

Show me the value

A clear business case for the supply chain will spur the transition to circular economy

Executive summary

ING is convinced of the circular economy's potential value and therefore took the lead in setting up the Circular Supply Chain Accelerator (CiSCA). The aim is to stimulate a more large-scale adoption of circular business models. The CiSCA proposition was further developed together with Accenture Strategy and supported by Circle Economy as knowledge partner. The CiSCA project is affiliated with the World Economic Forum's Platform for Accelerating the Circular Economy (WEF PACE).

The CiSCA project aims to accelerate the transition to a circular economy by addressing a primary challenge for companies with circular ambitions: development of circular business models and business cases for supply chains and clients. Here, ING can deploy its capabilities of conceptualising business models, identifying economic value drivers, testing business cases, assessing risk, and financial structuring to help companies transition to the circular economy.

As a first live trial of this CiSCA proposition, a pilot was set up with a large Dutch construction company that developed a circular proposition with its main supplier and client. This pilot confirmed the value of an outsider view and complementary skills that ING can offer to companies through CiSCA. Next to the pilot, more than 20 interviews were conducted with sector experts and additional desk research. Based on this, we identified the political agenda and changing client demand as the two main drivers that we expect to motivate European construction companies to transition to circular business models.

Although the primary goal of our journey was to further develop the CiSCA proposition and share the process and proposition insights in this report, we feel that the unique insight into the drivers for European construction companies to become more circular is worth sharing as well. Therefore, this report is divided into two parts and covers both of these things.



This report is published as part of the Platform for Accelerating the Circular Economy (PACE). PACE is a public-private collaboration mechanism and project accelerator dedicated to bringing about the circular economy at speed and scale. It brings together a coalition of more than 50 leaders and is co-chaired by the heads of Royal Philips, the Global Environment Facility and UN Environment. It is hosted by the World Economic Forum.

For more information, contact Mayke Geradts at sustainable.finance@ingbank.com

CiSCA project status update

1 CiSCA project developments

Having started the CiSCA project in 2017, the CiSCA proposition took further shape in 2018. This chapter describes the development of CiSCA from a process point of view whilst Chapter 5 provides further details on the content of the CiSCA proposition.

1.1 The origin of CiSCA

CiSCA is a service proposition to support companies that aim to transition to circular business models. By better connecting large manufacturers and the small to medium-sized and large companies in their supply chain, CiSCA follows a supply-chain approach.

Previous^{1,2} and recent³ research identified small and medium-sized enterprises in particular as a source of innovative circular solutions. At the same time, they face resource constraints in time, staff and budget to further develop and scale circular business propositions. Large manufacturers on the other hand often have more resources but are not able to realise their circular ambitions without collaborating with their supply chain partners on, for example, supply materials and innovation.

To verify these findings, at the end of 2017 a first round of stakeholder consultation with, among others, the European Investment Bank, Intesa Sao Paolo and Philips confirmed the need for a supply chain solution and that a bank like ING could help companies with both circular business-model development and addressing the ‘financeability’ of circular propositions, e.g. by establishing a circular economy funding platform. The intermediate insights and CiSCA aim were presented at the WEF summit in January 2018.

1.2 Refining the CiSCA proposition in 2018

Per mid-2018, a dedicated team started working on further developing the CiSCA proposition based on additional desk research and interviews with 28 companies (22 in the construction sector), (Dutch) governmental institutions and several circular economy experts.

The basis of the CiSCA proposition, a supply-chain approach to enhance the circular economy, was confirmed during the conducted interviews.

“Collaboration is the number one success factor [to achieve the transition to circular economy]. A supply chain approach is essential.” - Norbert Pralle, head of Corporate Responsibility, Innovation & IPR Management at STRABAG

Further findings as presented in Chapter 4 re-confirmed that companies need help to develop circular business models and viable business cases for key supply-chain actors and key clients. Additionally, financing was mentioned as a challenge and is certainly something that a bank like ING can and should address, e.g. by providing financing ourselves, providing financial structuring advice or by connecting companies to other financiers in the ING network, like venture capital funds. Still, the need for a solid circular business model and business case for the supply chain is deemed a crucial first step that banks like ING can help with. Therefore, the latter was chosen as a starting point for the CiSCA proposition as a step towards enhancing circular financing.

1.3 Sector and geographic CiSCA scope

ING and partners aim to develop a European accelerator for circular supply chains for all sectors that should eventually be geographically scalable. However, for 2018 we selected a single sector to concentrate the CiSCA efforts on. Subsequently, the Netherlands provided an interesting sample of companies relatively active with circular economy.

With regard to the sector selection, the two main selection criteria were: the opportunity to reduce the material intensity and GHG emissions of a sector (i.e. circular impact), and the ability to actually study and work with suitable^a supply chains. Based on these criteria, four sectors were evaluated: construction, electronics, automotive and consumer goods/ plastics. The construction sector was selected due to its material intensity, high GHG emissions and, as a key deciding factor, the traction we got from companies in participating in a circular economy transition project.

Most companies we got traction from were based in the Netherlands. Based on our research, we concluded that this particular engagement from Dutch construction companies is mostly driven by the Dutch government's active stance on circular economy (please refer to Chapter 3 and the separate section on drivers for the construction sector for further details). As a first step to enhancing the international scope of the companies represented in our research, we reached out to the international Urban & Infrastructure Community of the WEF. Additionally, the findings from the interviews with mostly Dutch companies were in line with the conclusions from the international reports that we studied.

1.4 Putting CiSCA to the test

As a first live trial of the CiSCA proposition, a pilot was set up with a large Dutch construction company that developed a circular proposition in collaboration with its main supplier and main client. A prototype was built to test and monitor the technical viability of this circular proposition. However, the assessment of its commercial viability turned out to be a challenge since additional insight in circular business models and value drivers was needed, also for the main supplier and client. This provided a good case for ING and partners to put CiSCA to the

^a The suitability of a supply chain was mostly determined by: several links/ supply chain participants to study, an large manufacturer with smaller suppliers, plus proximity and accessibility of the companies to the CiSCA team.








test and help the construction company to address the challenge of circular business model and business case development.

2 Benefits from circular construction in Europe

Transitioning to circular construction and rethinking the way we consume natural resources can help alleviate resource scarcity and significantly reduce GHG emissions^{4,5}, all helping to safeguard the planet for future generations. Besides this significant intangible value for society and the environment, the tangible societal and environmental value^b of a European circular-built environment^c adds up to an estimated \$300⁶ billion in additional annual savings compared to the current path towards 2030.

For companies, the additional annual savings from a circular-built environment are estimated at \$60 billion in primary resource benefits^d, originating from an estimated 3% increase in resource productivity based on circular business models. Although there are no numbers available for the economic potential of circular construction specifically, the CiSCA process helped identify several benefits of transitioning to circular construction. These drivers are divided in factors that could eventually limit a company's growth from business as usual ('threats') and others that could create additional value from circular business ('opportunities'). Further details are provided in the second section of this report.

