.....42
 - 3.3.4.3. District – circular spatial use.....44
- 3.4. Getting started.....46

4. BUILDING BLOCK 3: Practice & impact 47

5. ACKNOWLEDGEMENTS 63



1. INTRODUCTION

1.1. UNDERLYING MOTIVE

By 2050, Flanders wants to achieve a transition to a circular economy, with the lowest possible consumption of raw materials, resources, energy, water and space and the smallest possible impact on the environment. Not only in Flanders, but also in the rest of the world. Specifically, Flanders' ambition is to reduce material use by 30% by 2030.

The next generations have the right to live in a healthy and prosperous world. That makes it necessary to decouple our economic prosperity and growth from the environmental impact and ever-growing resource demands of our current economy. This requires a shift to a low-carbon economy to deal with the effects of climate change. Our initial focus here is to reduce material waste. This can be done through a transition to a circular economy, where we avert the use of primary raw materials as much as possible by making correct construction choices and by reusing or recycling existing materials and raw materials released from demolition and demolition work. Alongside this, by using more efficient and higher-quality materials as well as measures that extend the life of buildings and their materials. This is how we switch from a linear to a circular economy and continue to use materials in the economy without avoidable loss of value. That will require new revenue models that redistribute social costs and benefits while respecting planetary as well as social boundaries, now and in the future.

The construction industry is a major consumer of resources and has a significant impact on the environment. With the 'TOWARDS CIRCULAR CONSTRUCTION - Policy programme 2022 - 2030', an initial set of initiatives was developed to start the transition to a circular economy along with the sector. In early 2019, Circular Flanders, the Public Waste Agency of Flanders and Embuild Flanders launched the Green Deal for Circular Construction to shift up a gear in achieving a Circular Construction economy.

Through the joint commitment of the Green Deal for Circular Construction, more than 360 organisations worked together to put Circular Construction into daily practice in Flanders. Construction companies, architects, contractors, principals, civil society organisations, knowledge institutions and governments developed some concrete possibilities together, experimented in innovative pilot projects and developed some new insights. The Green Deal for Circular Construction brought together the knowledge and experience, supplemented by the needs of society, into a learning network. Alongside this, a research group worked supportively on what we called the preconditions, legal, economic and other barriers we encountered along the way. Data and experiences from the experiments fuelled this research.

“Circular construction is an approach to construction that aims to optimize resource utilization, generate economic, social, and environmental value, and consider both existing heritage and future opportunities in the construction industry. Achieving this goal requires strong collaboration within the value network.”

Definition of the Green Deal for Circular Construction, 2020

1.2. PURPOSE

A Green Deal aspires to green the economy. It is a lever for sustainability fuelled from the bottom up by bringing relevant parties together. Through a participatory approach, the government can not only detect the needs of organisations as well as the bottlenecks in practice more quickly, but consequently facilitate their elimination. A Green Deal also increases visibility and ensures that efforts and results are widely publicised.

The specific goal of the Green Deal for Circular Construction was to achieve accelerated adoption of circular economy principles within the construction sector. Acting together and learning together were the focus. The various actors, relevant to a Circular Construction process, worked together on innovative, Circular Construction projects and on concrete experiments at construction sites. This was how, together, we identified what preconditions and obstacles stand in the way of the transition to Circular Construction. The use of guided research and the facilitation of a learning process helped to make some proven practices visible, share knowledge among the actors involved and develop some workable solutions. With this Green Deal, we were aiming to develop an enhanced partnership that would provide input into future policies for the construction sector, in addition to individual lessons learned for each partner.

Every action taken within this Green Deal for Circular Construction had to contribute to the following strategic objectives for Circular Construction in Flanders:



1. RETHINKING THE CONSTRUCTION PROCESS

with a greater focus on

- the minimal use of primary raw materials, water and energy in the manufacture of building materials during construction;
- using the right material in the right place in the right way, taking into account the long-term impact. Here, maximum efforts are made to preserve the value of materials at the end of use, with a view to reuse;
- avoiding exposure to substances of very high concern through new construction products. And removing such substances from the materials chain when buildings and infrastructure are demolished or dismantled;
- designing and constructing new buildings and infrastructure works in such a way that the materials can be recovered without loss of value. In addition to this demountable construction, there must also be regard for change-oriented design; allowing for other needs and functions to be met with minimal effort, material and energy.



2. INVESTING in competencies

Invest in the competencies of all those involved in the construction process so that they can apply the principles of the circular economy in different areas (technical, legal, economic, communication etc.).



3. ENCOURAGING transparency and collaboration in the chain



4. PROVIDING AN INSIGHT

Understanding both economic and environmental impacts to facilitate considerations in reuse, transformation and renovation of buildings. With the end goal of more accurately estimating the economic added value of a Circular Construction practice.



5. DEVELOPING A TOOLKIT

All the parties support or provide input into the development of a toolkit to uncover the principles of Circular Construction in a uniform and objective manner. This toolkit provides support to the construction industry in implementing circular principles in their operations, in current and future construction plans.



2. BUILDING BLOCK 1

The process & the output

1.3. PARTICIPANTS

During the term of the Green Deal for Circular Construction, 376 organisations committed to helping achieve the goals, with a total of 651 employees actively participating in the activities. In order to join as a participant, organisations committed to:

- conducting at least one pilot project during the term of the Green Deal;
- actively participating in the learning network and exchanging knowledge and experiences with the other participants;
- making relevant data, results and lessons learned from the pilot projects available to the researchers at the Circular Construction Living Lab;
- taking the necessary steps to structurally embed the principles of Circular Construction at their own organisation.

Download the full engagement statement signed by all the participants [here](#).

For a list of all the participants, go to the last few pages.



In order to pursue the goals of the Green Deal for Circular Construction, a varied programme with numerous activities was set up.

The beating heart of this learning network was undoubtedly the meetings with all the partners. Gradually, these evolved from inspiration days to action days. Four times a year, Green Deal for Circular Construction participants were brought together to inspire them with domestic and foreign cases. There, including in the Communities of Practice, they worked on some concrete issues, brought in by the participants themselves.

Webinars and coaching sessions were organised for smaller groups. The online learning hub featured some trainings, informative articles, inspiring cases, links to tools, etc.

In addition, participants also received a monthly news flash in their mailbox to keep them informed of key activities and progress in the learning network.

Discover the learning hub



2.1. LEARNING NETWORK ACTIVITIES

2019

In the first year of the Green Deal for Circular Construction, the various dimensions of Circular Construction were explored step by step. It also zoomed in on the phases in a Circular Construction process and the levers for Circular Construction. At the same time, participants had the opportunity to get to know each other extensively during networking lunches and receptions on the inspiration days. This allowed them to explore collaborations and form partnerships with an eye towards their own pilot project in 2020.

LEARNING HUB

Webinars

- 7 webinars highlighted a circular theme for a smaller group
- an average of 70 participants per webinar

Curriculum

- 9 modules available for participants to independently raise their level of knowledge about Circular Construction
- references to 35 recent publications and reports, 7 tools, 8 databases and platforms

2020

In this second year of the learning network, work continued around the phases and levers of the Circular Construction process. Participants registered one or more pilot projects in which elements of Circular Construction would be put into practice. Due to the coronavirus crisis, everything had to be done entirely online. With the help of the digital platform Slack, the conversation kept going and some amazing collaborations blossomed between participants. As a result, the inspiration days, as mentioned, grew into some real action days; where pilot projects were pitched to one another, challenges were discussed in a group and even the first results were already being shared.

LEARNING HUB

Coaching sessions to support participants in rolling out their pilot project.

TARGETED CALL

Flanders Circular and the Public Waste Agency of Flanders launched a call for projects to support innovative projects in Circular Construction, with the aim of helping to overcome bottlenecks to sustainable innovation in the construction sector.

Flemish Minister for the Environment Zuhair Demir released 2.2 million euros for this purpose. A total of 29 projects were funded, including some pilot projects by Green Deal for Circular Construction participants.



Kick-off



Inspiration Day 1



Inspiration Day 2



Inspiration Day 3



Inspiration Day 4

2021

By necessity, the third year of the Green Deal for Circular Construction also took place primarily online. For certain smaller activities, a group of participants met in person. The common thread in 2021 was the levers for a circular economy that, as cross-cutting issues, are crucial to achieving a large-scale transition.

Based on the identified challenges to Circular Construction, five Communities of Practice started up; groups of dedicated participants who were seeking some tangible solutions around a particular issue.

For the general public, the website <https://bouwen.vlaanderen-circulair.be/en> was launched, with reports, presentations & the curriculum.



