REPORT | CONCRETE VALUE CHAIN

Living Lab Concretely Circular
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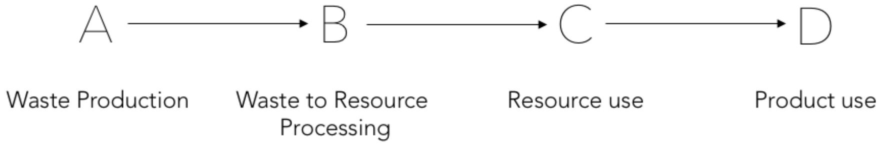
1 INTRODUCTION

Concrete waste is the largest waste stream in the MRA, 35% of construction and demolition waste is made up of concrete debris and 32 % is mixed debris, which also contains concrete waste (TNO & EIB, 2018). Since landfilling was forbidden in the Netherlands in 1997, close to all debris is recycled as granulate for the foundation for infrastructure, such as roads (Bakker & Hu, 2015). At the same time, concrete is also the most used material, with a total demand of almost two megatons per year in the MRA (TNO & EIB, 2018). However, a large share of the primary materials that are required for the production of concrete are imported to the Netherlands and additionally these primary materials are becoming increasingly scarce (Bakker & Hu, 2015). Due to the increased use of concrete as a building material in the past, the availability of concrete waste is increasing, whereas the demand from the infrastructural sector for concrete waste as subbase for roads is diminishing. Instead of recycling concrete waste as subbase for infrastructure, it can also be used as aggregate in new concrete, replacing some of those increasingly scarce primary materials. Currently only 2% of concrete waste is applied in this way (Netwerk Betonketen, 2014). There is thus a large potential for increasing this share. However, the demand for new concrete is much higher than the supply of concrete waste (TNO & EIB, 2018). Thus, even when maximally recycling concrete waste as an aggregate in new concrete, it cannot cover the entire demand for aggregate, and the use of primary materials will remain necessary, or other alternatives have to be found. An in-depth understanding of the concrete sector is required in order to identify the main impact points for increasing the share of recycled concrete waste in new concrete. This report therefore sets out to firstly analyse the current concrete sector and secondly determining what the key enablers and barriers are to increasing the circularity of concrete. It therefore asks the question 'What are enablers and barriers for increasing the circularity of the concrete value chain in the MRA?'.

In order to analyse the concrete sector, this report is based on a value chain framework that was set up priory and is shortly presented in the following section. Information to fill in the value chain framework is collected through desk research of existing research and reports, but also of websites, guidelines, norms and policy documents. Interviews with representatives of each of the steps of the value chain of concrete are held in order to fill potential data gaps. Please find a complete list of interviewees in Appendix A. Findings from a workshop about enablers and barriers of circularity in the concrete chain are included in the analysis. The report aims at providing a comprehensive overview of the current concrete sector in the MRA and highlighting the key barriers and enablers of a transition to a circular approach to concrete waste.

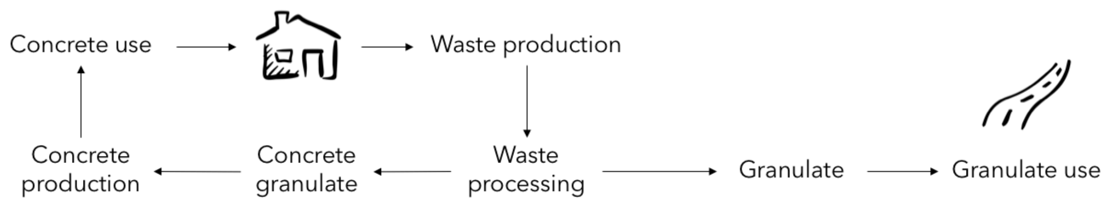
2 VALUE CHAIN FRAMEWORK

This report applies a value chain framework as analytical lens, which allows for an overview as well as an in-depth understanding of the concrete sector. Value chains describe how value is created along material flows, taking into account the interplay of the actors and their stakes, the economic value of the material, activities that take place as well as broader socio-economic and environmental factors. The value chain thus consists of a quantitative dimension, which is the material flow through space, as well as a qualitative dimension, which describes the actors that are connected to each step of the value chain, as well as their value creating activities and their interests. The value chain has four main steps, which are waste production, waste to resource processing, resource use and product use (see figure below).