Business drivers for circular construction in the EU

Threats	Opportunities
 Political agenda Main driver, consists of Policy and Legislation, and Taxation.	 Market demand Main opportunity, with government bodies as launching customers, followed by the B2B segment.
 Resource scarcity Minor business driver at the moment, key reason however for wanting circular economy for society at large and the planet.	 Product value Significant potential to realise new business models, enhancing value for both customers and companies.
	 Cost optimisation Interesting when considering less material usage and enhanced efficiency. Significant potential can be increased when taxation levels the playing field vs. linear propositions and virgin raw materials required.
	 Brand equity Opportunity that is difficult to quantify but that could be sizeable, also interesting for attracting and retaining talented employees.
	 Sector initiatives Minor opportunity, not enforceable in many cases, yet sector initiatives are suitable for co-creation and joint learning.

^b Other costs include *household expenditures* like rent, maintenance and utilities; *government expenses* like social housing, waste management, street lighting; the cost of *office space* and *externalities* like CO₂ and adverse health effects.

^c The Construction Industry Council suggests that the built environment, '...encompasses all forms of building...and civil engineering infrastructure, both above and below ground and includes the managed landscapes between and around buildings.

^d This includes virgin materials, use of fossil fuels for heating, residential and office land use and non-renewable electricity.

Based on our research, we conclude that circularity in the EU construction sector is most likely to be driven by government action and changing market demand. Next to that, public tender criteria are expected to change and include circular aspects, perhaps as early as 2023 in the Netherlands. When exploring circular opportunities however, companies come across a number of challenges as described in the next chapter.

3 Transition challenges for the construction sector

The CiSCA proposition is positioned as an enabler for the transition to circular economy by addressing one of the most important circular challenges for companies^e: defining clear circular business models and, based on this, a business case for key supply-chain participants, including clients. The focus on this specific circular challenge matches the capabilities of a bank like ING and is the result of our desk research and industry interviews.

Circular construction challenges have been extensively documented in numerous reports^{7,8,9,10,11,12,13} and are confirmed by our interviews with industry and circular economy experts. Therefore, we hereby limit ourselves to providing an overview of the most important challenges for circular construction in Europe:

- a) Lack of clear circular business models and business cases, including insight in added value of circular propositions for clients.
- b) Lack of clear and consistent policy, and the existence of hindering regulations.
- c) Fragmented supply chain, while cooperation is required for circular economy.
- d) Uncertain residual value of materials.
- e) Lack of objective circular assessment criteria/ certificates.
- f) Lack of comfort to commit to circular economy at senior level within companies.
- g) Changing financing needs due to changes in companies' business models.

Both the studied reports and our company interviews showed that developing clear circular business models and related business cases for large manufacturers, their main suppliers and their clients is a key challenge for making the transition to circularity^{14,15,16}. Besides having identified this as a primary challenge, it is also a challenge that banks are expected to help companies with¹⁷.

Actually, addressing this particular challenge will also address the challenges of fragmented supply chains and pave the way for discussing a changing financing need based on new circular business models and business cases^{f,18}. How the CiSCA proposition can address these challenges is explained in the next chapter.

^e The CiSCA research validated this point primarily for the construction sector.

^f Main challenges being 1) changing nature of cash flow 2) increased capital need for prefinancing and 3) legal issues surrounding collateral

4 The CiSCA proposition

4.1 Role of commercial banks in the circular transition

As demonstrated in the previous chapter, the transition to a circular economy requires circular business models, business cases and matching financing solutions for the supply chain. Commercial banks like ING can play a role in this transition by leveraging their capabilities of conceptualising business models, identifying economic value drivers, testing business cases, assessing risk and financial structuring.

“We have to collaborate with both our customers as well as our suppliers and show that circular propositions are feasible. Providing evidence on the added value of these propositions is essential...” - Cor van Vliet, Tender Manager at Van Hattum en Blankevoort (a VolkerWessels company)

It can be concluded that there is a need for the involvement of banks like ING that goes beyond financing. Once having established solid new business cases, the role of the banks continues as new financing solutions are to be explored.

4.2 Service options for the CiSCA proposition

When looking at the CiSCA proposition as an enabler of the transition to circular business, we currently see three main possible services based on the capabilities of a bank like ING:

- a) Supporting large manufacturers in identifying applicable business models for their circular propositions.
- b) Supporting large manufacturers and key supply chain participants to set up, structure and calculate the business case of circular offerings. This also includes engaging with key clients to evaluate what determines the value of circular propositions for them.
- c) Advising the large manufacturers and the involved supply chain participants on the financeability of their business propositions, including the applicable (innovative) financing products.

Specifically for the construction sector, a combination of all three services will address three challenges that hinder the transition to circular construction:

- Lack of clear circular business models and business cases for the supply chain.
- Segmented supply chains, while integration is required for a circular economy.
- Changing financing needs due to changes in companies' business models.

Contrary to earlier CiSCA project approaches, the CiSCA proposition doesn't focus on structuring the way large manufacturers request circular solutions from their supply chain partners, nor setting up a funding platform for circular propositions. Instead, a more collaborative and co-shaping approach was adopted.

4.3 The CiSCA proposition being tested in a pilot

The CiSCA proposition is currently being tested in an ongoing pilot with a large Dutch construction company that has realised a technical prototype of a circular proposition with its key supplier and client. In this section several interim results of the CiSCA proposition pilot are presented.

The key focus of the pilot is on supporting the construction company, its main supplier and its main client to assess to what extent this specific circular proposition could be included in their business operations. The CiSCA proposition helps to conceptualise and select circular business models^{9,19}, and identify how these business models and the accompanying business cases can be structured and improved. This will provide a stronger base for any financing request as well.

The pilot confirmed the value of involving a commercial bank with the development of a circular proposition, as banks can bring complementary circular economy and financial expertise with an outsider look. Especially the visualisation^h of the 'as is' scenario vs the potential circular scenarios helped to give insight in the main differences and the elements to influence when aiming to get to a solid and financeable business case. The key elements that were identified are:

- the potential of alternative income streams in circular models;
- the switch to a total cost of ownership view;
- governance structures that address the risk-reward distribution between the large manufacturer and its key supplier; and
- the actual ownership of the final materials.

Identifying these also helped the 'intrapreneurs', the employees driving internal (circular) innovation, to express the business potential of the circular proposition to senior management when looking for support to further develop and scale such an idea.

The exploration of the elements that can improve the financial viability of the circular business model, along with the first quantification of the business case, are areas of ongoing work that will be addressed in the remainder of the pilot.

5 CiSCA project conclusion and next steps

Convinced of the potential value of the circular economy, ING and partners explored how commercial banks can use their capabilities to aid the transition to a circular economy.

⁹ The five circular business models as defined by Accenture are used as a basis. These are: Circular Supplies, Resource Recovery, Product Life Extension, Sharing Platform and Products as a Service.

^h To get a feel for how such visualizations looked like, please refer to the Appendix.

The (Dutch) construction sector is exploring circular business opportunities, mostly driven by circularity on the political agenda and changing client demand. To successfully transition to circular business models however, companies in this sector are required to overcome several challenges, the most important one being the development of clear circular business models and business cases, for the large manufacturers but also their key suppliers and clients.