2022

In the fourth and final year of the Green Deal for Circular Construction, roles in the construction process served as a common thread. The network was reactivated through four physical meetings. Some extensive networking opportunities and a demo and design market were also set up. In order to maximise the capture of experiences and solutions from pilot projects, participants had the opportunity to update or report on their pilot project through various forums. To ensure that the work would continue, extensive interaction with the policy plan and the Circular Construction Strategic agenda, among other things, was initiated. This was how the transfer of ownership after the Green Deal for Circular Construction was prepared.



Action Day 9



Action Day 10



Action Day 11



Action Day 12

5 COMMUNITIES OF PRACTICE WITH

- 5 relevant issues
- concrete deliverables
- one leader and a group of committed participants, consisting of regular participants and alternating interested parties – a dedicated Teams channel for exchanging information

STRONG FOCUS ON COMMUNICATION

- 5 communication group meetings
- opportunities for communication to a wide audience
- video wall to increase visibility for projects + replace site visits
- continuous updates to website

TARGETED CALL

Through relaunch funds from the Flemish Resilience plan, VLAIO can award funding to 19 Circular Construction projects. These are projects that work in partnership to find solutions to systemic bottlenecks that are currently holding back Circular Construction. A total of 1.7 million euros was awarded.

2.2. CIRCULAR CONSTRUCTION LIVING LAB ACTIVITIES

In parallel with the activities of the Green Deal for Circular Construction, a scientific consortium called the Circular Construction Living Lab was active. This group linked existing research with field experience from pilot projects to develop some informed policy and practice recommendations. At regular intervals, they presented their results during action days or webinars. Conversely, they were also fed by participants' projects and the researchers' questions formed part of the Communities of Practice.

The Circular Construction Living Lab was monitored and implemented by VITO, Buildwise, Hasselt University and the Vrije Universiteit Brussel, and supported by Datavisser. They regularly consulted a Compass Group – a trans-disciplinary arena with experts from finance and law, knowledge institutions and NGOs. This group consisted of frontrunners, who played an active role in the transition; innovators, who wanted to share innovative visions, and bridge-builders (who could facilitate and accelerate implementation).

Within two sub-tasks, Urban Mining and Change-oriented building and renovation, the Circular Construction Living Lab analysed the data from the pilot projects and supported the project leaders in their quest for solutions. In addition to the architectural issues, they also addressed some economic ones, the environmental impact of solutions being examined, legislative and regulatory bottlenecks, financial feasibility and new business models.



URBAN MINING

Urban Mining is the creation of additional value by selectively demolishing existing buildings and recovering as many valuable materials as possible, preparing them for recycling and reuse.

With current construction and demolition practices as the starting point, it explored how Urban Mining as a concept can be better adopted in the construction industry and how all costs and benefits can be (re) distributed within the value chain to recover building materials for new high-value building applications.

In June 2021, the Circular Construction Living Lab released the report on Urban Mining. The full version, as well as the extensive summary, can be found on [this page](#).



CHANGE-ORIENTATED BUILDING AND RENOVATION

By drawing lessons from the past, new construction and renovation projects present valuable opportunities. Through 'change-oriented building and renovation', buildings are designed to support the changing needs and desires of users and society. Not only today, but in the future too.

In this second sub-task, the Circular Construction Living Lab mainly focused on unravelling the opportunities and obstacles that change-orientated building and renovation has to offer regarding the circular economy. This resulted in a 'Practical Guide for Change-Based Construction', which zooms in on the effectiveness and feasibility of technical solutions; a roadmap for circular business models, which compiles practical information on various financial models; and a roadmap with a Q&A on circular procurement.

In February 2023, the Circular Construction Living Lab released the [report on change-oriented building and renovation](#). Still in the pipeline: a policy matrix that provides local governments with guidance on how to build circularly tailored to their ambition.

2.3. RECOMMENDATIONS FOR ORGANISING A LEARNING NETWORK

INSPIRATION AND COMMITMENT

Organising a learning network requires a continuous balance between inspiring on the one hand and committing to action on the other, between broad themes and concrete topics.

At the outset, the focus was on training participants in the theory of Circular Construction so that they were at an equal level of knowledge. On the other hand, practical experience also varied. Hence, much attention was paid to inspiring them with specific examples of Circular Construction. Inspiring speakers from home and abroad, both pioneers and experts, took the stage. As soon as their own pilot projects emerged, participants took the floor themselves as far as possible, in plenary sessions and smaller-group workshops.



REGISTERING PILOT PROJECTS

In the second year of the Green Deal for Circular Construction, a large number of pilot projects had already been launched. Although this formed part of the commitment, only half of the signatories registered one or more projects through the formal route. We noticed a great willingness to share the approach, experience gained and lessons learned from this during the action days, through a keynote or workshop.

However, only a small number of organizations actively participated in reporting their progress through online surveys or telephone interviews. It was recommended that proper agreements and a method for recording updates on the pilot projects be established from the beginning – for example, through interviews at meetings and the possibility of highlighting the project through a video recording.



MEETING AND MAKING TANGIBLE

The physical action days in the final year of the Green Deal for Circular Construction – after two years of digital meetings – proved crucial in reviving the network towards the closing event. The networking opportunities during the first and last year proved to be a great asset.

During organised speed dates, new actors got to know one another. During networking lunches and receptions, space was created for dialogue about each other's views. And at the demonstration markets, circularity was made tangible, in the form of materials, products and circular designs.



DIGITAL NETWORK IN TIMES OF SOCIAL DISTANCING

By necessity, the Green Deal for Circular Construction ran entirely online for two years. Both in terms of organisation and content, this went very smoothly and participants were satisfied.

Of course, the dynamics of a physical event are different. The spontaneous networking, essential for forming partnerships around an innovative topic such as Circular Construction, was lacking. The result was a declining number of participants in the digital action days. Fortunately, the sessions were recorded and participants could watch them afterwards.



DELVING INTO COMMUNITIES OF PRACTICE

Five Communities of Practice, or CoPs for short, were launched midway through the Green Deal for Circular Construction. These were where a select group of engaged participants tackled some specific challenges. The audience chose which themes to focus on (see below in section 2 and 3). The aim was to discuss challenges and lessons learned across all the pilot projects and to yield some concrete, valuable results for the entire network.

Initially, the intention was for these CoPs to grow organically. In practice, however, it turned out that one or more permanent leaders per CoP were needed to start the meetings well-prepared and with a concrete agenda. In addition, the group of participants varied greatly during the term. The open nature of this group made it difficult to build upon the level of knowledge and experience acquired, so participants were less inclined to share their experiences and challenges in detail.



COMMUNICATING TO THE NETWORK

Sharing information through a number of well-chosen channels proved to be a great asset to the Green Deal for Circular Construction. Communication took place through one central online platform with both a member area and a public section, through a monthly news flash for participants and through a LinkedIn group accessible to the general public. Numerous participants with large networks or strong communication channels lent their support in spreading our messages.

A key focus here is keeping the information up-to-date at all times on the various media. Initially, Slack was also used so participants could chat directly with one another. Afterwards, the leaders of the CoPs switched to Teams to share working documents and interact with participants.

2.4. PURSUING THE CIRCULAR CONSTRUCTION STRATEGIC AGENDA

The Green Deal for Circular Construction offered participants the opportunity to delve into Circular Construction, acquire knowledge, experiment, network and all of this supported with scientific knowledge from the Circular Construction Living Lab.

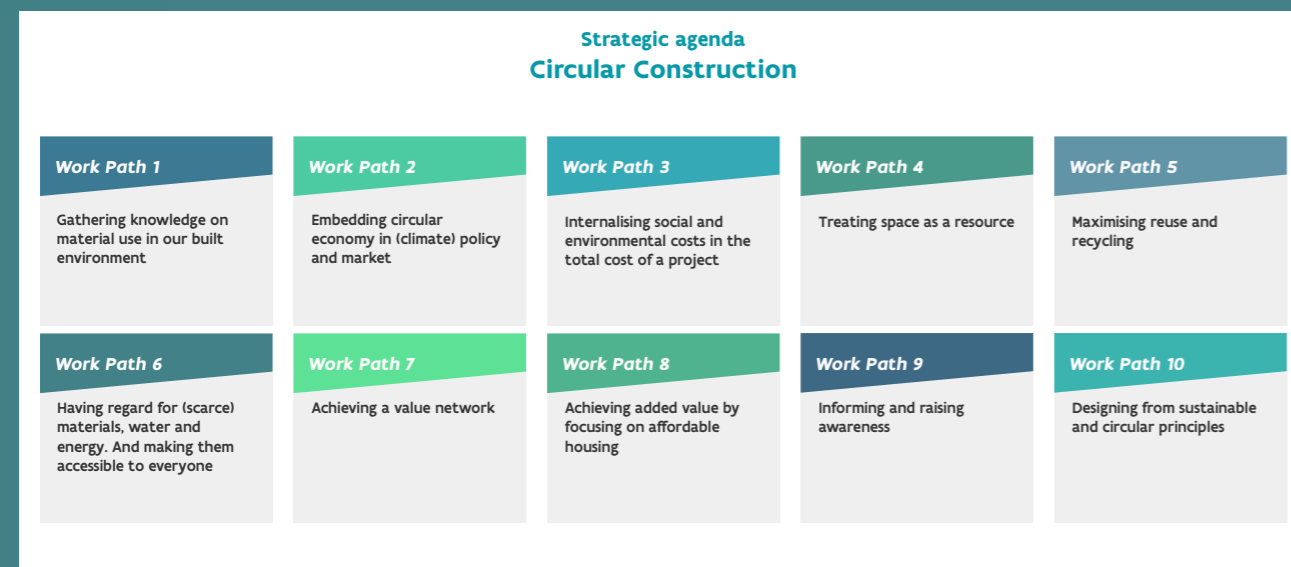
However, the shift to a Circular Construction economy requires far-reaching, long-term measures. It requires innovation and a complete change of direction. It requires a new perspective on design, manufacturing, services, consumption and business models. In order to address this on an ongoing basis, the Circular Construction Strategic