3 CONCRETE VALUE CHAIN

This report identifies four steps of the value chain of concrete waste, which includes the concrete waste production, processing of concrete waste, concrete production and the use of granulate, and finally concrete use. The figure below visualises how these steps of the value chain are connected. Concrete waste is produced through the demolition, deconstruction or refurbishment of the built environment, this concrete waste is then processed to either concrete granulate or mixed granulate. Mixed granulate is used as subbase for roads. Concrete granulate can replace aggregate of primary materials in the production of concrete. The concrete is eventually used in the built environment. The individual steps of the concrete value chain are discussed in the following section.



STEP A - CONCRETE WASTE PRODUCTION

Step A of the concrete chain is the production of concrete waste through demolition or increasingly through deconstruction for the increased recovery of materials. This process is generally done by demolition companies. After demolition, they either sell the materials as products, or they pay for the waste to be processed. Demolition companies are private companies that are hired for demolition projects on a relatively regional scale.

Demolition projects might create construction and demolition waste, which is an unseparated and thus mixed streams of all kinds of materials (see interview findings). If separation does take place then the materials are usually separated into debris and other streams, such as plastic or wood (see interview findings). The demolition process can be divided in two stages, which result in different types of composition of debris (see interview findings). In the first stage the upper construction is removed, which yields mixed debris. In the second stage the foundation is removed, which is made of concrete and therefore yields purer concrete debris. There are a number of technological, practical and economic constraints to higher rates of separation of demolitions (see interview findings). Firstly, in the past buildings were not constructed for deconstruction and technologies are not yet available to separate these materials during demolition. Secondly, demolition projects often take place in a confined space and this limited space does not allow for extensive separation. Thirdly, Time constraints of demolition projects limit the possibility to separate more. And lastly, if it is a small demolition project which yields low amount of waste, then separation becomes unprofitable.

Nonetheless, source separation is becoming increasingly common, which means higher rates of separation (see interview findings). An increasing number of demolition companies that separate at the source in order to create a purer waste stream. About 20% of demolition projects are today deconstructed for the reuse of the freed materials. Especially municipalities increasingly require this approach in their tenders. Higher costs can in part be compensated through selling of the freed materials. The remaining costs of deconstruction for reuse mean a price increase of about 15-20%.

STEP B - CONCRETE WASTE PROCESSING

Step B of the concrete chain concerns the processing of concrete waste. This is usually done by recycling companies, unless demolition companies process debris to granulate on site and sell the resulting product directly. Recycling companies are paid for receiving waste, they separate and process the waste and subsequently sell the resulting product to other parties. Recycling companies are private companies. They are organised on a larger scale than demolition companies, however, construction and demolition waste in particular is organised regionally, due to its weight.

Debris from demolition projects is sometimes broken to mixed granulate on site, and sold directly to infrastructure companies (see interview findings). The mixed granulate produced this way automatically contains at least 50% concrete and often more, because of the relatively low rate of separation. Producing concrete granulate for the production of mortar on site is usually not profitable, because smaller fractions (0-4) will still have to be transported elsewhere, which increases the costs of transportation as opposed to producing granulate that can be recycled as foundations (see interview findings). The production of granulate for this purpose makes for a profitable business case with a steady demand. The higher the share of concrete in the granulate, the better it can be sold (see interview findings).