Commercial banks like ING possess the capabilities and knowledge to support companies in setting up circular business models and business cases, providing a solid basis for discussing the financeability of such circular propositions. Illustrated by the current CiSCA proposition pilot, commercial banks can offer services that go beyond financing and help large manufacturers, their key supply chain partners and their clients to come closer to realising their circular ambitions.








The next steps of the CiSCA project are to continue the pilot to come to a complete understanding of the large manufacturers' needs when aiming to transition to a circular business. With the need for a scalable approach across sectors and geographies in mind, refining the CiSCA proposition will be further explored in 2019, allowing ING to further equip itself to support the transition to a circular economy.

Business drivers of circular construction in the EU

1 Drivers for transitioning to circular business

According to Circle Economy²⁰, the circular economy is considered to be past the start-up phase in the construction sector. However, it is not yet in the phase of large-scale adoption. From our research we conclude that the majority of companies do not include circularity in their mainstream business yet. Currently, a few early adopters of circular business models and some pilots from established companies show the signs of a transition to circular construction. When aiming to accelerate this transition, it is crucial to understand what motivates companies to start transitioning at all. Our research identified the below business drivers for circular construction, some that could limit a company's growth from business as usual ('threats') and others that could create additional value from circular business ('opportunities'). The following paragraphs illustrate these drivers with several examples.

Business drivers for circular construction in the EU

Threats	Opportunities
 Political agenda Main driver, consists of Policy and Legislation, and Taxation.	 Market demand Main opportunity, with government bodies as launching customers, followed by the B2B segment.
 Resource scarcity Minor business driver at the moment, key reason however for wanting circular economy for society at large and the planet.	 Product value Significant potential to realise new business models, enhancing value for both customers and companies.
	 Cost optimisation Interesting when considering less material usage and enhanced efficiency. Significant potential can be increased when taxation levels the playing field vs. linear propositions and virgin raw materials required.
	 Brand equity Opportunity that is difficult to quantify but that could be sizeable, also interesting for attracting and retaining talented employees.
	 Sector initiatives Minor opportunity, not enforceable in many cases, yet sector initiatives are suitable for co-creation and joint learning.

1.1 Political agenda stimulating circular economy

Based on recent examples, we see circular economy increasingly becoming a topic on national and supra-national political agendas. Turning such agenda items into binding policy, legislation and economic incentives could greatly enhance the effectiveness of political frameworks to stimulate the transition to a circular economy.

Recent efforts to develop a political framework of policy and legislation that stimulate the transition to a circular economy can be found in the EU's Circular Economy Action Plan²¹.

This includes the EU Waste Directive, which stipulates a 70% recycling rate of non-hazardous construction and demolition waste by 2030²². At a national level, the UK government has indicated that the broader EU circular economy measures will be adopted within UK legislation, at a later date, even if the UK leaves the EU²³. In Denmark, the government launched its own national circular economy strategy in September 2018. Seeing companies as the driving force to realise this ambition, the Danish government will invest €16 million in 15 selected initiatives²⁴.

In 2016, the Dutch government stated the ambition to have a fully circular economy by 2050. Here, 2030 should mark the mid-point with a 50% reduction of raw materials usage²⁵. In 2017, the Resources Treaty ('Grondstoffenakkoord') laid the foundation of the 2018 sector-based Transition Agendas, e.g. the one for construction ('Transitieagenda Circulaire Bouweconomie'). As a result of this circular ambition from the government, also a stricter Environmental Performance of Buildings norm²⁶ ('Milieu Prestatie Gebouwen') is expected by Dutch companies. Overall, the conducted interviews confirmed that the Dutch government's ambition is an important reason for companies to engage with the circular economy. We observe that most official circular ambitions at government level are currently non-binding targets, so it remains to be seen how effective these will be in practice.

Taxation and other financial incentives are an important extension of policy and legislation that can be used to alter behaviour. Such financial incentives can shift financial burdens and create a level playing field that could make more sustainable or upcycled materials economically competitive or stimulate renovation versus new production.

Tax incentives stimulating circular economy beyond energy, waste and resource extraction are not yet widespread. Recently, new tax incentives for selected circular economy technologies have been introduced in the Netherlands, allowing companies an additional maximal 36% tax deduction on investments. Next to this, companies may also apply additional flexibility in depreciating the investment costs²⁷. Other examples can be found in the Swedish VAT decrease for repairs of bicycles, clothes and shoes from 25% to 12%²⁸ and the UK landfill tax that aims to improve the financial attractiveness of advanced waste treatment technologies²⁹. Besides taxation, extended Enhanced Producer Responsibility (EPR), where producers are responsible for the end-of-life stage of products sold to consumers, and extended deposit schemes that include for example spent batteries, mobile phones and coffee cups, are often mentioned as other forms of economic incentives that can help the acceleration to a circular economy^{30,31,32}.

1.2 Resource scarcity

From a societal and environmental point of view, resource scarcity is a key reason why companies should transition to a circular economy. However, in the interviews this driver was not mentioned as being particularly strong for businesses in the European construction sector. EU construction companies are either unaware of the risk of resource scarcity, or do

not see it as a risk impacting their own performance (i.e. a risk impacting the end customer or the construction companies suppliers).

Although interviewees hardly ever mentioned resource scarcity as a driver for circular construction in Europe, and generally the construction sector does not work with precious materials³³, we actually do observe shortages of specific construction materials (e.g. construction grade sand³⁴). Such shortages are mostly caused by strong demand in the (linear) construction sector that exceeds the current production capacity of suppliers³⁵. Companies like Urban Mining Collective³⁶ and Excess Materials Exchange³⁷ are currently operating in the niche-market of re-using construction materials and elements. Such companies will be well positioned when a company's competitive advantage will be determined by its access to materials.

"In the future the construction sector will no longer be led by the ones that can provide the funds; it will be those who can provide the raw materials [that will have the competitive advantage]." - Michel Baars, co-founder and CEO of New Horizon and the Urban Mining Collective

1.3 Market demand for circular propositions

Especially for a strongly demand-driven sector like constructionⁱ, a change in the criteria of customers is essential to stimulate the transition to a circular economy. Currently, demand for solutions including circular elements is limited to governments and a few companies acting as early adopters.

The currently low circular demand can be attributed to various causes. In general, clients do not explicitly ask for a circular product or service, yet more for a solution. For construction specifically, there are two further complicating factors. Firstly, the price of real estate is more determined by location than by (material) design and material use³⁸, limiting the impact of using circular principles on the short-term value for investors. Secondly, the construction sector's clients/investors are not typically the ones inhabiting these buildings. This leads to the so-called split incentive³⁹ dilemma where investors who have a more short-term focus bear the costs but do not benefit first-hand from long-term benefits, which are for instance increased well-being or a lower energy bill.