agenda was rolled out. Analysis of the experiments from the Green Deal for Circular Construction and additional investigations provided an insight into the levers and sticking points for a Circular Construction economy in Flanders. The Circular Construction Strategic agenda defined 10 work paths that will be further translated into concrete actions in the coming years.

This long list of actions came about in collaboration with a great many construction actors who want to help accelerate the Circular Construction economy in Flanders.

The Circular Construction Strategic agenda is shaping a future in which high-quality living, working and living take priority. For everyone. And with respect for people and the environment.

By making efficient use of the existing portfolio and all the materials. By accurately inventorying, managing and repurposing everything, extending its life. And thus to turn the Flemish built-up environment into a real 'urban mine' with a positive impact on the environment and society.



3. BUILDING BLOCK 2: The content & outcome

The extent to which the Green Deal for Circular Construction succeeded in achieving substantive results was measured against a number of parameters.

In the first instance, the level of knowledge regarding Circular Construction was monitored within the network; both theoretical knowledge and its practical application. There was also consideration for the extent to which the theme was picked up by the media and Circular Construction was highlighted for a wide audience.

Finally, lessons on Circular Construction are covered. These lessons learned were collected during numerous pilot projects and workshops, and frequently exchanged on the Green Deal for Circular Construction stage. The parameters are elements that can influence both the market and policy, as well as supporting research and education for accelerating the circular transition.



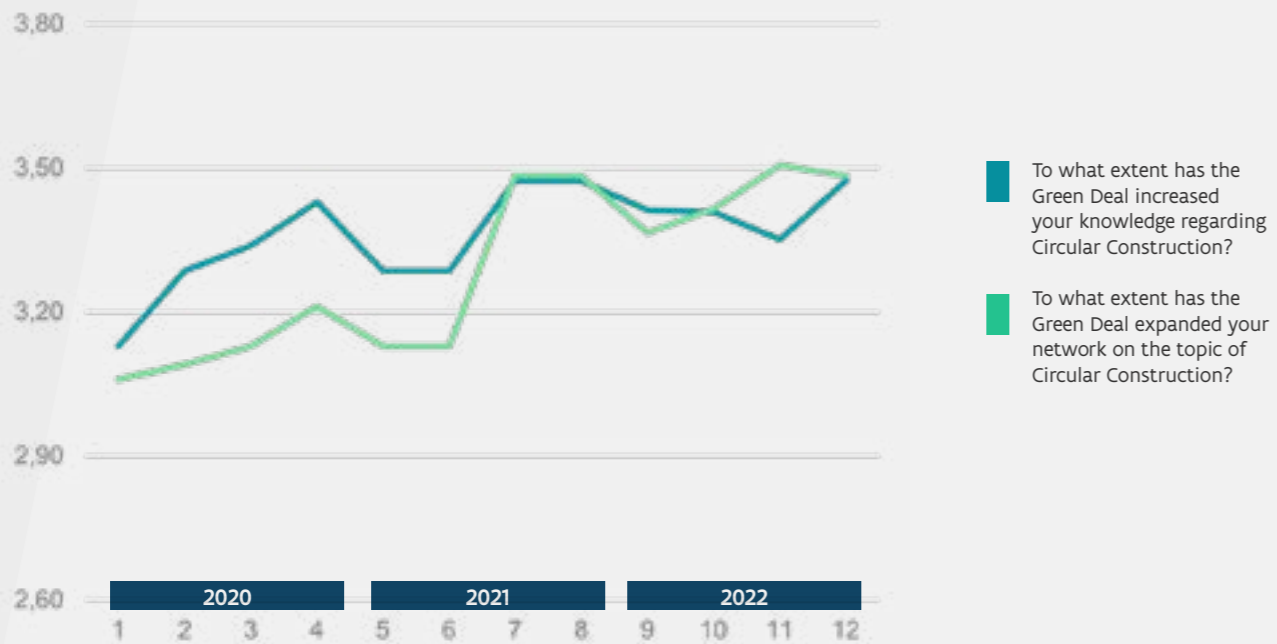
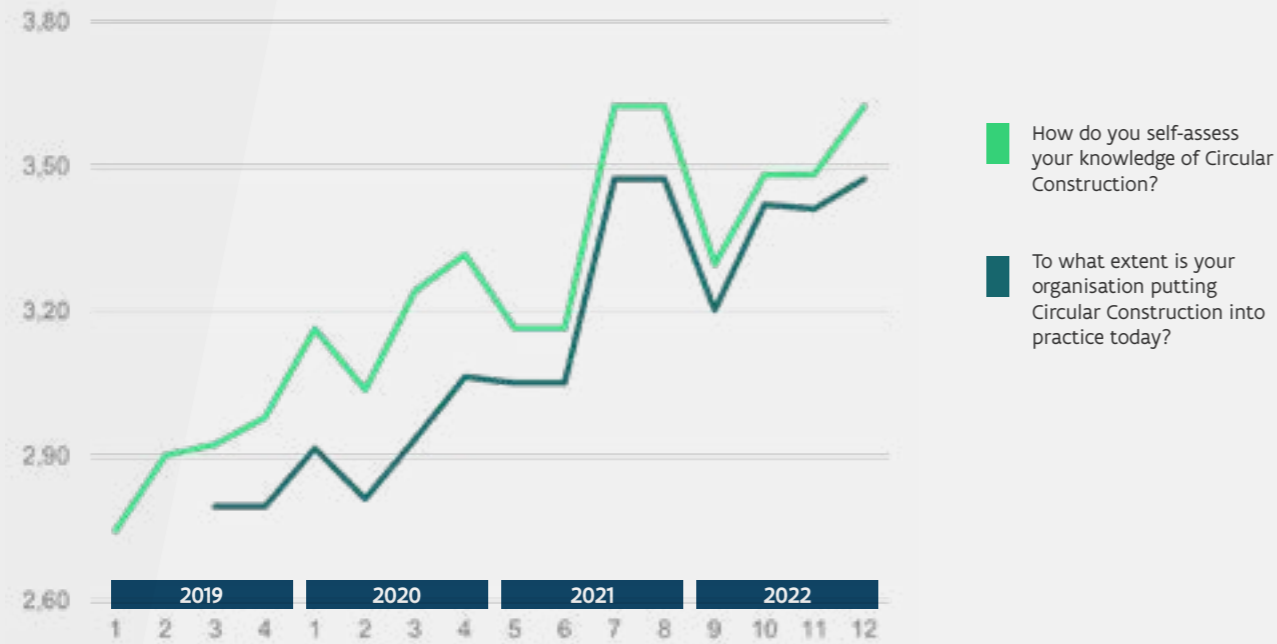
3.1. CIRCULAR CONSTRUCTION COMPETENCIES

The first step in the Green Deal for Circular Construction was to increase the level of knowledge on the matter. A steady growth in participants' circular knowledge was indeed evident from the surveys conducted. The extent to which Circular Construction was put into practice also increased.

When registering for or evaluating each inspiration and action day, participants were asked a series of questions in which they had to assign a score between one and five. The figure below outlines the evolution over the four years of the Green Deal for Circular Construction. The second graph shows the extent to which the Green Deal for Circular

Construction has contributed to increasing knowledge and networking around Circular Construction.

Indeed, these graphs show that knowledge regarding Circular Construction has risen over the years. And although the influence of the Green Deal for Circular Construction in this cannot be strictly measured, it can be assumed that the activities did have a solid impact on knowledge and practical experience. Participants also indicated that the Green Deal for Circular Construction increased their networking within the field over the years.



