



Rijkswaterstaat  
Ministry of Infrastructure  
and Water Management

# The future starts now

Annual Report 2019

Impulse Programme for the Circular Economy

Rijkswaterstaat



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# The future starts now

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Impulse Programme for the Circular Economy  
Rijkswaterstaat



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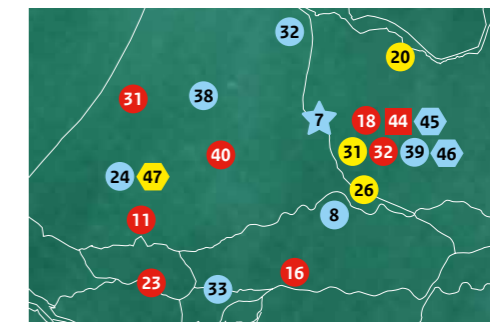
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# The future starts now

## Welcome!

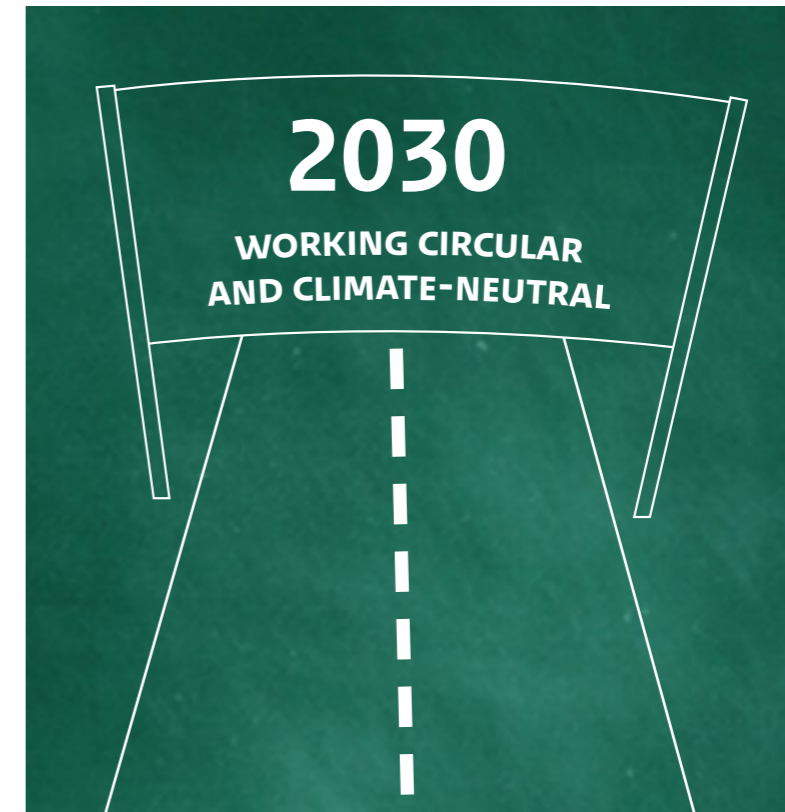
What steps has Rijkswaterstaat (executive agency of the Dutch Ministry of Infrastructure and Water Management) taken in the field of circular working in 2019? What works well and where do we need to step up our efforts? You can read everything in this annual report on the Impulse Programme for the Circular Economy. It is intended for everyone who wants to achieve something or feels that circularity is something that has to be embraced: colleagues from Rijkswaterstaat, other government agencies, research centres or private parties. New in this report is the focus on climate neutrality, i.e. the ambition to have zero impact on the climate in all our work – including that of our contractors. We want to work in a circular and climate-neutral way by 2030. Both ambitions reinforce each other. More high-quality recycling of materials, an important principle of the circular economy, means less CO<sub>2</sub> emissions and therefore less of an impact on the climate. On the other hand, working on climate neutrality stimulates the circular transition. It is therefore logical that these ambitions go hand in hand.

## Foreword

Rijkswaterstaat is constantly working on making the Netherlands safe, liveable and accessible. We integrate sustainability into all our activities. We consider a sustainable living environment to be our basis. That basis consists of three key focus areas. *Sustainable area development* in order to create a clean, green and pleasant living environment for future generations, too. A *circular economy*, in which elements, materials and raw materials are reused in the highest possible quality. And *climate neutrality*, in which CO<sub>2</sub> emission is reduced and climate change is countered.

