



European Construction Sector Observatory

Policy fact sheet

Netherlands

Circular Construction Economy
Knowledge and Innovation Programme

Thematic Objectives 1, 3 & 4

November 2020



In a nutshell

Implementing body	Construction and Technology Innovation Centre (Bouw en Techniek Innovatiecentrum – BTIC)
Key features & objectives	Knowledge and innovation programme supporting circular construction research and innovation projects.
Implementation date	2020
Targeted beneficiaries	Construction sector stakeholders (e.g. companies, institutions, research organisations, universities, Digital Innovation Hubs, etc.).
Targeted sub-sectors	All sub-sectors
Budget (EUR)	8 million (4-year Circular Concrete sub-programme ¹). Overall budget not disclosed.
Good practice	★ ★ ★ ☆ ☆
Transferability	★ ★ ★ ☆ ☆

The concept of the circular economy promotes a more efficient use of resources and the reduction of waste. The construction sector is one of the most resource and waste intensive economic activities, generating 30% of all waste in the EU².

Dutch policymakers have long been active in energy policy with the long-term ambition of becoming a circular economy. In 2016, for example, the Dutch National Agreement on the Circular Economy was signed³. The government set the ambitious target of reducing the use of raw materials by 50% by 2030 and becoming a completely circular and waste-free economy by 2050. To achieve these goals, three main objectives were established⁴:

1. More efficient use of raw materials in production processes to reduce the amount of raw materials needed;
2. Promoting the use of sustainably produced renewable and widely available raw materials, (e.g. biomass) to reduce the country’s dependency on fossil fuel resources;
3. Developing new production methods and designing new products based on a circular economy approach.

Five transition agendas were developed to help achieve these goals. They relate to five key Dutch sectors and value chains that have a high environmental footprint. One of these sectors is construction⁵. The sector accounts for 50% of total raw material consumption in the Netherlands. The Raw Materials Agreement (Grondstoffenakkoord) is the guiding principle of the Circular Construction Economy Transition Agenda⁶. To translate the transition agendas into specific actions and projects, the government launched the Circular Economy Implementation Programme 2019-2023⁷.

Three Dutch ministries (the Ministry of Economic Affairs and Climate Policy, the Ministry of the Interior and Kingdom Relations and the Ministry of Infrastructure and Water Management) joined forces with other key stakeholders (e.g. industry associations, research organisations and universities) to set up the Construction and Technology Innovation Centre (Bouw en Techniek Innovatiecentrum – BTIC) in May 2019.

The BTIC has developed five knowledge and innovation programmes. The Circular Construction Economy (CCE) Knowledge and Innovation Programme was launched in May 2020 to support the construction sector’s transition to a circular economy. Although it has only recently been launched, one sub-programme focusing on Circular Concrete has already been implemented.

1.

General description

The Construction Agenda was launched in 2016. It proposed an ambitious renewal programme to address major social challenges related to energy transition, the sustainable use of raw materials, circularity, digitalisation, mobility and climate change. The principal aim is to strengthen the broad construction and infrastructure sector and to make the Netherlands future-proof⁸.

To help address the objectives of the Construction Agenda (Bouwagenda)⁹, the BTIC has developed five knowledge and innovation programmes, each of which comprises a range of initiatives:

- Integrated energy transition of existing buildings;
- Digitalisation, including the ‘Digital Twins’ sub-programme;
- Circular Construction Economy (CCE);
- Infrastructure;
- Climate adaptation and area development.

The Circular Construction Economy (CCE) Knowledge and Innovation Programme aims to help achieve the Construction Agenda’s objectives by addressing priority circular construction research and innovation challenges.

The CCE programme aims to bring together government, business and knowledge stakeholders to develop circular construction solutions to business and research challenges that require a far-reaching degree of cooperation.

CCE programme activities are being delivered through three sub-programmes:

- Transition programme;
- Innovation programme;
- Measuring impact programme.

Transition programme

The main objective is to accelerate the transition to a circular economy through the development of circular strategies, including new business models and environmentally friendly policy measures, legislation and tendering methods. To achieve its main objective, five transition activity areas are defined, as shown in Table 1.