Governments and semi-governments can kick-start demand for solutions that incorporate circular elements. Part of the Dutch government's circular ambition is the intention to include circularity in all public tenders as of 2023⁴⁰. Therefore, several Dutch construction companies, especially those participating in public tenders, are exploring circular propositions they can

ⁱ Due to a high level of competition and low margins, construction companies have a below average level of freedom to control their product offering. Subsequently they are highly dependent on the requirements of the customer. An industry where this is less the case is the high-end mobile phone market or business software market.

offer^{41,42}. Additionally, semi-governments can drive demand, such as housing corporations that have a long-term horizon⁴³.

Despite the often-mentioned split incentive, we also see opportunities for circular construction in the private sector. Companies acting as tenants of office buildings appreciate buildings with circular elements because these contribute to their reputation (branding) and because a more sustainable and flexible environment enhances employee well-being and productivity⁴⁴. Our interviews confirmed that this is translated into a higher demand for offices certified with building labels. Currently such certifications and corresponding labels mostly focus on energy use and well-being of users, but significant effort is put into including circularity measures in building labels such as BREAAAM⁴⁵.

1.4 Enhanced product value

Using circular economy principles can stimulate companies to innovate and create new products or services that are more competitive than the linear alternative.

Within construction, we specifically see designing for flexibility providing potential value. Dutch housing companies⁴⁶ explored this by developing multi-purpose buildings, proving valuable for investors to minimise the risk of vacancy. An infrastructure example of flexible design is found in the modular viaduct developed by Dutch construction company Van Hattum en Blankevoort (a VolkerWessels company). Here, modularity reduces the construction time and allows for decommissioning, moving and lifetime extensions of infrastructure works and their respective materials and elements. Such design for flexibility is highly valued by important clients like the Dutch Agency for Public Works and Water Management ('Rijkswaterstaat')⁴⁷.

1.5 Cost optimisation

Reducing material usage, reusing materials and/or reducing waste allows construction companies to reduce costs. Other positive operational effects could include reduced production time and reduced logistics. Especially modular construction techniques are reported to have the potential to reduce construction costs by as much as 30% to 60%⁴⁸.

Even though the interviewed companies indicate that re-used materials are currently unable to compete with virgin materials in terms of price and supply volumes, the market for re-used materials is growing. In fact, the Urban Mining Collective is lowering or waiving decommissioning fees in order to harvest materials from old buildings⁴⁹. A flexible, modular design can further enhance re-usage of materials by making the decommissioning process faster (saving on labour costs) and easier (reducing damage and increasing value of used materials). Separating materials streams also makes recycling easier and decreases landfill costs.

Depending on for instance the production process, complexity of materials and the price of virgin materials^{50,51}, some companies might be better positioned to engage with reusing and/or recycling materials than others. However, to reap such benefits in the future, the choice for circular design and sustainable materials needs to be made before construction starts. This not only requires cooperation of the current client, designer, constructor and the future decommissioners, but also a more long-term vision.

“In the future the construction sector will no longer be led by the ones that can provide the funds; it will be those who can provide the raw materials [that will have the competitive advantage].” - Michel Baars, co-founder and CEO of New Horizon and the Urban Mining Collective

1.6 Enhanced brand equity

Intangible added value provided by embracing circularity is found in enhanced brand equity. This materialises in being perceived as an innovative and sustainable company by clients, and an opportunity to connect to customers beyond what would be a sales transaction in a linear business model⁵². This creates not only customer loyalty, but also the chance to create new sources of revenues from e.g. a service model. As demonstrated by our interviews, investing in circular economy is also said to help with attracting and retaining a talented workforce.

“Focusing on the circular economy helps us to remain innovative and present ourselves as a modern employer, attracting and retaining talent.” - Esther Donders, Chief Procurement Officer at Heijmans

1.7 Sector initiatives

Sector initiatives add value because they connect peers across the value chain, including clients. It creates a co-creative setting that stimulates innovation and knowledge exchange, where also important agreements can be reached on e.g. definitions, measurement criteria etc. Having the government on board makes sector initiatives particularly strong.

Illustrations of public-private cooperation can be found in the UK's Green Building Council Circular Economy Program for the built environment and its Advancing Net Zero Campaign⁵³, and the Dutch Concrete Agreement ('Betonakkoord')⁵⁴ and Transition Agenda for circular Construction ('Transitieagenda Circulaire Bouweconomie')⁵⁵. Being voluntary by nature, a limiting factor of such sector agreements is that formulated targets are not binding.

2 Conclusions on circular economy drivers for the construction sector

The currently strong economic growth and shortage of qualified personnel leads to a challenge for the construction sector to keep up with the high demand for its services and products⁵⁶. As a result, the ability of construction companies and their suppliers to free up resources to explore circular opportunities is very limited. This is augmented by specific sector characteristics such as low margins and long-standing habits.

Based on our research, we conclude that circularity in the EU construction sector will be mostly driven by government action and changing market demand. Circular economy being on the political agenda has caught the attention of companies, visible through pilots of these companies and participation in sector initiatives where the public and private sector cooperate. Next to that, public tender criteria are expected to change and include circular aspects, in the Netherlands perhaps as early as 2023. The demand-driven characteristic of the market combined with the ever-lasting competition to win orders might drive companies to ensure they are well positioned to fulfil any future request.

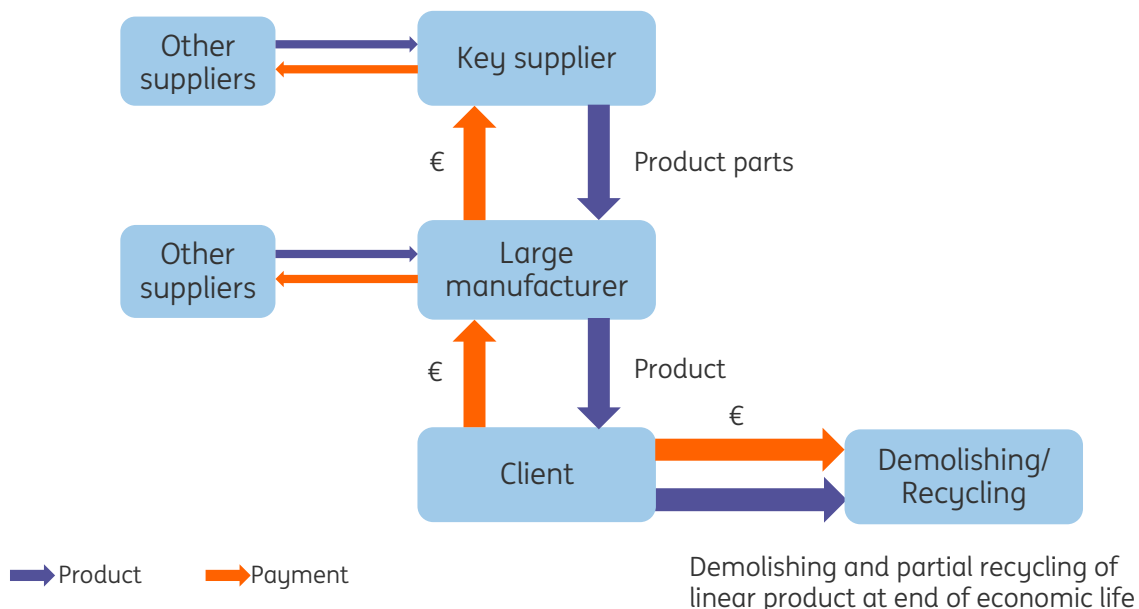
“Investing in exploring the circular economy now helps us to be able to fulfill our clients’ needs of tomorrow. We see more and more clients prompted to somehow incorporate circular aspects in their buildings.” - Gerard Streng, Director Revitalisation and Development at Strukton

Appendix: Visualising circular business models

During the pilot, the applicability of several circular business models has been discussed. To facilitate these discussions, several business models and variations have been conceptualised. For the purpose of illustrating the undertaken CiSCA activities, a number of conceptualisations have been included in this appendix. Note that these images are specifically drafted for the specific pilot project and are for illustration purposes only. The steps of quantification of the business models based on a total cost of ownership view, exploring alternative income streams and exploring governance structures still need to be concluded.