We want to be an inspiring and enabling leader in the field of sustainability. As the largest client for infrastructural facilities in the Netherlands, we play an important role in the transition to a circular and climate-neutral infrastructure sector. Moreover, we can make a big difference in our role as a government-wide purchaser of catering and ICT, among other things.

But we cannot achieve this transition on our own. That is why we are experimenting and innovating together with our supply chain partners. We are gaining practical experience in projects, developing knowledge and are working together with other clients and market parties on the development of instruments. We also



act as launching customer to stimulate the development and upscaling of circular innovations. We are giving an impuls to climate-neutral and circular procurement by means of climate funding from the coalition agreement, the so-called Climate Envelope.

These efforts are paying off. In 2019, the focus has shifted from 'pioneering' to 'everyday' work.



An increasing number of projects apply the circular design principles and use environmental costs as an award criterion; take, for example, the dyke reinforcement project Grebbedijk, project Reevesluis, the Afsluitdijk and the A27 Houten Hooipolder.

There are more results. In the Open Learning Environment of the Bouwcampus and Rijkswaterstaat, some sixty people from all corners of the business community developed a joint vision of what is already possible and which innovations are still needed to build circular viaducts and bridges by 2030. We developed a circular approach for the major renovation and replacement (R&R) of more than 130 bridges, tunnels and locks, which will be locked into the contract award. In addition, within the platform Circulair Bouwen '23 (CB'23), a guideline has been developed with all parties to measure circularity. We're all heading in the same direction, and those involved already refer to it in practice.

There is more we are proud of. An important milestone in 2019 is that the policy ambitions have been translated into implementation. Together with fellow government agencies ProRail and the Dutch Ministry of Infrastructure and Water Management, we have developed the strategy 'Towards climate neutral and circular public infrastructure projects'. In 2020, we will work with market parties and other government bodies to develop this strategy. What are we going to do and at what pace?

This puts us on the right track. However, this is a track that we are not taking alone, but together with the supply chain. We therefore call on everyone who has anything to do with working in a circular and climate-neutral way to share insights and opportunities.

Every day we make Rijkswaterstaat more circular, together with our partners in the chain. Every day we learn to make different choices. Working in a circular way starts with the choices we make today. Focusing on the ambitious goals for the future: working in a circular and climate-neutral way by 2030. So, the future starts now.



**Cees Brandsen**  
*Managing director of the Rijkswaterstaat Water, Transport and Environment division*



**Peter Struik**  
*Managing director of the Rijkswaterstaat Sustainability and Built Environment programme*

## Contact us

Do you also want to work with circularity in your project? Then contact us via [circulair@rws.nl](mailto:circulair@rws.nl)





# Chapter 1 Working in a circular and climate- neutral way, the backgrounds

This chapter explains the importance of working in a circular and climate-neutral way, the ambitions and the approach of Rijkswaterstaat. It also outlines the political ambitions, agendas and agreements that have been made in recent years; in other words the policy context.

### Why does Rijkswaterstaat believe it is important to work in a circular and climate-neutral way?

#### Contributing to the responsible use of raw materials and CO<sub>2</sub> reduction

Rijkswaterstaat is a major consumer of asphalt, concrete, soil and sand. Sand and soil are readily available in the near future and do not run out quickly. However, we do need large quantities of these commodities, and their extraction and transport cause a lot of CO<sub>2</sub> emissions. In the case of asphalt and concrete, this mainly concerns the emissions associated with the production, construction and processing of the materials. As a national government organisation, we feel a responsibility to contribute to reducing the use of raw materials and lowering CO<sub>2</sub> emissions. After all, a clean, green and pleasant living environment is the basis of our work.

#### Major client in the infrastructure sector

As a major client commissioning public works, Rijkswaterstaat can make a difference in the transition to the circular economy. Our purchasing volumes make it interesting for the market to invest in circular solutions. Take the major replacement and renovation work on more than 130 bridges, tunnels, locks and viaducts over the next few years. This task offers great urgency and opportunities to put this circular way of working into practice and reduce the climate impact.

#### Government-wide purchaser

Not only in the infrastructure sector can we make an impact. Rijkswaterstaat is also a government-wide purchaser of five major corporate procurement

categories, including office equipment and catering. At the end of 2017, for example, a contract was signed for the supply of 100,000 'circular' government workstations.