Waste producers pay a differing amount of money for delivering waste at recycling companies. As a rule of thumb, the more separated the delivered waste is, the lower the costs of the delivery (see interview findings). Thus, delivering construction and demolition waste, which is a very mixed stream is more expensive than delivering debris (approximately 90 euro as opposed to 4 euro). At the recycling company it is determined whether a delivery of debris contains pure concrete through visual inspection. These deliveries are kept apart and are processed to concrete granulate. Most delivered concrete waste is part of mixed streams and thus processed into mixed granulate. However, some recycling companies apply advanced separation technologies, which enables them to retrieve a larger and purer stream of concrete waste, than only through visual inspection, such as for example Paro in Amsterdam or Twee "R" in Twente.

In order to produce mixed granulate the debris only requires to be broken with a breaker (see interview findings). However, for concrete granulate additional processing steps are required, because there are higher requirements for the quality for concrete granulate as opposed to mixed granulate (see interview findings). These include sieving in order to filter out the fraction that is required for the production of concrete (usually 4/16, 4/22 or 4/32). Fractions that are larger can be broken again, whereas smaller fractions (0/4) cannot be applied and are therefore used in mixed granulate. However, innovative technologies increasingly enable the use of the 0/4 fraction (Wassink, 2017).

Concrete granulate has to consist for at least 90% of broken concrete (BRBS Recycling, n.d.). Mixed granulate contains at least 50% concrete, the remaining share consists mainly of debris from masonry and bricks (BRBS Recycling, n.d.). The non-concrete share of mixed granulate has only a small number of use cases and low structural properties (BRBS Recycling, n.d.). By mixing it with concrete (or by simply not removing the concrete fraction) the properties of the resulting mixed granulate become similar to those of concrete granulate (Bodemrichtlijn, n.d.). However, mixed granulate cannot be reused in new concrete (see interview findings). One of the reasons for the production of mixed granulate is the prevention of a surplus of lower quality granulate of masonry and bricks (see interview findings). The produced granulates are certified by VROM as a product and therefore have no attached EURAL-code (Bodemrichtlijn, n.d.). Both types of granulate are sold, either to concrete producers or to companies that do infrastructural works. The price of the granulate can fluctuate per day and is determined by factors such as transport, processing, availability of the granulate, which depends on the number and type of demolition projects in the region, but also availability of the primary materials (Bakker & Hu, 2015, see interview findings).

There is a high demand for mixed granulate, and the more concrete the mixed granulate contains, the higher its market value is (see interview findings). The production of concrete granulate does not generate additional value for many recycling companies (see interview findings). However, companies that have the recycling infrastructure for concrete waste in place and/or produce concrete themselves can make more profit with concrete granulate than with mixed granulate (see interview findings).

STEP C - CONCRETE PRODUCTION AND USE OF MIXED GRANULATE

Step C of the concrete chain is the production of concrete with concrete granulate or the use of mixed granulate as subbase for infrastructure. Concrete producers replace some of the primary aggregate materials with concrete granulate for either the production of concrete mortar or concrete prefab elements. There thus are two types of concrete producing industries: the prefab concrete industry (approximately 40%) and the concrete mortar industry (approximately 60%) (Betonhuis, n.d. b).

Conventional concrete contains three main ingredients; which are cement (one quarter of the concrete) and sand and gravel as aggregate (three quarters of the concrete), and water, which acts as a binder (Betonhuis, n.d. a). The aggregate has to consist of inert material. It is common to use a surplus of cement in order to let the concrete harden faster (see interview findings).

Concrete producers buy certified concrete granulate from recycling companies. Depending on the application of the concrete, additional requirements for the concrete granulate are necessary, because the quality of the concrete granulate that replaces the sand and gravel can influence the final quality of the concrete (see interview findings). The more concrete granulate is applied in new concrete, the cleaner the material has to be. These additional requirements concern the pollution of the granulate, especially pollution with materials that can float in the wet concrete are problematic, such as wood and plastic. A too high share of bricks and masonry in the concrete granulate are also problematic due to subsequent water management. Currently, the recycling norm is at a maximum of 30% concrete granulate as a replacement of sand and gravel, even though higher percentages of replacement are technically possible (see interview findings). Shares that are higher than these 30% are applied outside the norm, but are tested on the norm (see interview findings). This is done in agreement with the customer, and the responsibility also lies with the customer.