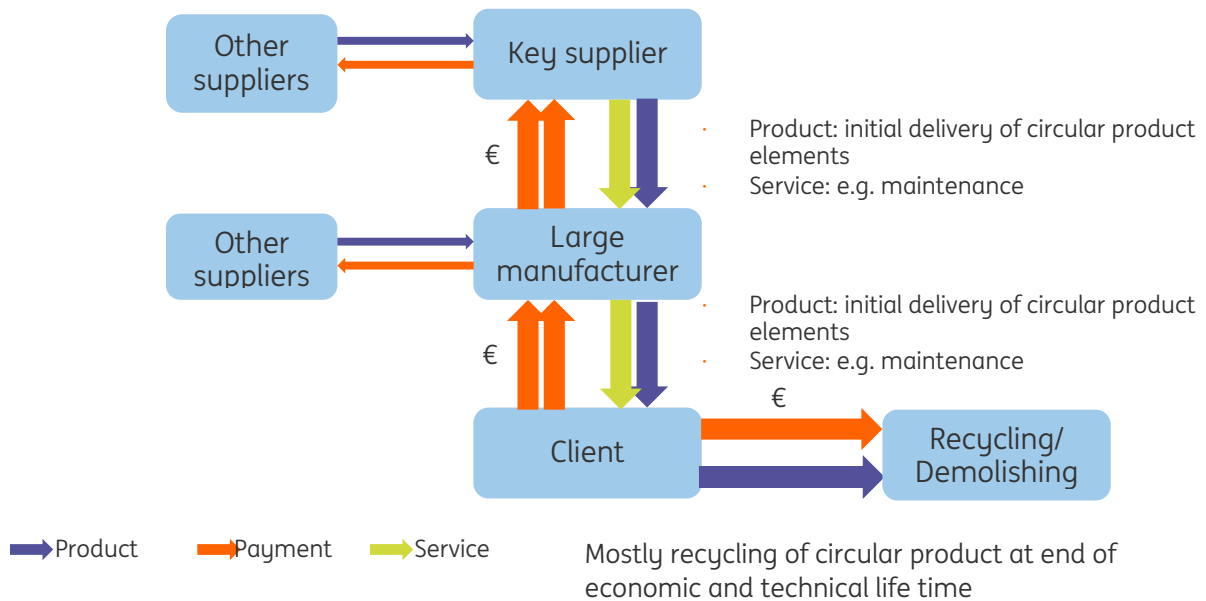
Linear offering – Business as usual

Linear offering leads to a single transaction between the large manufacturer and the client



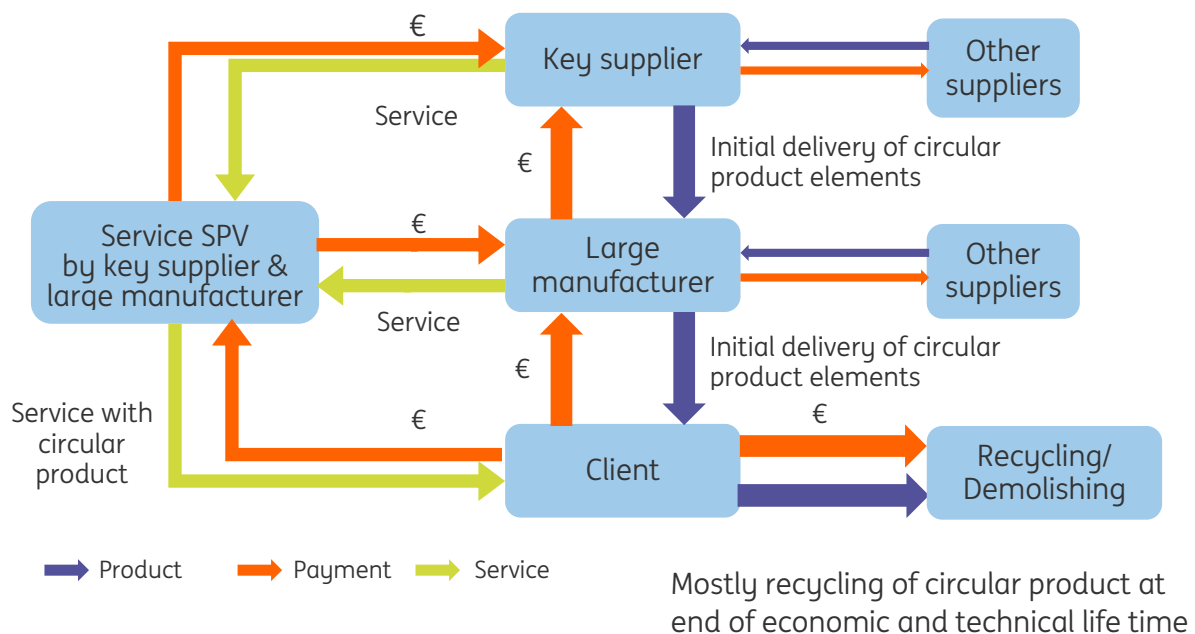
Circular offering – Lifetime extension type A

Lifetime extension leads to additional service propositions and interaction with the client