3.2. LESSONS LEARNED REGARDING CIRCULAR CONSTRUCTION

The lessons learned during the four years of Green Deal for Circular Construction are numerous and can be divided into three categories:

1. The key lessons learned from each of the **five Communities of Practice**, where intensive work was done on some very concrete results.
2. A selection of lessons learned by topic covered on the inspiration and action days: **the phases in the Circular Construction process, the roles of different parties in the construction process and the levers for Circular Construction.**
3. The **different levels** of Circular Construction:

3.2.1. COMMUNITIES OF PRACTICE

3.2.1.1. MATERIAL AND BUILDING PASSPORT

Many different material and building passports are already in use, which were presented during the CoPs. Lessons learned about what does or does not work with these existing passports were explored. The benefits identified include: identifying environmental impact, promoting circularity, optimising maintenance and guaranteeing health and safety. It is also clear what should be included in a material and building passport to promote Circular Construction. Some examples of parameters include: the quantities of a material, its precise dimensions, its history of use, its adaptability, the environmental impact of the structure, etc.

However, a standard material and building passport is still lacking. Participants agreed that central direction is needed with a clear role for government around privacy, ownership and revenue-sharing. An open, standard construction work passport, based on experience in actual projects, that can be readily consulted by different construction actors, is being sought. The Public Waste Agency of Flanders is working on both content and technical IT to develop such a

from component, building and infrastructure to the district level and its broader spatial impact.



standard.

A great many experts from the field came to testify about their use of a material and building passport – three lessons learned from those testimonies are:

- "Publish once, reuse everywhere": data should be requested once and then shared with other applications as far as possible. It should not be a stand-alone document, but linked to other databases.
- A material and building passport is only valuable if the content is standardised, through legislation and (European) standards.
- The government will further develop proposals and is continuing to take the initiative. It is investigating whether a mandatory passport when a structure is sold or modified could help keep the passport up to date.

Discover the full [curriculum](#) on the importance of sharing information.



3.2.1.2. THE SYNERGIES FOR CIRCULAR BUSINESS MODELS

As a tangible result, this CoP developed a roadmap for circular business in construction, which is intended to lower the threshold for action, whether collectively or individually. This roadmap gathers together some basic knowledge, presents some practical information and offers some inspiration for anyone who wants to initiate, scale up and broaden circular business practices.

Recent years have clearly shown that many construction actors are looking for inspiration around circular business models. There is no 'one size fits all' circular business model suitable for all products or projects. Which are prevalent and which are less so? How feasible are they for their own business or segment? The roadmap contains some clear information sheets on business concepts for Circular Construction, helping with to make choices in a Circular Construction process.

The value network in the construction industry is both extensive and fragmented. Even though building or renovation projects always involve some form of collaboration, often the full value chain is not unlocked. Thus, the actors responsible for maintenance, repair, demolition/dismantling, transformation of buildings, reuse of construction products and recycling of construction materials are rarely involved in the (re)design and (re) construction of buildings. However, they are indispensable in Circular Construction practices (see also section 'collaboration as an enabler'). The roadmap compiles some practical guidelines for

setting up and maintaining a collaboration and also provides some legal tips for enshrining it.

The topic of funding was also explored in this CoP. The roadmap includes an overview of insights, tools and success factors around funding circular projects. It zooms in on how the 'total cost of ownership' (TCO) contributes to circularity. After all, a low TCO requires regard for a low cost of maintenance, replacements and possible transformations when selecting construction solutions. In the current state of affairs, it is notable that traditional 'hit & run' project development, joint owners' associations (JOAs) and private principals do not subscribe to such TCO ideas, because responsibilities are not assigned to the right party and there is a strong insistence upon individual ownership. Furthermore, the section also supports the notion that a financial mix of investors is desirable for spreading risks, associated with shared ownership for example, across different actors within the value network. These investors may be bank(s), pension funds or possibly external investors, such as private companies, citizens and governments.

Finally, it also addresses transparency around prices throughout the chain to build trust in circular business models.

Discover the full roadmap on the [Living Lab page](#).

3.2.1.3. A DEMOLITION INVENTORY AS A STARTING POINT FOR MORE AND BETTER URBAN MINING

Building upon the [Living Lab report](#), the CoP explored how a demolition inventory could be a starting point for better urban mining. The CoP sought to connect and align the various aspects of urban mining, and grew into a meeting place where sharing knowledge was central. The demolition inventory formed an anchor point that was fed with information from the following concrete projects, among others. The [Paardenmarkt campus case](#) in Antwerp focused on selective demolition and reuse. The city of Mechelen explored the role of a [local government as a construction director](#). The Public Waste Agency of Flanders studied how the [symbiosis platform](#) could add value to reuse and recycling in the construction sector. The CoP succeeded in becoming a finder of diverse innovative initiatives – a sounding board for further research too.

Through the [Data-driven demolition project](#), which mapped out four concrete material streams, it studied how the use of a demolition inventory could help improve collaboration, while centralising and sharing information for stronger reuse and better recycling. This quickly bridged out to other initiatives, such as the reuse inventory or the material and building passport.

Within the framework of the CoP, it did not prove feasible to take some pressing sticking points from an urban mining process to the next level. How to deal with the many logistical challenges faced by materials hubs? How can supply and demand in the demolition, reuse and recycling market be better aligned? How can a funding model for this reuse and recycling sector take shape? Here, then, are the challenges to work on further in the future.



3.2.1.4. CIRCULAR PROCUREMENT, FROM SUPPORT TO TAILORED DEMAND

In the Community of Practice on Circular Procurement, several actual procurement cases and legal or other questions were scrutinised. Thanks to the preliminary process from the Green Deal on Circular Procurement, this topic did not start from a blank sheet. Participants were already able to find many tools, training courses, examples and product-specific information on the website aankopen.vlaanderen-circulair.be/en. New insights from this CoP and from the pilot projects were gathered together on the same website.

What made the discussions in this group so fascinating was the diversity of stakeholders. Both public and private principals, construction companies and material producers approached the challenges surrounding circular procurement from different perspectives. One of the main challenges was to define circular ambitions according to objective and comparable criteria.

The [Circubestek](#) project provided some concrete answers to this. In addition, the [Cabrio](#) project provided some insights into how construction projects can be tendered circularly. Specific to renovation, the [handbook for the Interreg North-West Europe FCRBE project](#) on reuse ambitions in tenders for construction or renovation projects was also discussed.

The three leaders of this CoP further utilized the insights and discussions from the group that were applicable to the entire network. They applied these learnings to translate the [circular ambition map into specific strategies for the construction sector](#). Through the Circular Construction Living Lab, the most major or common legal questions from this CoP were listed and answered. The cases and issues were further disseminated through the website and newsletter of circubuild to architects and construction companies not directly involved in this learning network.

Finally, this CoP was also part of a European knowledge-sharing [Interreg NSR ProCirc](#) project in which, among other things, a [methodology](#) was



tested with the aim of focusing on the necessary support and information-gathering on circular principles among a tendering team.

The main conclusion after the past four years is: 'Just go for it'. Of course, there are some important preconditions for a Circular Construction project to succeed. Proper project preparation, including adequate ambition and needs assessment, is indispensable. In addition, the level of knowledge among principals should also continue to increase, so that they are aware of the opportunities already available. Fortunately, more and more research results, practical experiences and sample specifications are available, which can

be used to further incorporate circular principles into tendering contracts. Nothing prevents the principal from getting started with Circular Construction.

3.2.1.5. THE EFFECTIVENESS OF CHANGE-ORIENTED (RE)CONSTRUCTION

If the various workshops and cases today make anything clear, it is that circular and change-oriented building is not one-size-fits-all, but highly dependent upon context. This is why it is important to always consider the big picture and develop future scenarios for the building that can be included in the design.

Everyone who participates in design, construction or decommissioning should be pursuing the same circular ambitions. Therefore, the advice is always to take sufficient time to communicate about this, in order not only to create, but also to maintain support among all stakeholders.

In order to successfully implement circular principles in practice, there is a need for technical solutions that maximise change-oriented (re) construction. To assess which solutions are most suitable for each specific case, a multi-aspect analysis is needed in terms of building technology, acoustics, ease of dismantling, environmental impact, aesthetics, etc.

In order that such analysis can be made and that the solutions can then be confidently applied in practice, there is a need for:

- Objective information on practical and effective feasibility. This includes, for example, identifying economic insights (such as costing, Total Cost of Ownership (TCO), Life Cycle Costing (LCC) and affordability) or legal barriers.
- Validated information on technical performance.

This can be achieved by having the technical solutions validated by a group of experts. Experiences from completed construction projects can also be shared.

- More targeted knowledge dissemination with regard for the assets of circular solutions and the translation of individual lessons learned into outputs for further professionalisation of the sector (e.g. databases, training courses).

On the financial front, there is currently no unequivocal conclusion for change-oriented construction. Change-oriented construction may involve an additional cost, but several pilot projects also saw a return (such as the [Parkgebouw](#) and the [Wijnegem shopping centre](#)).