Table 1: Transition programme activities and objectives

Activity areas	Objectives
Public policies and legislation	1) To analyse whether, and if so which, public policies and legislation have a hindering effect on the transition to a circular economy, and 2) to identify public policies and legislation which can contribute to the accelerated introduction of a circular economy.
Public procurement	To analyse existing tendering procedures and how they can accelerate the transition to a circular economy.
Circular business models	To analyse ownership models, value chain cooperation, purchasing processes and revenue models in order to identify the necessary changes to achieve a circular economy.
Lifelong learning	To design an integrated open learning ecosystem, including specific educational programmes for competence development.
Comprehensive approach	To develop a comprehensive framework where technical, financial, social and ecological factors are taken into consideration when implementing circular building concepts.

Source: Kennis- en Innovatieprogramma Circulaire Bouweconomie¹⁰

Innovation programme

The main objective is to promote research and innovation focusing on the development of new materials and the design of new construction processes and methods. To achieve its main objective, seven innovation activity areas are defined, as shown in Table 2. They are classified as either process and method innovations or new material innovations.

Table 2: Innovation programme activities and objectives

Activity areas	Objectives
Design of new construction processes and methods	
Circular project	To investigate the processes that materials, waste and components go through during the construction and demolition process.
Processes	To develop key enabling design methodologies that facilitate circular maintenance, repair, sustainability, modularity, adaptability and disassembly at different scale levels (from product, component and building level to urban development).
Products, components and processes	To gather international good practices on the use of TRL5 technologies for the construction of new buildings.
	To design and validate new products, components and quality processes based on new technologies.
Development of new materials	
Lifespan of existing structures	To develop practical solutions to increase the lifespan of existing structures.
Reuse of components	To establish a set of quality requirements for the reuse of components.
New (biobased) materials	To carry out a techno-economic feasibility analysis of internationally identified biobased materials at technology readiness level (TRL) 4.

Source: Kennis- en Innovatieprogramma Circulaire Bouweconomie¹¹

Measuring impact programme

The main objective is to develop new assessment methods for measuring the environmental and social impact of the circular economy. To achieve its main objective, seven innovation activity areas are defined, as shown in Table 3. They are classified as either measurement method activities or measurement tool activities.

Table 3: Measuring impact programme activities and objectives

Activity areas	Objectives
Methodology	
Data	To increase the availability and use of high-quality data on the technical properties of materials, products and construction processes.
Next generation Life-Cycle Assessment	To design new indicators for the development of a multi-cycle approach to Life-Cycle Assessment (LCA).
Residual value	To develop new standards that enable a comprehensive analysis of the residual value of secondary products.
Outlooks	To develop a dashboard to estimate the impact of future changes in legislation and business operations in the field of the circular economy.
Tools	
Data & Digitalisation	To develop a set of agreements on data management and data sharing.
Harmonisation	To come to an agreement on a harmonised quantitative and qualitative impact assessment tool.
Technical quality	To develop a new set of publicly available tools to determine the residual value of secondary products.

Source: Kennis- en Innovatieprogramma Circulaire Bouweconomie¹²

2.

Achieved or expected results

The Circular Construction Economy (CCE) Knowledge and Innovation Programme is a newly launched research and innovation programme (May 2020).

Implemented by BTIC, it brings together value chain stakeholders from the supply and demand side to boost joint initiatives.

BTIC helps to build project consortia to support programme implementation, including partner identification and connection, and access to funding at national and European level.

Expected results

As a new initiative, results and evaluation data on programme implementation are currently rather limited. However, the principal expected results of the CCE sub-programmes include¹³:

- **Pilot projects** that are expected to be implemented as part of the **Transition Programme**. Their focus will be to validate new business models and implement lifelong learning programmes in five different organisations;
- A **Building Circularity User Manual** that will be developed as part of the **Innovation Programme**. Its purpose will be to enable local and regional stakeholders such as municipalities, living labs, clusters and Digital Innovation Hubs to assess the degree of circularity of buildings' design, building parts and construction materials;
- A **Social Lifecycle Assessment** that is expected to be developed as part of the **Measuring Impact Programme** to assess the extent to which production and construction processes throughout the entire construction lifecycle influence the well-being of society.

Given that the CCE Programme has only recently been launched, relatively few results have been realised to date. However, results are expected to be achieved and reported within the next year or two.