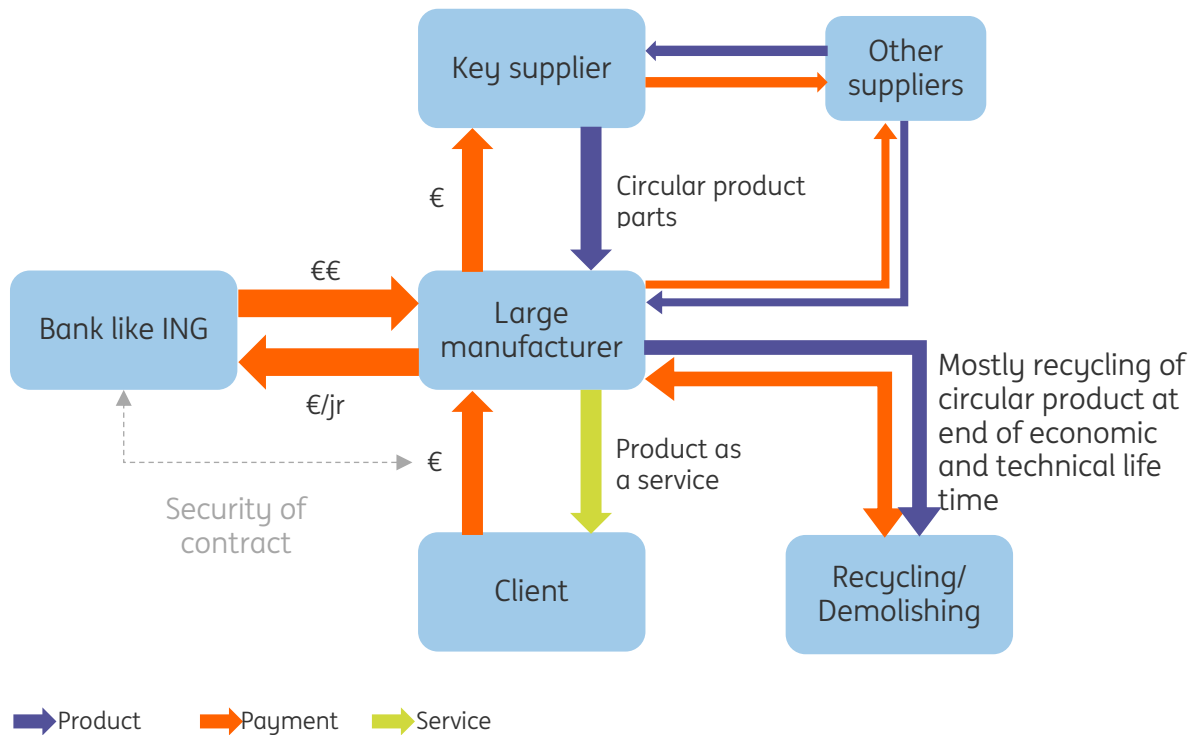
Circular offering – Lifetime extension type B

Using a Special Purpose Vehicle for service balances risk distribution between supplier & manufacturer



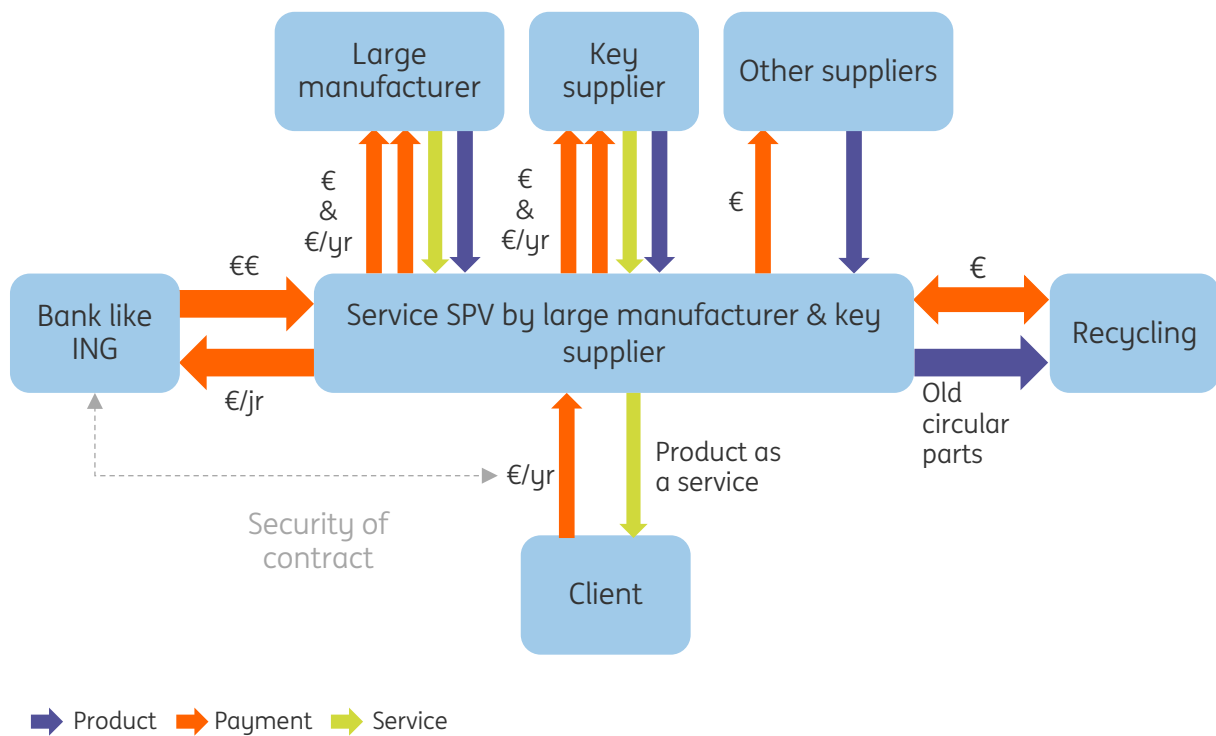
Circular offering – Product as a service type A

Remaining owner of the product as large manufacturer results in control but also new risks



Circular offering – Product as a service type B

Using a service Special Purpose Vehicle clarifies responsibilities and risks for all parties