One strategy that has been used in several projects is to achieve significant savings in the initial phase, for example, by compacting the programme, building less large and sharing spaces, in order to free up some budget for change-oriented solutions that may be more expensive than standard solutions. However, it remains difficult to estimate these costs at the start of a project. It is even more difficult is to make longer-term estimates (maintenance costs, renovation costs, energy costs, etc.) while taking into account the circular potential of the project. This is why the demand for a general LCC method for realistically and accurately calculating life-cycle costs remains.



Wijnegem Shopping Centre

3.2.1. CONSTRUCTION PROCESS

3.2.1.1. DESIGN

A good start is half the battle. Forming a construction team at the start of the design process proves to be an important catalyst for bringing a Circular Construction project to fruition. Involving the contractors and/or material producers from the start of a construction project allows for the exchange of knowledge early in the process, insights into Circular Construction, and the ability to set the same ambitions for the project and the entire design process. This helps achieve a circular (total) solution.

This way of working does require a more intensive and time-consuming design process. Partners need to be involved earlier in the design process. As a result, more information must be processed and discussed at an earlier stage. This means more time and thinking space should be provided in the early stages of the design process to make the subsequent design and construction phases go more smoothly.

In doing so, it is helpful if the architect or principal already has some background knowledge and can take on the role of director within that construction team. But even if no single party has sufficient background knowledge, coordination of the construction team is an important aspect. Otherwise, there is a risk that – due to a lack of understanding and ownership of responsibilities – circular motivation will fall away as the process progresses.

In order to support the design team in Circular Construction, several design tools

have been developed in recent years.

Some examples are:

- [GRO](#) (Agency for Facility Operations): encourages an integrated approach at the site and building level with a focus on people, planet, profit. The tool allows for selecting the criteria that will be targeted. For each criterion, there are performance levels linked to points. The strength of the tool is simultaneously its weakness: it goes broader than circular economy and thus does not go into detail.
- [TOTEM](#) (Public Waste Agency of Flanders, Brussels Environment and the Public service of Wallonia): calculates the environmental impact of a building, by adding up the impact of the materials chosen. In this way, material choices can be substantiated and/or adjusted.
- [Circularly Built](#) (Buildwise and Embuild Flanders as part of the CBCI project): guides the various actors around a construction project in communicating and making concrete their ambitions around Circular Construction. During the design and construction process, the predetermined ambitions can then be (re)evaluated. Compatibility with GRO was an important precondition during the development of the tool: Circularly Built goes into more detail about the area of 'Change-oriented design' and Circular Construction from the GRO tool.

The conclusion from several sessions was that the tools certainly do help to raise awareness, but not yet enough to guide and justify design choices. Some concrete example projects capture the imagination more and incite further action. Consequently, from practitioners, the demand for further example projects remains high.



3.2.1.2. CONSTRUCTION AND ASSEMBLY

In order to promote sustainability while controlling affordability, quality and lead time, the concept of 'Industrialisation of Construction' was scrutinised. The goal here is to achieve a construction process similar to an industrial process, such as in the manufacturing industry. Such a construction process can be supported by innovations that may enhance the various process activities. These include 3D printing, process optimisation (lean construction), the use of Building Information Modelling (BIM), Augmented Reality (AR), Virtual Reality (VR) and 3D measurement techniques, as well as prefabrication and system solutions.

Several projects from the Green Deal for Circular Construction can be linked to these activities. For example, Beneens is developing [BIM-Integrum](#); a platform that can display both the as-built case and the post-intervention case, the maintenance guidelines and the potential for urban mining in a clear, user-friendly working environment. [Bruil](#) put a 3D printed home with concrete on the Kamp C site. Several projects were also established around system solutions and modular construction. [Juunoo](#) developed some modular and detachable interior walls. [Staenis](#) devised an innovative grid system for circular floor structures. [Bao Living](#) built some modular utilities

and Inhout installed some fully modular homes, called [Mobbles](#). In turn, a [viewing box](#) was built in the Potterij with circular techniques; which, by the way, can also be visited virtually. And [Mosard](#) and [OpenStructures](#) developed some open build standards for obtaining compatible build kits with the same modular dimensions; useful for reuse in the future.

Scaling up pilot projects to a Circular Construction economy will require a lot of manpower. With the current tightness in the labour market, there is a need to look at how to link this to the social economy. Repetitive manual work, following from construction industrialisation, can be used for activities that are not or are of limited automation (such as de-ironing wood). The social economy can also support more complex jobs, such as building demolition or site preparation. The message is to connect the success factors from the social economy to the needs of the construction sector.



MULTI project

3.2.1.3. URBAN MINING AND DEMOLITION

Each year, Flanders produces about 15 million tons of construction and demolition waste. Although a large percentage of this waste is already recycled, the goal is to achieve more selective collection and disposal of construction and demolition waste in order to strive for maximum reuse. Urban mining and reuse are essential to moving towards a circular economy in the construction sector.

For planned renovation or demolition work, a materials inventory should ideally be created even before the permit request is made, in order to get an overview of what materials can be recovered. The audit method from the [FCRBE project](#) may provide some assistance in estimating the reuse potential. For demolition monitoring, a demolition plan and waste management plan can be drawn up based on this inventory, providing a link to the further processing chain (reuse and recycling). Moreover, since 1 July 2022, a [demolition monitoring plan](#) has been mandatory for demolition, renovation or dismantling works that fall under the scope of art. 4.3.3 §1. Vlarema (Flemish Decree on Materials). We see in practice that there is still a need for an accompanying standard for dismantling or demolition specifications.

But just as with construction projects, there is still a strong focus on the lowest initial cost when [tendering for a demolition project](#). Each party will seek to optimise its own ambitions,

costs and responsibilities or risks. There is a need for knowledge and some clear incentives in the tendering process to achieve more circular solutions within demolition projects. Analogous to the idea of 'Construction Teams', people should be working in 'Demolition Teams: an overarching structure that allows for maximum knowledge-sharing, consultation, collaboration and thoughtful dismantling and reuse from the start of a demolition project. This analysis is based on the results from the first part of the [Circular Construction Living Lab](#).

The fact that selective demolition can also be an opportunity for material producers who re-manufacture products with the recovered raw materials was demonstrated in the [Rockcycle](#) and [Equitone](#) pilot projects. Reverse logistics, whereby materials are taken back from the working area by the material producer, remains a major challenge here. For example, [Derbigum](#) cites how partnering with demolishers for collection is a first step in the right direction; in contrast, a more structural system of extended producer responsibility would have a greater impact. [Rotor DC's](#) pilot project on collecting and presenting sanitary facilities for reuse showed that while it is technically possible, the cleaning process was not yet cost-effective at that time. The insights gathered in the Green Deal for Circular Construction are compiled in a [learning hub](#) on the website.



Bao Living

3.2.1.4. REUSE

Keeping materials in the cycle through reuse reduces the need for new raw materials – scarce or otherwise. Some great examples that have emerged within the Green Deal for Circular Construction include the activities of [Domus Mundi](#) and the practical case of the [MULTI project](#); the renovation of the formerly named 'De Brouckère Tower' in the heart of Brussels.

What became clear during such projects was that sufficient time must be provided in the design process to purchase, test and treat the materials. Architects are best to consider that reclaimed materials can alter architectural plans. Consequently, flexibility is a must. But starting design with insight is also important. In recent years, numerous initiatives and tools have also been set up to promote this reuse: online platforms have been launched that collect and offer reusable materials (such as [Leuven Materials Bank](#), [Recuplan](#), [Werflink](#) or [Opalis](#)), research has been conducted into material passports (see “3.3.1.1. Materiaal-en Gebouwpaspoort” op pagina) and an [inventory guide](#) has been created. Contractors and material manufacturers can also support designers in material selection and construction methods (by forming construction teams). This is important for correctly implementing recovered materials, while ensuring a circular and future-proof design. For example, the renovation project at the Aquafin site demonstrated that when reusing technical facilities, such as an air handling unit in this case, the manufacturer's expertise is an important factor. Thanks to the manufacturer, who evaluated the condition of the air handling unit and was present during assembly, the reuse story became a success.

In practice, the question of who takes responsibility and bears the risk in a construction project with

reuse (contractor, material supplier, principal, etc.) sometimes caused problems with insurance companies under the 10-year liability. In response, the verification agency SECO, through the [Safety in Circularity](#) project, began attesting processes of those involved in recovery. This means users of recycled materials can have confidence in the workmanship of the contractors and material producers involved.

Another important actor is governments. The Flemish Public Procurement Plan asks governments to take up their exemplary role in circular purchasing (see “3.3.1.4. Circulair aanbesteden, van draagvlak naar een aangepaste vraag” op pagina) by giving preference to recycled materials and resources. A publication with [tendering strategies for governance bodies](#), which articulates examples of reuse goals, is also available on the FCRBE project page.