In the short to medium term, the success of the CCE programme will depend on the extent to which it can contribute to the achievement of the Construction Transition Agenda's goals for 2030 over the next 6 years (2020-2026). In the longer term, the programme's success or failure will be linked to whether it achieves the targets set by the Construction Transition Agenda:

- 50% reduction in the use of raw materials in construction by 2030;
- Construction sector transition to a completely circular and waste-free economy by 2050.

Initial results achieved

The BTIC has already launched its first knowledge and innovation programme – the **Circular Concrete Programme 2020-2023**¹⁴.

With a budget of EUR 8 million over four years, the **Circular Concrete programme** has been designed with contributions from three organisations – Wageningen Food and Biobased Research (WFBR), Avans Hogeschool and TNO.

The Circular Concrete programme will focus on the development of:

- New binders and / or (secondary) aggregates with a specific focus on:
 - Bio-based materials that reduce the use of primary materials and CO₂ production;
 - A new generation of bottom ash-based geopolymer binders (AEC-BA) to replace current cement binders and reduce the use of primary raw materials and CO₂ production;

- Performance assessments of new types of concrete;
- The lifetime extension of existing structures to ensure a more efficient use of concrete structures and a reduction in CO₂ emissions and primary material use.

The ongoing development of a **new digitalisation programme**¹⁵ is another early stage result. Its launch date is not yet confirmed; however, BTIC has published the concept of the programme. The final vision of this programme is expected to be published by the end of 2020.

The new programme will be one of BTIC's five parallel knowledge and innovation programmes. The overall aim of the digitalisation programme is **to support the digital transformation of the construction, design and technology sector.**

The digitalisation programme will focus on topics such as **Digital Twins, Automation, Artificial Intelligence (AI), and Virtual, Augmented and Mixed Reality.** These areas of development will be translated into knowledge and innovation lines that are tackled through sub-programmes. The Digital Twins sub-programme is the first to be announced. The development of the strategic agenda and other sub-programmes is ongoing. All sub-programmes will be structured around:

- **Human capital and digitalisation** – to support the development of digital technologies, knowledge, methods and skills to improve productivity and quality;
- **Data integration** – to support the development of data management, sharing and governance solutions, based on open architecture;
- **Analytics and Artificial Intelligence (AI)** – to support the development of smart solutions to

increase high-quality building and infrastructure data access and use, and process automation (e.g. design, inspection and managements of buildings and infrastructure).

Monitoring and evaluation

Programme reviews are expected to take place every two years. Although a formal monitoring or evaluation framework is not yet in place, one is being developed for the Circular Concrete programme. This would suggest that similar frameworks will be developed for each sub-programme that is launched.

The purpose of bi-annual reviews will be to assess a range of programme implementation aspects such as obstacles, barriers, needs and drivers, and to adapt the programme to address evolving challenges and needs¹⁶.

The Circular Concrete evaluation framework will, for example, include a role for measurement methods such as lifecycle assessments (LCAs). The potential use of Building Information Modelling (BIM) tools/applications and other decision support tools will also be assessed¹⁷.

At the project level, implementation progress monitoring is currently informal and rather limited in scope and approach¹⁸.

From a high-level perspective however, the key objectives of the Construction Transition Agenda for 2030 and 2050 provide an indication of the medium- and longer-term targets that projects will need to work towards¹⁹. Projects implemented over the coming years will need to demonstrate, for example, a pathway to achieving the 2030 transition goals.

3.

Perspectives and lessons learned

Despite only being launched this year, there are three key lessons learned to date, in relation to the ongoing implementation of the Circular Construction Economy Knowledge and Innovation Programme and the role of the BTIC in the transition towards a circular construction economy.

The process of creating a shared vision and programme for circular construction development has been difficult and gradual.

Putting circular economy principles into practice requires large-scale cooperation. Aligning the different views and interests of construction sectors and all key stakeholders has therefore been, and will continue to be, a considerable challenge. The same is true when trying to align the views, interests and objectives of smaller groups of stakeholders²⁰.

According to the Chairman of the Supervisory Committee for the Implementation of the Circular Construction Economy Transition Agenda, every transition starts with awareness raising²¹. The scale of the circular economy challenge is also highlighted by the former Secretary of State for Infrastructure and the Environment in the Netherlands²², who stated “we have to wean ourselves off our disposable lifestyle and start thinking differently about raw materials and waste”²³. The expertise of the construction industry is key to helping all value chain partners to embrace the transition towards a circular economy²⁴.