Credits

Accenture Strategy

Jurriaan Coomans

Quentin Drewell

Suzanne Hazelzet

Maurits Olijve

Jim Teunizen

Alba Concepts

Iris van de Beek

Being Development

Fieke de Haan

Circle Economy

Ben Kubbinga

Marc de Wit

Copper8

Cécile van Oppen

Edge Technologies

Fabienne Cézanne

Ellen MacArthur Foundation

Olivia Finch

Van Hattum en Blankevoort

Menno van Oeveren

Cor van Vliet

Heembouw

Aljld van Doorn

Heijmans

Esther Donders

ING Bank

Joost van Dun

Jan van der Doelen

Mayke Geradts

Floske Kusse

Guido Meerman

Danielle Nativ

Serge de Reuver

Sander Roos

Maurice van Sante

Leonie Schreve

Van Leeuwen

Liag Architects

Lieftink

New Horizon

OVG Real Estate

Rijksdienst voor Ondernemende Nederland

Royal BAM Group / AM

Spanbeton

Strukton

Studio R

Volker Wessels

De Vries & Verburg

WEF - Community for Urban Development & Infrastructure

Züblin/ Strabag

Geerte de Visser

Annerie Vreugdenhil

Hein Wegdam

Ivar Wiersma

Leon Wijnands

Andries van Leeuwen

Thomas Bögl

Dirk Lieftink

Joost Plompen

Michel Baars

Nena Rood

Hans Scherpenzeel

Nitesh Magdani

Maarten Marcus

Steven Hupkens

Cees Quartel

Gerard Streng

Rogier Joosten

Bas Spelbos

Evert Hogendoorn

Ton van der Spek

Harry Stolk

Timo Stuij

Michael Buehler

Hani Dakhil

Norbert Pralle

Fabian Bauer

Literature list

- 1 Rizos, V. et al. (2016). *Implementation of Circular Economy Business Models by Small and Medium-Sized Enterprises (SMEs): Barriers and Enablers*. Sustainability. Available at: <https://www.mdpi.com/2071-1050/8/11/1212>
- 2 Flash Eurobarometer 441 – TNS Political & Social (2016). *European SMEs and the Circular Economy*. European Commission. Available at: http://ec.europa.eu/environment/green-growth/docs/fl_441_sum_en.pdf
- 3 Circle Economy and WBCSD (2018). *Scaling the Circular Built Environment – Pathways for Business and Government*. Available at: https://www.circle-economy.com/wp-content/uploads/2018/12/WBCSD_Scaling-the-circular-built-environment.pdf
- 4 Ellen MacArthur Foundation and the McKinsey Center for Business and Environment. (2015). *Growth Within: a Circular Economy Vision for a Competitive Europe*. Available at: <https://www.ellenmacarthurfoundation.org/publications/growth-within-a-circular-economy-vision-for-a-competitive-europe>
- 5 Circle Economy and WBCSD (2018). *Scaling the Circular Built Environment – Pathways for Business and Government*. Available at: https://www.circle-economy.com/wp-content/uploads/2018/12/WBCSD_Scaling-the-circular-built-environment.pdf
- 6 Ellen MacArthur Foundation and the McKinsey Center for Business and Environment. (2015). *Growth Within: a Circular Economy Vision for a Competitive Europe*. Available at: <https://www.ellenmacarthurfoundation.org/publications/growth-within-a-circular-economy-vision-for-a-competitive-europe>
- 7 Circle Economy and WBCSD (2018). *Scaling the Circular Built Environment – Pathways for Business and Government*. Available at: https://www.circle-economy.com/wp-content/uploads/2018/12/WBCSD_Scaling-the-circular-built-environment.pdf
- 8 Arup and Ellen MacArthur Foundation. (2018). *First Steps towards a Circular Built Environment*. Available at: <https://www.arup.com/perspectives/publications/research/section/first-steps-towards-a-circular-built-environment>
- 9 Accenture. (2016). *From Rhetoric to Reality: the Circular Economy Index of Dutch Businesses*. Available at: <https://mvo.nederland.nl/sites/default/files/media/Circular%20Economy%20Index%202016.pdf>
- 10 Adams, K. et al. (2016). *Circular Economy in Construction: current Awareness, Challenges and Enablers*. Waste and Resource Management. Available at: https://www.researchgate.net/publication/313872330_Circular_economy_in_construction_current_awareness_challenges_and_enablers
- 11 UPS and Greenbiz. (2016). *The Growth of the Circular Economy*. Available at: https://sustainability.ups.com/media/UPS_GreenBiz_Whitepaper.pdf
- 12 Arup and Ellen MacArthur Foundation. (2018). *First Steps towards a Circular Built Environment*. Available at: [https://www.arup.com/perspectives/publications/research/section/first-steps-towards-a-circular-built-environment?query=first steps towards](https://www.arup.com/perspectives/publications/research/section/first-steps-towards-a-circular-built-environment?query=first%20steps%20towards)
- 13 Het Groene Brein. (2016). *What are the Barriers in... current Policy and Legislation?* Available at: <https://kenniskaarten.hetgroenebrein.nl/en/knowledge-map-circular-economy/current-policy-and-legislation/>
- 14 Adams, K. et al. (2016). *Circular Economy in Construction: current Awareness, Challenges and Enablers*. Waste and Resource Management. Available at: https://www.researchgate.net/publication/313872330_Circular_economy_in_construction_current_awareness_challenges_and_enablers
- 15 Accenture. (2016). *From Rhetoric to Reality: the Circular Economy Index of Dutch Businesses*. Available at: <https://mvo.nederland.nl/sites/default/files/media/Circular%20Economy%20Index%202016.pdf>
- 16 UPS and Greenbiz. (2016). *The Growth of the Circular Economy*. Available at: https://sustainability.ups.com/media/UPS_GreenBiz_Whitepaper.pdf
- 17 Circle Economy and WBCSD (2018). *Scaling the Circular Built Environment – Pathways for Business and Government*. Available at: https://www.circle-economy.com/wp-content/uploads/2018/12/WBCSD_Scaling-the-circular-built-environment.pdf

- 18 ING Economics Department (2015). *Rethinking finance in a circular economy*. Available at: <https://www.ing.com/Newsroom/All-news/Features/Circular-economy-challenges-financial-business-models.htm>
- 19 Accenture Strategy. (2014). *Circular Advantage: Innovative Business Models and Technologies to Create Value in a World without Limits to Growth*. Available at: https://www.accenture.com/t20150523T053139_w_/us-en/_acnmedia/Accenture/Conversion-Assets/DotCom/Documents/Global/PDF/Strategy_6/Accenture-Circular-Advantage-Innovative-Business-Models-Technologies-Value-Growth.pdf
- 20 ABN AMRO and Circle Economy. (2017). *A Future-proof Built Environment - Putting Circular Business Models into Practice*. Available at: <https://www.circle-economy.com/case/a-future-proof-built-environment>
- 21 European Commission. (2018). *Circular Economy - Implementation of the Circular Economy Action Plan*. Available at: http://ec.europa.eu/environment/circular-economy/index_en.htm
- 22 European Commission. (2018). *Waste: Construction and Demolition Waste (CDW)*. Available at: http://ec.europa.eu/environment/waste/construction_demolition.htm
- 23 Doherty, J. (2018). *Circular Economy Package officially published. Let's Recycle*. Available at: <https://www.letsrecycle.com/news/latest-news/circular-economy-officially-published/>
- 24 State of Green. (2018). *New national Danish Strategy for Circular Economy*. Available at: <https://stateofgreen.com/en/partners/state-of-green/news/new-national-danish-strategy-for-circular-economy/>
- 25 Rijksoverheid. (2016). *Circulaire Economie*. Available at: <https://www.rijksoverheid.nl/binaries/rijksoverheid/documenten/rapporten/2016/09/14/circulaire-economie/Circulaire+Economie+samenvatting+NL.PDF>
- 26 Netherlands Enterprise Agency ("RVO"). (2018). *MilieuPrestatie Gebouwen - MPG*. Available at: <https://www.rvo.nl/onderwerpen/duurzaam-ondernemen/gebouwen/wetten-en-regels-gebouwen/nieuwbouw/milieuprestatie-gebouwen>
- 27 Netherlands Enterprise Agency ("RVO"). (2018). *MIA (Environmental investment rebate) and Vamil (Arbitrary depreciation of environmental investments)*. Available at: <https://english.rvo.nl/subsidies-programmes/mia-environmental-investment-rebate-and-vamil-arbitrary-depreciation-environmental-investments>
- 28 Orange, R. (2016). *Waste not want not: Sweden to give Tax Breaks for Repairs*. *The Guardian*. Available at: <https://www.theguardian.com/world/2016/sep/19/waste-not-want-not-sweden-tax-breaks-repairs>
- 29 Seely, A. (2009). *Landfill Tax: Introduction & early History*. Available at: <https://researchbriefings.parliament.uk/ResearchBriefing/Summary/SN00237>
- 30 Ernst & Young. (2016). *Exploration of the Role of Extended Producer Responsibility for the Circular Economy in the Netherlands*. Available at: [https://www.ey.com/Publication/vwLUAssets/ey-exploration-role-extended-producer-responsibility-for-circular-economy-netherlands/\\$FILE/ey-exploration-role-extended-producer-responsibility-for-circular-economy-netherlands.pdf](https://www.ey.com/Publication/vwLUAssets/ey-exploration-role-extended-producer-responsibility-for-circular-economy-netherlands/$FILE/ey-exploration-role-extended-producer-responsibility-for-circular-economy-netherlands.pdf)
- 31 Wolde, ten, A. (2015). *Solution for Re-assessing Waste Management and the Circular Economy*. *Global Economic Symposium*. Available at: <https://www.global-economic-symposium.org/knowledgebase/re-assessing-waste-management-and-the-circular-economy/solutions/solution.2016-07-06.6079158669>
- 32 Cole, R. (2017). *European Countries urged to use Economic Incentives in next Step towards Circular Economy*. Available at: <https://resource.co/article/european-countries-urged-use-economic-incentives-next-step-towards-circular-economy-11981>
- 33 ING Economics Department (2017). *Circular Construction: Opportunities for Demolishers and Wholesalers*. Available at: https://www.ing.nl/media/ING_EBZ_Circular-construction_Opportunities-for-demolishers-and-wholesalers_juni-2017_tcm162-127568.pdf
- 34 Gabbatiss, J. (2017). *Sand Mafias and Vanishing Islands: how the World is dealing with the Global Sand Shortage*. Available at: https://www.independent.co.uk/news/long_reads/sand-shortage-world-how-deal-solve-issue-raw-materials-supplies-glass-electronics-concrete-a8093721.html
- 35 ING Economics Department (2018). *Afnemende Groei Bouwproductie*. Available at: <https://www.ing.nl/zakelijk/kennis-over-de-economie/uw-sector/building-and-construction/circulair-bouwen.html>
- 36 Urban Mining Collective. (2018). *Urban Mining Collective*. Available at: <http://urbanminingcollective.nl/>
- 37 Excess Materials Exchange. (2018). *What we Offer*. Available at: <http://excessmaterialsexchange.com/>
- 38 Circle Economy et al. (2019). *Building Value; a Pathway to Circular Construction Finance*. Available at: <http://www.circle-economy.com/Building-Value>