The overall conclusion is that the best reuse results are achieved when the actors on both the demolition team and the construction team are knowledgeable about the principles of the circular economy. In addition, communication and a long-term vision play an important role.

Finally, Dimitri Minten of [architecture firm RE-ST](#) stated that, before considering dismantling or demolition, ways to make the best use of the existing portfolio should be sought. In addition to reusing materials, it is important to strive for maximum reuse of the building itself.

3.2.1. LEVERS

3.2.1.1. POLICY

Although the role of government as a driver and lever for a Circular Construction economy was not explicitly on the agenda of the Green Deal for Circular Construction, it was nonetheless woven in as a common thread throughout action days, projects and experiments.

Funding for pilot projects through the [Circular City \(2019\)](#), [Construction \(2020\)](#) and [Living Labs \(2022\)](#) calls gave researchers, entrepreneurs and principals the additional time and space needed to get started with circular concepts.

The government also did not leave itself out as a principal and pioneer of circular projects. [Zin in Noord](#) illustrated how Facilitair Bedrijf put this into practice. With [Kamp C](#), the Province of Antwerp gave a powerful signal by implementing a Circular Construction, thoroughly documented from concept to completion. [The city of Mechelen](#) highlighted how a local government can achieve circular ambition and guarantee circular urban development. Particular attention was paid to the challenges surrounding circular tendering.

In order to create a clear framework and time frame for the transition to a Circular Construction economy, we also looked to the Flemish government. Green Deal for Circular Construction participants were surveyed and encouraged to have their voices heard in the creation of the Policy Programme [Towards Circular Construction 2022-2030](#) and the [Circular Construction Strategic agenda](#). In addition to a circular future vision, both are formulating some ambitious action plans for the coming years.

The digitalisation of the construction industry and the development of tools for identifying and tracking circularity presents a challenge for the government in monitoring minimum standards, ensuring alignment between tools and enabling multi-way and transparent use of data. The CoP on building and material passports (see earlier in this final report) saw a clear added value in such a governance role for the government.

Werflink





3.2.1.2. CIRCULAR PROCUREMENT

In addition to interacting with the participants in the Circular Procurement CoP, several pilot projects have committed to this lever. In order to uphold its exemplary role, the Government of Flanders is actively engaging in circular procurement through its partnership with Circular Flanders. The Agency for Facility Operations is spearheading this initiative by providing framework contracts for cities and municipalities. This allows them to conveniently access circular products and services. As a result, principals can directly contribute to the growth and development of Flemish companies dedicated to circular innovation, including start-ups and SMEs.

By having regard to circular principles in the conclusion and implementation of private contracts and public procurement, the market for circular products and solutions can grow. The many circular businesses need this growing demand to continue investing in innovation. The Circular Procurement lever starts from the many [practical results](#) from the pilot projects and can rely upon an extensive online community on LinkedIn, where questions and ideas are posted by participants. The learning hub features specific webinars on [Product-as-a-Service](#), the [role of the tenderer](#), a [circular 'sale' of the City of Mechelen's library](#) and a practical guide on how to use TOTEM in tendering.

An exemplary case of innovative circular tendering is ['t Centrum](#) project. Kamp C implemented a circular tendering process where a construction consortium, including the architect, contractor, engineer, and others, was involved right from the beginning. The selection of the consortia occurred in multiple stages, and the contract was ultimately awarded to the consortium with the most favorable bid. Unlike traditional tenders, the price was not the sole determining factor. The winning consortium received a predetermined budget to carry out the project. Additionally, Kamp C provided guidelines on the desired outcomes and functionalities of the building, rather than prescribing specific construction methods. This approach encouraged the consortium to propose their own innovative solutions, fostering market-driven innovation.

3.2.1.3. INNOVATION & ENTREPRENEURSHIP

Innovation and entrepreneurship are key drivers of social change, which is why the Innovation and Entrepreneurship Agency (VLAIO) is pulling this lever within the Circular Flanders partnership. In 2020, several consortia received financial support to address [systemic bottlenecks in Circular Construction](#). Through the calls '[Life Extension for the Manufacturing Industry](#)' and '[Circular Construction and Circular Manufacturing Industry Living Labs](#)' in 2022, some even more ambitious projects received an additional push for their innovative and/or entrepreneurial plans. In addition to using materials at the highest quality possible, chain collaboration, knowledge-building, sharing best practices and system change are key.

In addition, the main focus of this lever is to inform, raise awareness and guide businesses. In this regard, the business consultants of the [Business Pathways Team](#) are also taking on an important role: they are increasingly committed to supporting companies in their circular ambitions. With a number of points of contact for the construction industry on this team, companies can now be helped to move forward better and faster. But the many [tools and platforms](#) that have been developed over the past four years can also help business leaders or design teams. The goal is to scale up the many [innovative circular products and services](#) that were addressed in the Green Deal for Circular Construction and, to this end, several actions are also planned in the follow-up measures for the Strategic agenda.

GSI lawyers' workshop





Wooncoop

3.2.1.4. FUNDING

In recent years, regard for Circular Construction in the financial sector has been increasing. Both generally, with for example the EU taxonomy that encourages financiers to invest in sustainable activities and Circular Construction¹, and specifically with various [FINMIX sessions](#); a panel of financing experts that reviews circular business plans and advises on the most appropriate funding mix.

At the same time, there are still some major steps to be taken to simplify the financing of Circular Construction. For example, circular cases are often very innovative and cannot provide a track record or certainty around parameters such as the residual value. In order to deal with the risks of such

a funding case, appropriate assessment should be integrated into the current practice of financiers. In the Green Deal for Circular Construction, a great many organisations have tried to contribute to this. For example, alternative payment models and housing forms were discussed ([Wooncoop](#), [CESCO XL](#)), a tool was built to objectively and easily assess the circularity performance of an investment ([CEvaluator](#)) and there was an investigation into how a CESCO (Circular Economy Service Companies) could launch a Circular Construction concept at the same or a lower (investment) price compared to traditional building techniques ([CESGO!](#)).

Through the [leverage](#) of Circular Flanders and led by Febelfin and PMV, work will continue on this in the coming years.

¹ "Building designs and construction techniques support circularity and in particular demonstrate, with reference to ISO 20887(288) or other standards for assessing the disassembly or adaptability of buildings, how they are designed to be more resource efficient, adaptable, flexible and dismantlable to enable reuse and recycling."

3.2.1.5. RESEARCH

Despite the great and justified interest in the circular economy, it is still very young as a field within research and development. A full field of research lies open that could enable the path to the next circular steps. This includes measuring circularity, estimating the impact of policy measures, underpinning new business models, new technologies for recycling, dismantling and recovery, for information-sharing, etc.

Four years of working together in a learning network around Circular Construction has raised many research questions. This lever brings them together and links them to existing research agendas. What questions are already the subject of research, both in Flanders and at the European level? How does the circular economy agenda compare with agendas in other countries, and agendas around other themes, such as on industry 4.0 and digitalisation? Specifically within the Green Deal for Circular Construction, the [Circular](#)

[Construction Living Lab](#) worked on the major systemic issues, and there was also room for some focused research. They thus made a comparative study of the existing material passports and the minimum parameters to be compared. The [18 March 2021 Day of Action](#) also harked back to research in the European [BAMB](#) project on this topic. Here, the participants in the CoP material passports could immediately share their practical experience with the researchers. This interaction made the leverage richer and more relevant.

In addition to new research, it is also important to be able to measure progress. To this end, a [CEmonitor](#) was developed that monitors indicators in different levels and themes. Under the [housing](#) theme, the material footprint of buildings is addressed.



3.2.1.6. COLLABORATION AS AN ENABLER

As can be seen from the steps above, a great many different actors, from [principal](#) to [architect](#) and [manufacturer](#) to [contractor](#), are involved in the construction process. Each of these four roles was explicitly addressed during a day of action. In order to achieve successful circular implementations, integral collaboration throughout the construction chain is a necessary condition. Thereby, an open dialogue is encouraged from the start, with a whole range of actors such as the licensing authority, the building manager, the engineer, the manufacturer of materials and technologies, the demolition contractor, the reuse expert, the vendor of reuse materials, the processor, etc.

Any collaboration model (a traditional model, Design Build (Finance) (Maintain), etc.) offers opportunities for circularity, although the construction team in particular came up in the Green Deal for Circular Construction. A construction team puts the various parties at the table together from the beginning. Choosing to work with a construction team is possible, provided that each actor has the will to work together and if the principal has the competencies to participate in it. The construction team allows individual expertise to come together and confidently arrive at circular solutions. It ensures a focus on quality and profitability, rather than mere price. The [pilot project by OPZ Geel](#) showed that a long study period with the construction

team pays off. This is because it avoids any new discussions and revisions at the site phase.