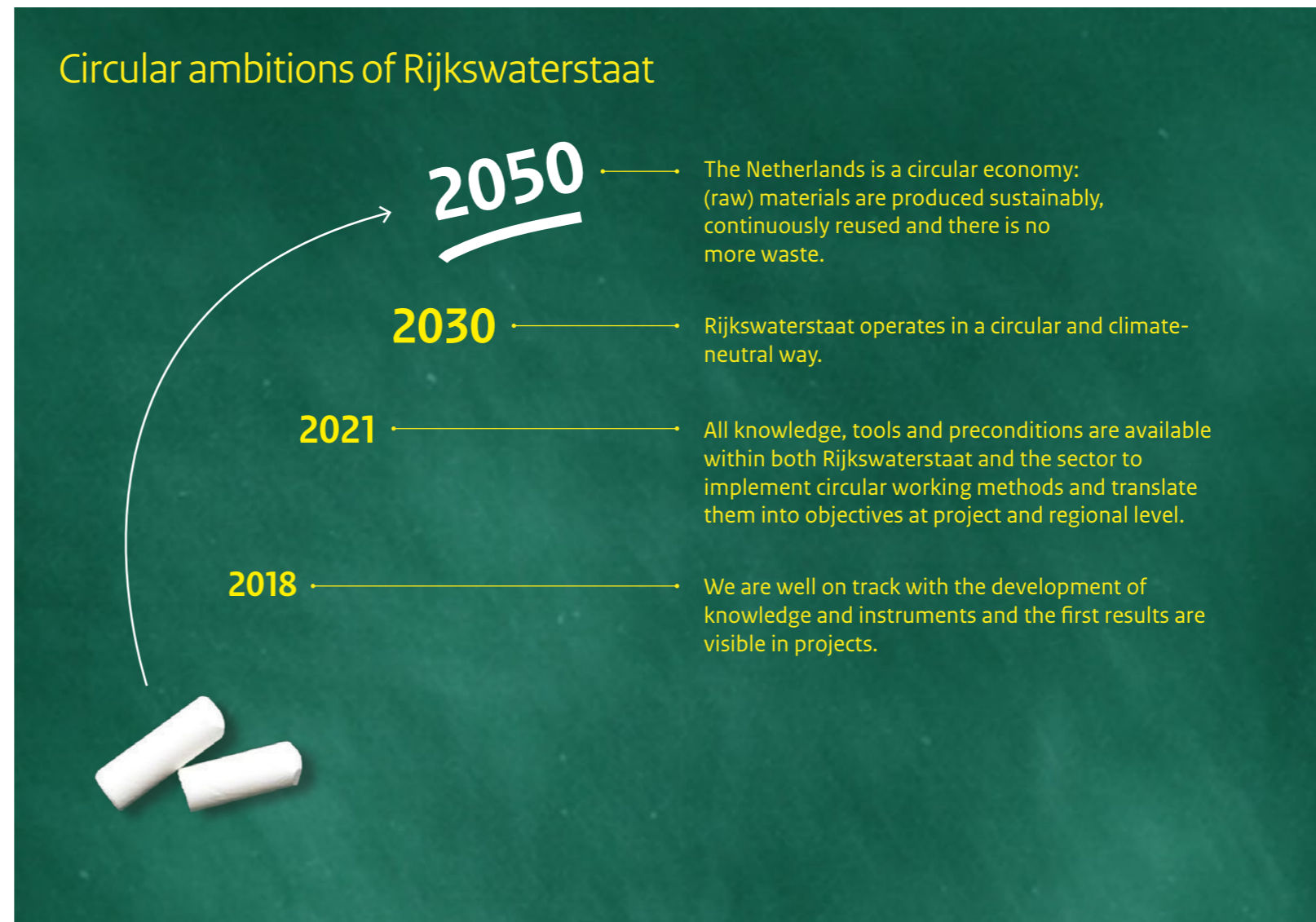
*'A contract for 100,000 circular government workstations, that's what makes a difference.'*

Ellen Hoog Antink – strategic advisor on circularity

### What ambitions and goals are we working on?

#### Nationwide: a circular economy in 2050

In 2016, the government expressed its ambition to have a circular economy by 2050. In other words: primary commodities and materials will be produced sustainably, continually reused and there will be no more waste. This has been laid down in the government-wide Circular Economy Programme. This includes an interim objective of reducing the use of primary raw materials by 50% and the CO<sub>2</sub> emission by 49% by 2030.