Most mixed granulate is used as a subbase for roads. Mixed granulate has a higher constructional value than e.g. sand, which also means the upper layers can be thinner and thus use less material (see interview findings).

STEP D - USE OF CONCRETE

In this step either the concrete containing concrete granulate. Contractors or implementors thus use the concrete for built structures. The largest demand for concrete is from the utility sector (41%) and the residential sector (34%) (TNO & EIB, 2018). The remainder of the demand is for infrastructure and sewage.

The request for concrete by the customer is leading for the composition of the concrete. The price of concrete lies between 85 and 140 euro per m^3, depending on its final application. The building owner can receive a Vamil subsidy of maximally 50 euro per m^3 if the applied concrete that contains 30% concrete granulate according to the certificate 'Sustainable concrete' of the Concrete Sustainability Council (RVO, 2019). Furthermore, using CG as replacement for primary materials is one of the factors that enables the building owner to receive sustainability certificates, such as the BREAAM certificate for their building. This increases the market value of the building. These two factors, subsidy and certificates, currently act as financial motivation for applying concrete granulate.

4 KEY ENABLERS AND BARRIERS

The analysis of the value chain of concrete as presented above lays the basis for identifying overarching enablers and barriers for increasing the circularity of the concrete chain. They were identified through the careful analysis of literature, documents, websites and the interviews and subsequently confirmed during a workshop about circular concrete. In this section these overarching barriers and enablers are presented and discussed. In more general terms the relation between barriers and enablers can be described as a substitutive one, thus a barrier that is addressed and thus removed becomes an enabler.

PUBLIC SECTOR	CONCRETE CHAIN	OVERARCHING FACTORS
Rules and regulations	Alignment concrete chain	Technological innovation
Public procurement	Guidelines and deals	Geographical scale
Norms and certificates	Path dependency	Time and effort

RULES AND REGULATIONS

Governmental regulations offer security and safety, however, while doing so they might restrict flexibility. In the concrete sector there are increasingly many innovative technologies, which cannot be applied due to rigid regulations. Innovative actors in the concrete sector have to adapt their new technologies, processes and approaches to older regulations. Additionally, every municipality's rules and regulations differ, which additionally complicates the process of innovation and thus increased circularity of the concrete chain. The interviews and workshop yielded that many actors that are part of the concrete chain therefore see a large role for governments to impact the circularity of the concrete chain. Therefore, in order to stimulate recycling of concrete waste in new concrete regulations need adapted to the possibilities of new technologies as well as aligned between different regions. However, a certain caution is required in order not to trade off too much of the much-needed security and safety. Additionally, recycling practices that increase circularity can be stimulated through subsidy, such as the Vamil subsidy for building owners, which applies when the concrete used in the building has the 'Sustainable concrete' certificate.

PUBLIC PROCUREMENT

The largest share of new concrete is used in utility and infrastructure (TNO & EIB, 2018). This illustrates that much of the construction that takes place with concrete is commissioned by a governmental body. Public procurement thus plays a major role in the concrete sector and largely influences which types of concrete are used. The government can contribute to optimising the recycling of construction waste by prescribing the use of concrete granulate in new construction projects and selecting demolition companies based on whether the practice source separation. By having a clear vision and ambition public procurement could lead to an increasingly cooperative concrete chain with actors and processes that are well aligned.