Workshops around the legal implications ([GSI lawyers](#) and [Hasselt University](#)) revealed the importance of a memorandum of understanding and collaboration agreement. Such collaborative models require a director. This role can be taken up by the architect or builder, for example. However, the architect's design brief is legally defined in the infamous 1939 Architects Act. Therefore, if the architect wishes to include more facilitative roles in the construction team, they must be clearly defined to avoid any legal and regulatory implications.

The many projects showed that experimenting with new forms of collaboration requires due preparation and takes some time. In the end, it comes down to daring and doing. Determining a shared circular ambition, to which one can always return throughout the project, has proven to be a valuable investment.

3.2.1.7. JOBS & SKILLS

The shift to a circular economy will also bring some major changes for the labour market. Part of what change-oriented construction and standardisation involve are a workplace shift. New digital solutions for transparency in the construction process and in collaborations create other jobs and require some new skills in the construction industry. The 18 March 2021 Day of Action focused on this theme

and participants were given an explanation by Zero Waste Scotland about their [research into circular jobs](#), which they did together with Circle Economy in Amsterdam. On the same action day, an update on the Belgian situation in terms of jobs and competencies for Circular Construction was given by HIVA, the Public Employment Service of Flanders and Constructiv.

In the 'Jobs & Skills' lever, under the leadership of the Department of Work and Social Economy, these new challenges and policy insights will be further developed. The partnership will also provide some updates on [competency projections](#) for renovation, the creation of the [green skills roadmap](#) and results from the European [Michelle project](#) in the new Circular Construction Strategic agenda. Collaboration with the social economy and innovation actors (e.g. living labs industry 4.0, spearhead clusters) can also provide some new insights for the Circular Construction pathway.

3.2.1.8. COMMUNICATION & RAISING AWARENESS

Through practical experimentation, participants gained firsthand experience of the benefits and challenges associated with Circular Construction. Knowledge-sharing and effective communication played a pivotal role in inspiring others, influencing markets, and shaping policies. By showcasing successful examples and demonstrating alternative approaches, we can catalyze the (r)evolution of circular practices from niche

projects to mainstream adoption. Therefore, the examples are in a public [circular cases database](#), complemented by a [virtual tour](#) of some pilot projects. A [white paper](#) provides initial orientation for those new to Circular Construction; for more in-depth information, there is the [learning hub](#) and [library](#).

Throughout the Green Deal for Circular Construction there was consistent communication regarding both the theory and practical aspects of circular construction. A full [action week](#) joined this in May 2021. Consumers must see the benefits of the innovative products; manufacturers the added value of their investments in circular materials; architects the possibilities of change-oriented design; principals the examples to dare to go for it, etc. A final important aspect in this lever is the participatory aspect. The community that grew in this learning process helped each other make that circular shift. This happened both during the physical networking sessions on the action days and online on the [LinkedIn group](#). This online group will remain active even after the end of the Green Deal for Circular Construction as a channel for the exchange of questions, knowledge and events. Moreover, in the follow-up measures within the Circular Construction Strategic agenda, an entire work path will be dedicated to raising awareness and education.

Hasselt University workshop





Kamp C

3.2.1. LEVELS OF SCALE

Circular principles can be applied at different levels: component, building and district levels. Each level offers different results. During the action days, examples and lessons learned from these three different levels of scale were discussed.

3.2.1.1. COMPONENT

Pilot projects working at the component level often deal with the technical development of Circular Construction materials and components. By designing with consideration for later dismantling or recycling, by using recycled or renewable raw materials and by choosing reversible compositions, etc., Circular Construction can begin in a thoughtful way. In order to show some concrete examples, Bond Beter Leefmilieu and VIBE created the database [C-Bouwers.be](#), and Buildwise explained some technical insights and practical examples with [bio-based materials](#). Tendering authorities can encourage these investments by specifically mentioning these principles in tenders, as the [Public Waste Agency of Flanders study](#) showed on the 8 October 2019 Action Day. Material manufacturers and suppliers gave an insight into market evolutions, as well as their reasons for investing in circularity, during the action day on [2 June 2022](#). Under the concrete agreement, too, many experiments have led to a single action plan that the sector is working on to make concrete more sustainable and circular.

3.2.1.2. BUILDING

When we think of circularity, we think primarily of technical lessons learned, whereas the

Green Deal for Circular Construction has also demonstrated innovation on a social level. In addition to intensified collaborations during the construction process, other housing options were given a place during the action days. In particular, the demand for affordable housing came up again and again. The idea that sustainable or circular would be more expensive is not true; the [CircularBuildingAffordableHousing](#) project showed that it can actually be cheaper in the long run. The fact that it can also be more beneficial in the short term was demonstrated during the fourth inspiration day through [Wooncoop's](#) presentation. This housing cooperative combines the advantages of renting and buying and is committed to giving residents peace of mind around maintenance, repairs and other common expenses. It is both paid off and saved according to salary and contribution at the start, so that the initially larger investment is carried by several shoulders. The [UP project](#) also focused on finding some new legal and financial solutions for keeping circularly renovated rental housing affordable to sell to families with limited means.

More and more, we are seeing alternative types of cohabitation emerging that reduce the materials footprint, such as co-housing, tiny houses and temporary care homes. Among the pilot projects of the Green Deal for Circular Construction, for example, there was [Co-housing Group BioTope](#); a grand collective housing project on a brownfield in Ghent. They are now sharing their experience of the Circular Construction process with other co-housing groups through three themes: how to deal with a brownfield as a site for a Circular Construction project; a smart building with



BioTope co-housing

optimisation of material use throughout its life cycle, and thirdly, a demonstration of circular innovative construction techniques. The circular care home [Toontjeshuizen](#) has developed a sample model for circular housing with several partners from the academic, healthcare, technology and construction sectors. The resident and their needs were central to this. A balance was sought between the project's affordability, flexibility, adaptability and circularity. As the residents' needs tend to change over time, the architectural design includes reversible spaces.

Most of the lessons learned and insights at this level of scale over the past four years have been about buildings, although circular infrastructure efforts have also been regularly shared. For example, the Agency for Roads and Traffic showed how [life-extending maintenance](#) can have a major impact and the City of Antwerp conducted an [exploratory study to tender \(temporary\) bicycle bridges](#) in a more circular way. The report consists of a list of 40 global examples of circular (bicycle) bridges, a summary and assessment of existing tools and an evaluation of construction materials.

3.2.1.3. DISTRICT – CIRCULAR SPATIAL USE

The surroundings are under pressure. Encroaching upon open space, the paving of surfaces and the incoherent layout of Flanders poses great challenges to society. The circular economy is about decoupling material consumption from welfare growth, and doing more with less for greater welfare. We also link circular spatial use to that, which is about decoupling the (growing) need for the consumption of space, and even reversing spatial blunders, without putting any pressure on collective well-being. The learning hub offers a [full curriculum](#) of key strategies around this topic.

During the action days, two architects inspired a reflection upon our spatial use. RE-ST made a case for not building and substantiated this with several examples of how spatial needs can be resolved without consuming any additional cubic meters. They always look for ways to make the best use of the existing portfolio when there is a request for new construction or additions. Some examples can be found in the [report on the action day on 6 October 2022](#).

“The greatest sustainability in construction lies in not needing to build at all.”

Dimitri Minten, RE-ST

Architect Marc Martens explained how the spatial structure is a relationship between morphological, historical and socio-cultural elements. Ideally, new infill space should be maximally connected to the historic (city) fabric; such as, for example, a street pattern and pre-existing features, like passageways and heritage. He too advocated for the maximum use of space and portfolio rather than tabula rasa in new developments. At the same time, respecting the spatial structure need not get in the way of implementing ambitious architectural projects. Understanding and judiciously intervening in this structure leads to the protection of both spatial and social capital. A great example of how to fill a brownfield can be found in the [slides from the action day on the design phase on 23 May 2019](#).