- 39 European Commission. (2014). *Overcoming the split incentive barrier in the building sector*. Available at: http://publications.jrc.ec.europa.eu/repository/bitstream/JRC90407/2014_jrc_sci_pol_rep_cov_template_online_final.pdf
- 40 Transitieteam. (2018). *Transitieagenda Circulaire Bouweconomie*. Rijksoverheid. Available at: <https://www.rijksoverheid.nl/documenten/rapporten/2018/01/15/bijlage-4-transitieagenda-bouw>
- 41 Dura Vermeer. (2018). *Gemeente Katwijk opent ons Eerste Project van de Circulaire Weg*. Available at: <https://www.duravermeer.nl/nieuws/gemeente-katwijk-opent-ons-eerste-project-van-de-circulaire-weg>
- 42 Volker Wessels. (2018). *Nederland krijgt in 2018 eerste Circulaire Viaduct*. Available at: <https://www.volkerwessels.com/nl/nieuws/detail/nederland-krijgt-in-2018-eerste-circulaire-viaduct>
- 43 Circle Economy et al. (2019). *Building Value; a Pathway to Circular Construction Finance*. Available at: <http://www.circle-economy.com/Building-Value>
- 44 Park 20|20. (2018). *20 Redenen waarom Bedrijven hebben gekozen voor Park 20|20*. Available at: <http://www.park2020.com/#flexibility>
- 45 Circle Economy et al. (2018). *A Practical Approach to Circular Buildings*. Available at: <https://www.circle-economy.com/a-practical-approach-to-circular-buildings>
- 46 Platform 31. (n.d.). *Evaluatie Solids*. Available at: <https://www.platform31.nl/publicaties/evaluatie-solids>
- 47 Rebel and CE Delft. (2018). *Circulair werken, wat kost dat eigenlijk?: een eerste Verkenning van Maatschappelijke Kosten en Baten van circulair werken bij RWS*. Ministerie van Infrastructuur en Rijkswaterstaat. Available at: <http://publicaties.miniennm.nl/documenten/verkenning-kosten-en-baten-circulair-werken-een-eerste-verkenning-van-maatschappelijke-kosten-en-baten-van-circulair-werken-bij-rws>
- 48 Ellen MacArthur Foundation and the McKinsey Center for Business and Environment. (2015). *Growth Within: a Circular Economy Vision for a Competitive Europe*. Available at: <https://www.ellenmacarthurfoundation.org/publications/growth-within-a-circular-economy-vision-for-a-competitive-europe>
- 49 Excess Materials Exchange. (2018). *What we Offer*. Available at: <http://excessmaterialsexchange.com/>
- 50 World Economic Forum and Ellen MacArthur Foundation. (2017). *The New Plastics Economy – catalysing Action*. Available at: <http://www.ellenmacarthurfoundation.org/publications>
- 51 ING Economics Department (2017). *Circular Construction: Opportunities for Demolishers and Wholesalers. Circulair Bouwen*. Available at: https://www.ing.nl/media/ING_EBZ_Circularzakelijk/kennis-over-de-economie/uw-sector/building-and-construction_Opportunities-for-demolishers-and-wholesalers_juni-2017_tcm162-127568.pdf/circulair-bouwen.html
- 52 ING Economics Department (2017). *Circular Construction: Opportunities for Demolishers and Wholesalers. Circulair Bouwen*. Available at: https://www.ing.nl/media/ING_EBZ_Circularzakelijk/kennis-over-de-economie/uw-sector/building-and-construction_Opportunities-for-demolishers-and-wholesalers_juni-2017_tcm162-127568.pdf/circulair-bouwen.html
- 53 UKGBC. (2018). *Advancing Net Zero*. Available at: <https://www.ukgbc.org/ukgbc-work/advancing-net-zero/>
- 54 MVO Nederland. (2018). *Bouwsector kiest onherroepelijk voor de Toekomst: 4 Ministeries en 50 Bouwbedrijven tekenen Betonakkoord o.l.v. MVO Nederland*. Available at: <https://mvonederland.nl/nieuws/bouwsector-kiest-onherroepelijk-voor-de-toekomst-4-ministeries-en-50-bouwbedrijven-tekenen>
- 55 Transitieteam. (2018). *Transitieagenda Circulaire Bouweconomie*. Rijksoverheid. Available at: <https://www.rijksoverheid.nl/documenten/rapporten/2018/01/15/bijlage-4-transitieagenda-bouw>
- 56 ING Economics Department (2018). *Afnemende groei Bouwproductie*. Available at: <https://www.ing.nl/zakelijk/kennis-over-de-economie/uw-sector/outlook/bouw.html>