NORMS AND CERTIFICATES

Quality standards that concrete granulate as replacement for sand and gravel has to fulfil are determined in the 'BRBS / VOBN Productinformatieblad Betongranulaat 4/32'. These standards conform with the CUR-recommendations 112 and NEN 5905 (which is the Dutch interpretation of NEN-EN 12620 Aggregate for concrete). According to NEN 5905 CG has to consist for more than 90% of broken concrete. The concrete granulate requires a KOMO-product certificate which contains the environmental, hygienic and technical specifications, and has to be tested according to BRL 2506. CUR advice 112 currently allows for 30% concrete granulate as replacement for primary aggregate, but also specifies that higher percentages are possible, with adapted calculations (Betonhuis, n.d. c). Technically a much higher percentage than the current 30% norm for replacing sand and gravel with concrete granulate are possible. Currently, higher percentages are sometimes applied outside of the norm, but with mutual consent of the concrete producers and their clients. This illustrates that a much higher percentage of recycling is theoretically possible. However, norms and certificates, as e.g. certificates for the quality of granulates, are made by the sector itself, which is not always equally open to change. Therefore, these norms and certificates are only limitedly progressive and do not lead to meaningful change. Further, they often do not match the requirements of the subsequent users (as is the case with concrete granulate).

ALIGNMENT CONCRETE CHAIN

All actors in the concrete chain have differing activities and thus also interests (workshop findings). Additionally, while some are quite conservative and work in the traditional way, others are innovative and work more progressively (see interview findings). Therefore, they do not have a shared vision or ambitions. For making meaningful change towards a more circular concrete chain alignment of the concrete chain is essential. In order to do so all actors need to become aware of the requirements at the end of the chain and thus need to establish a shared vision and ambition (workshop findings). For this insight and overview of the different activities, ambitions and visions is required. Specific points of action are required to realise such an alignment, as is it essential to increasing the circularity of the concrete sector. As until now such an approach is lacking, even though many actors point to the gap in the concrete chain as a particular barrier for achieving more circularity. Concrete deals and actions are required, including the sharing of knowledge and experience and aligning the visions and ambitions of the different actors. Hereby an essential tool is the sharing of knowledge and experience between the different actors in order to be able to follow a shared vision and ambitions (workshop findings).

GUIDELINES AND DEALS

Within the concrete sector there are already a few guidelines and deals for its increased circularity, including the earlier 'Green Deal Beton' and the later 'Betonakkoord'. However, these are not considered specific enough as they do not suggest a concrete course of action. This is even more applicable for the 'Green Deal Beton' than for the 'Betonakkoord' (Verlouw, 2018). Additionally, critics as well as some actors from the concrete sector find them not sufficiently ambitious (NRC, 2018, see interview findings). They argue that the concrete sector is less ambitious than the Paris climate accord, also because it is not directly linked with this agreement (NRC, 2018). Others argue that the deal is too ambitious, leaving the goals specified in it unattainable. However, supporters point out that ambitious goals are necessary for change (Cobouw, 2017).

PATH DEPENDENCY

Many concrete producers are linked to the only cement company in the Netherlands, called ENCI, whose mother company is Heidelberg Cement. These concrete producers are dependent on the cement industry for their primary materials. Therefore, the cement industry influences the recipes of concrete. Since the cement industry is in need of a market for their cement products, it does not want desire a change of the concrete industry. However, concrete producers that are not linked to ENCI are more open for change (see interview findings). This way the concrete sector is split in two groups: the ones that work in the traditional/conventional way (and are linked to the cement industry) and those that are willing to change (and are independent of the cement industry). Due to the dependence on the cement industry the former group of concrete producers is quite path dependent, and therefore less able or eager to change towards an increased circularity of the concrete sector.

TECHNOLOGICAL INNOVATION

Eventually primary materials become so scarce that concrete waste has to be reused in new concrete (see interview findings). The availability of concrete waste does not cover the demand for new concrete. Therefore, the use of innovations that enable a replacement of primary aggregate through concrete granulate significantly higher than 30% is questionable. A target rate for the use of concrete granulate in all concrete structures may prove more useful than single projects that replace primary materials completely by secondary materials.