At the residential level, we saw several pilot projects pass by. One example is the upgrading of 'de Tuinwijk' ('the Garden District') in Kortrijk by MAKER architects. The original garden district idea, where individual gardens connect to a central, communal green space, had been largely lost from that district. Many gardens had been transformed into garages and enclosed rear buildings. In the project, 18 (terraced) houses were replaced with a new infill according to the principles of Circular Construction. This was at the scale of

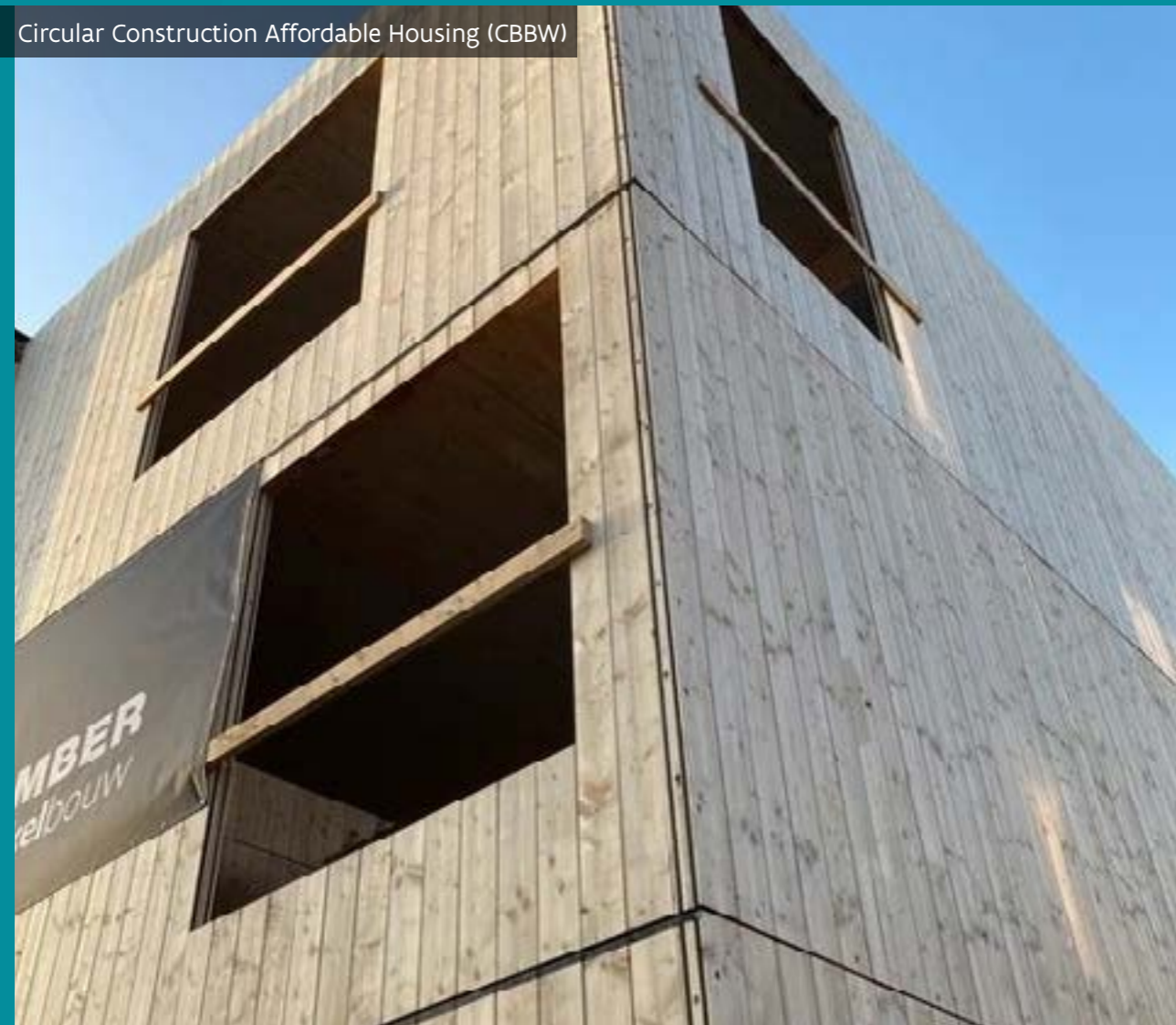
the neighbourhood (integration, affordability, 'space bank', car-free zone), of the plot (housing typologies) and of the structural detail (reuse of building materials). The architects' objective:

- Getting the district to grow with the urban fabric around it.
- Provide flexible housing options that allow for varying family composition and commuting relationships.
- Change-oriented construction: wooden skeleton construction was used in three models that allows the residential units to grow.

The successful ambition to recover bricks and tiles is reflected in [this presentation on the project](#).

The Circular Construction Strategic agenda includes this theme as a work path. One of the actions focuses on encouraging renovations at the neighbourhood level; here, the scale offers more options in terms of material efficiency and in terms of financially viable circular solutions. Some examples from the network are described under 'Building Block 3'.

Circular Construction Affordable Housing (CBBW)



De Tuinwijk, Kortrijk



3.4. GETTING STARTED

Those interested in learning more about circular construction can visit the Circular Flanders construction website. A great deal of information has been gathered together on this website:

- The [learning hub](#) brings together trainings, webinars, presentations and detailed cases on a number of circular themes. For example, the learning hub includes a curriculum with eight modules, ranging from why Circular Construction is important to the importance of sharing information. For each theme, cases are also presented, in words and/or images.
- The [library](#) brings together reports, platforms and tools from participants regarding Circular Construction. Through keywords (tags), publications linked to a particular topic can be easily retrieved.
- The [projects](#) page offers an extensive overview of notable projects launched in recent years. There is a sheet for each project. There is also the opportunity to virtually visit some of the projects. Updates to one's own project are welcome and may still be passed along.



4. BUILDING BLOCK 3: Practice & impact



4.1. PILOT PROJECTS

As part of their commitment to the Green Deal for Circular Construction, participants submitted one or more pilot projects. A total of 164 unique pilot projects were registered, involving 153 different participating organisations. 59 of the projects were launched in partnership. Most of the projects are at the building level, although some work was also done at the material and district levels. A nice spread is noticeable across the themes

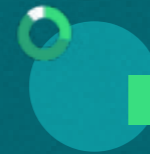
covered in Building Block 2. The complete overview of the pilot projects can be found at bouwen.vlaanderen-circulair.be/en. To compensate for the inability to conduct physical site visits during the coronavirus crisis, a video wall was set up to provide participants with a virtual experience of some of the pilot projects. This allows them to get a sense of the projects and engage with them remotely.



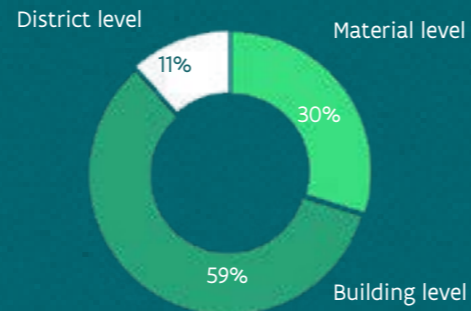
UNIQUE PILOT PROJECTS

164

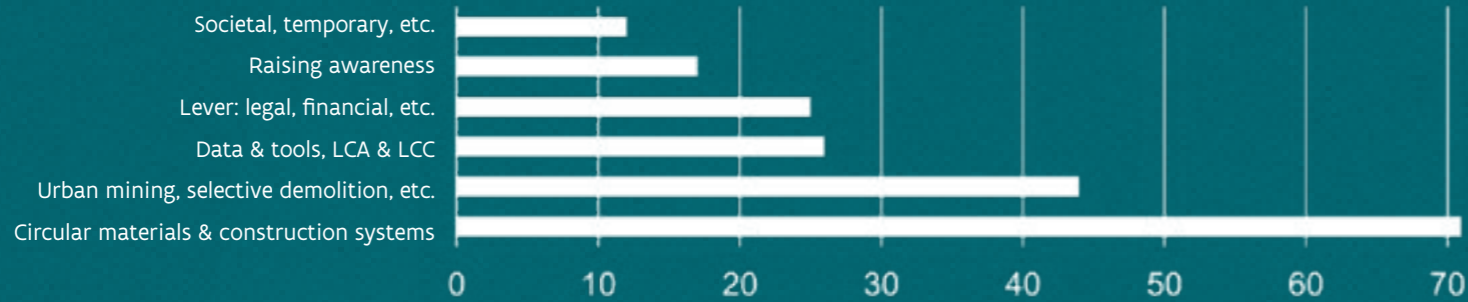
Participants involved: 153
Pilot projects in partnership: 59



BY LEVEL



THEME (multiple themes possible per project)



1. ACKNOWLEDGEMENTS

Many thanks once more to all the Green Deal for Circular Construction participants and partners for the interesting experiments and great networking sessions over the past four years!

Good luck from the team of initiators:

Embuild Flanders: Charlotte Cambier, Fabienne De Langhe, Griet Goossens, Petra Ronda, Ester Bertrand, Ansy Poelman, Marc Dillen

Public Waste Agency of Flanders: Karlien Wauters, Arianne Acke, Elke Meex, Evi Rossi, Stefan Van Geenhoven

Circular Flanders: Brigitte Mouligneau, Veerle Labeeuw, Roos Servaes, Anneke De Hert

Möbius Business Redesign: Danielle Dewickere, Sophie Devresse, Rin Verstraeten, Helen Versluys





Final Report of the Green Deal for Circular Construction, an initiative by Circular Flanders, the Public Waste Agency of Flanders and Embuild Flanders between 2019 and 2022.