The willingness of stakeholders to cooperate has enabled the creation of the Construction and Technology Innovation Centre (Bouw en Techniek Innovatiecentrum – BTIC) and the implementation of the CCE programme.

The need for a better and more efficient use of resources and the reduction of waste is being

recognised by more and more organisations across private and public sectors, and by society. This point is made by the former Chief Engineer-Director of the Dutch Directorate-General for Public Works and Water Management (Rijkswaterstaat)²⁵.

The private sector acknowledges that there is an increasing need for research to continue developing the innovative solutions and new processes that have resulted from pilot project implementations over recent years²⁶. To support this aim, BTIC has succeeded in bringing together all key construction sector stakeholders from the construction sector to form a “one-stop-shop” for open innovation and the exchange of knowledge. The main purpose is to make circular construction solutions and processes feasible, scalable and affordable²⁷.

Strong ongoing commitment from all key stakeholders is essential to create, share and develop the knowledge, instruments and tools required to guarantee the success of the CCE programme.

The transition to a circular economy is an ‘irreversible process’, according to the Dutch Architectural Firms Association²⁸. Circularity is still too theoretical, according to the Chairman of the Dutch Association of Supplying Building Materials Industry (NVTB)²⁹. However, the first steps towards a circular construction economy have been taken. This has been made possible by a strong push from the national government and a growing awareness among private stakeholders of the benefits of becoming circular.

To support the transition agenda, the Netherlands joined the Platform for Accelerating the Circular Economy (PACE) in July 2018 to help the country to learn from international best practices. Although construction companies are not used to the BTIC ‘open innovation’ way of working, the majority are

willing to participate in joint initiatives under the CCE programme, provided that some of those

initiatives are linked to large-scale infrastructure and building site projects³⁰.

4.

Conclusion and recommendations

Reducing the use of raw materials, increasing the reuse of materials, and the elimination of construction / demolition waste are all central to the circular construction economy transition process.

Although the CCE Programme is at an early stage, BTIC has successfully brought together key stakeholders to cooperate and collaborate in the design and implementation of joint circular construction economy initiatives and projects. However, the willingness of stakeholders to cooperate needs to be translated into tangible action which delivers real impact.

Based on the initial lessons learned to date and the CCE Programme's achieved and expected results, **five main recommendations** are suggested to help improve programme implementation and impact:

- Awareness raising campaigns are needed to disseminate the objectives of the CCE programme to potential participants (e.g. construction value chain companies) and increase the number of joint initiatives and projects implemented;
- As the number of projects and initiatives implemented as part of the CCE programme continues to grow, the governance structure and coordination mechanisms of the BTIC will need to be revised and adapted to ensure that the needs of a growing number of participants are met;
- Ensuring access to sufficient funding to develop common projects from both the public and the private sector should be a priority for the practical implementation of the knowledge and innovation programme;
- The uptake of key enabling technologies and innovative solutions by all stakeholders in the construction sector needs to be promoted in

order to ensure a proper transition to a circular economy;

- The acute shortage of skilled labour to broadly adopt the developed innovations and new circular working methods remains a challenge in the construction sector in the Netherlands³¹. The education and training system should therefore be adapted to fit emerging needs, in terms of digitalisation, the circular construction approach and new business models.

Overall, the CCE Programme is rated a '3-star good practice measure' on a scale of 1 (low) to 5 (high).

This score is primarily based on the solid start to the CCE Programme, contrasted with the fact that it is a new initiative that has only recently been launched. BTIC has provided a successful framework for cooperation between different stakeholders. Collaboration among key stakeholders is an important enabler in the ongoing development of the CCE programme. The programme shows good potential, but its early stage of development and obvious lack of results at present do not allow the award of a higher score. As results begin to emerge and once an evaluation framework is in place, the CCE Programme has the potential to achieve a higher 'good practice' score.

The CCE Programme is rated a '3-star transferable measure' on a scale of 1 (low) to 5 (high).

This scoring is similar to that given for 'good practice'. The programme is potentially transferable, but it is still too early to say for certain. At this point, the programme concept and approach appear to be the most easily transferable aspects, providing that interested parties adapt them to fit their own national / sectoral / value chain context. As with 'good practice', the extent to which the CCE Programme may be transferable may increase as the initiative evolves.

Endnotes

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