GEOGRAPHICAL SCALE

Transport and processing of concrete waste to concrete granulate can result in the environmental impact of concrete granulate being larger than that of primary materials (see interview findings). Moreover, transportation of these heavy materials is expensive (see interview findings). Therefore, the transport distances between the different activities of the concrete chain need to be as short as possible. Match-making between demand and supply on a local scale is essential to environmental and economic gain. This can be achieved by providing several functions in one location and through intensive cooperation between value chain actors (workshop findings). This process of matchmaking can be facilitated by big data, as for example in the Cinderela process, so as to identify opportunities for local and direct reuse of concrete (workshop findings).

TIME AND EFFORT

In order to develop new technologies, processes and collaborations actors of the value chain need to invest time and effort (and thus money). However, when time is available, then money is short, and when money is available then time is short (workshop findings). Due to this trade-off actors of the concrete chain are unable to invest as much time and effort as they would like in order to increase the circularity of the concrete chain.

5 REFLECTION AND DISCUSSION

The recycling of concrete waste has large potential for improvement, and the overview and enablers and barriers presented in this report can contribute to the fulfilment of this potential. However, in order to truly mitigate the adverse effects of the concrete industry, additional approaches to this waste-based recycling approach are required. Three main additional interventions emerged from this research, some of which are more radical than increasing the rate of high value recycling. Firstly, the direct reuse of structures would reduce a. the production of waste and b. the need to build new structures. However, this type of reuse is currently inhibited by the costs of redevelopment being higher than the costs of demolition and renewed construction. This is the cause of materials being relatively cheap as opposed to relatively expensive labour. Reversing this balance might contribute to more sustainable solutions for the construction and demolition sector. Secondly, the highest share of CO_2 comes the production of cement (CE Delft, 2014). Finding alternatives or at least mitigating the CO_2 production of cement is paramount for increasing the sustainability of concrete. Last, but not least, rethinking the demand for construction and finding a way to build less would certainly reduce the adverse impacts of concrete. In order to so greater insight is required in the dynamics that underlie the relentless need for construction.

REFERENCES

Bakker, M., & Hu, M. (2015). Closed-loop economy: case of concrete in the Netherlands. *Delft University of Technology, Delft, Netherlands*.

Betonhuis (n.d. a). Beton als bouwmateriaal. Retrieved on 20 March 2019 from http://www.cementenbeton.nl/materiaal

Betonhuis (n.d. b). Marktinformatie Beton. Retrieved on 20 March 2019 from http://www.cementenbeton.nl/marktinformatie/betonmarkt

Betonhuis (n.d. c). Beton en betongranulaat. Retrieved on 20 March 2019 from http://betonhuis-betonmortel.nl/duurzaam-beton/duurzaam-bouwen-met-beton/beton-en-betongranulaat

Betonhuis (n.d. d). Grenzen aan betongranulaat. Retrieved on 20 March 2019 from http://www.cementenbeton.nl/publicaties/agrabeton/agrabeton-artikelen/grenzen-aan-betongranulaat

Bijleveld, M., Bergsma, G., & van Lieshout, M. (2013). Milieu-impact van betongebruik in de Nederlandse bouw. *Delft: CE Delft Report*.

Bodemrichtlijn (n.d.). Puin en granulaten. Retrieved on 20 March 2019 from https://www.bodemrichtlijn.nl/Bibliotheek/bouwstoffen-en-afvalstoffen/puin-en-granulaten

BRBS Recycling (n.d.). Informatieblad Toepassingsmogelijkheden Recyclinggranulaten. Retrieved on 20 March 2019 from https://www.cementbouw.nl/cms/wp-content/uploads/2018/12/Infoblad-toepassingsmogelijkheden-recyclinggranulaat_V2.pdf

Cobouw (2017). Kritiek op het betonakkoord: geluid van een andere generatie. Retrieved on 24 March 2019 from https://www.cobouw.nl/bouwbreed/nieuws/2017/07/kritiek-op-betonakkoord-geluid-van-een-andere-generatie-101250569

Rijksdienst voor ondernemend Nederland (2019). Duurzaam (beton)product met ten minste 30% gerecycled content. Retrieved on 20 March 2019 from https://www.rvo.nl/subsidies-regelingen/milieulijst-en-energielijst/miavamil/duurzaam-betonproduct-met-ten-minste-30-gerecycled-content

Van Santen, H. (2018). Akkoord: Vanaf 2030 alle beton hergebruiken. Retrieved on 20 March 2019 from https://www.nrc.nl/nieuws/2018/07/10/akkoord-vanaf-2030-alle-beton-hergebruiken-a1609491

Verlouw, C. (2018). Betonakkoord moet de sector verduurzamen, maar dat is nog niet zo makkelijk. Retrieved on 24 March 2019 from https://www.trouw.nl/groen/betonakkoord-moet-de-sector-verduurzamen-maar-dat-is-nog-niet-zo-makkelijk~a3dedb52/

Wassink, J. (2017). The last step in concrete recycling. Retrieved on 24 March 2019 from https://www.delta.tudelft.nl/article/last-step-concrete-recycling

APPENDICES

APPENDIX A – LIST OF INTERVIEWEES & SUMMARY INTERVIEW GUIDE

Rens Groeneveld	Sortiva
Richard Giesen	Bruil
Marga & Alexander Pouw	Theo Pouw
Leonie Pijnenburg	Heijmans
René Oudt	Oudt Zwanenburg

René Oudt | Director, Oudt Zwanenburg

René Oudt owns a demolition company and is therefore is a representative of step A of the value chain. During this interview the demolition process was discussed and the barriers to increasing the sorting rate at the source. The demand for recycling granulates as a subbase for infrastructure was covered as well as the demand for circular recycling practices and the effect of these demands on demolition practices. Rules and regulation about the demolition process and recycling rates and guidelines and deals of the concrete sector were also a topic of this interview.

Rens Groeneveld | Manager Mineral Streams, Sortiva

Sortiva is a recycling company that recycles concrete waste into concrete granulate among others, and therefore this interviewee is a representative of step B of the value chain. The interview covered the processing steps of concrete waste, and the considerations of increasing recycling rates for concrete granulate that can be reused in the concrete production. Use cases of granulates and the profitability of their production were considered. The relationship to partners and their perceived stakes were discussed, as well as norms and certificates concerning concrete granulate.

Marga & Alexander Pouw | Board, Theo Pouw

Theo Pouw is a recycling company, that also produces concrete mortar. Therefore, Theo Pouw is representing two steps of the value chain, namely step B and C. During this interview the drawbacks and benefits of using concrete granulate as replacement for primary aggregate materials were discussed. Barriers and opportunities of recycling concrete in new concrete were covered, as well as the demand for concrete containing recycling granulate. The interview also covered the benefits of combining two steps of the value chain and the geographical scale of the concrete value chain.

Richard Giesen | Manager R&D Concrete Mortar, Bruil

This actor is a representative of the concrete producing industry, and therefore directly linked to step C of the value chain. In this interview the various aspects of concrete recycling and the future of concrete were discussed. The first part of the interview was about the drawbacks and benefits of using concrete granulate as replacement for primary aggregate materials. Barriers and opportunities of recycling concrete in new concrete were covered, as well as the demand for concrete containing recycling granulate. Additionally, existing regulations, norms and certificates of concrete granulate and their implications on the quality of the concrete were discussed. The second part was concerned with the future of concrete in terms of technological possibilities, but also in terms of environmental impact.

Leonie Pijnenburg | Procurement 100% Circular Concrete, Heijmans

Leonie Pijnenburg was interviewed as a representative of step D of the value chain, since Heijmans is one of the major contracting authorities in the construction sector in the Netherlands. During this interview the role of Heijmans in the concrete sector in relation to the circular economy was discussed. Heijmans strategy in working with more sustainable concrete was covered. The relevance of sustainability deals about circular concrete was talked about. Other topics included the influence of different actors, including the government, on the concrete chain and the environmental impact of circular solutions.