### Rijkswaterstaat: working in a circular and climate-neutral way by 2030

This means the following in practice:

- We consume as few primary raw materials as possible by constructing, replacing, renovating, maintaining and managing our infrastructure and physical land area, and we emit as little CO<sub>2</sub> as possible.
- We focus on the high-quality reuse of all residual flows and released materials and the preservation of natural capital.
- In our business operations our procurement is entirely circular and we use all residual flows in a high-quality manner.

### Our vision on working in a circular way

#### High-quality recycling

High-quality recycling of materials is an important part of the circular economy. This means, for example, that we reuse sections of our steel bridges that are still in good technical condition. This way, we avoid a lot of CO<sub>2</sub> emissions during transport and recycling and no new primary commodities need to be extracted. Currently, we already recycle many of our materials, but in a low-grade manner. For example, we use old concrete for road foundations, but not as a primary commodity for new concrete yet. We also waste too much. The viaducts that have been demolished in recent years, for example, have only reached their technical lifespan in 11% of the cases. This is because viaducts are not designed to be easily adapted to, for example, extra lanes. This is a waste of materials and we lose economic value.

### Storage bank full of infinitely usable raw materials

The management area of Rijkswaterstaat is becoming a storage bank full of raw materials, equipment or complete structures, which we use again and again (to a high standard). For example, we strengthen the dyke with soil released during a river-widening project, or we use sections of an old bridge again in a new bridge. In addition, we design our infrastructure to be future-proof, so that we can easily reuse individual parts of it.

### What does this transition mean?

#### A system change within the sector

Working in a circular way requires a radical system change within the sector, where we start thinking more in terms of supply chains, and from a long-term value perspective. This requires a different form of cooperation with market parties, with whom we work more creatively on solutions. It means a different way of thinking, in which we make choices based on long-term impact. And a change in our technical principles, in which we focus more on value. For example, we need circular business models, such as purchasing a service instead of a product. Material flows are organised differently to maximise value. In addition, there should be more focus on high-quality reuse of parts, objects and materials. Each party – contractor, engineering firm, processing company and raw material supplier – has a role to play in this. Many roles are also shifting. One example is the dismantling of the district office of Rijkswaterstaat in Terneuzen. The contractor did not work as a demolition company. rather as a harvesting company.



Data also plays a much greater role in the circular economy because information on materials used, construction methods and maintenance is becoming much more important.

#### A changing role for Rijkswaterstaat

The role of Rijkswaterstaat is also changing. In the transition to a circular economy, we have the following roles:

- Director of the transition: as a major purchaser and manager of infrastructure, we can accelerate the transition.
- A driving role in supply-chain cooperation: we can bring parties together to develop good climate-neutral and circular solutions, tools and preconditions that make circular construction possible.
- Implementer of the circular economy policy of the Dutch Ministry of Infrastructure and Water Management (IenW). In this, we fulfil the role of knowledge partner and facilitator between market parties and organisations, including in the plastics and consumer goods sectors.

#### How does Rijkswaterstaat deal with the transition?

##### Pilots and knowledge development

We in the Netherlands, as the rest of the world, are at the beginning of the transition to a circular economy. Rijkswaterstaat, too, is still experimenting with what working circularly exactly means. That is why on the one hand we work on specific innovations, pilot schemes and projects and on the other hand on

knowledge and strategy development, together with the market and other customers.

##### Learning by thinking and doing

This approach is elaborated in the Rijkswaterstaat's Impulse Programme for the Circular Economy. The programme translates the insights gradually to the organisation and the infrastructure sector. It has been set up as an adaptive learning and development programme that works according to the principle 'learning by thinking and doing'. An example of this working method is the Open Learning Environment for circular viaducts and bridges (see page 38).

##### Six programme tracks

With the impulse programme, we give direction to innovations and pilot schemes and produce new frameworks and working methods. The programme consists of four specific and two process-oriented tracks:

1. Data and measuring circularity
2. Circular design and management
3. Circular material use
4. Circular tendering and purchasing
5. External cooperation
6. Internal organisational change

The specific tracks of the programme consist of the most important areas to enable circular working methods. These require a system and culture change, which is why the impulse programme also devotes a great deal of attention to two process-oriented tracks: external cooperation and internal organisational change. See illustration on page 13.

External cooperation is mainly about the question: how can we achieve our ambitions together with other partners? Think of fellow government agencies and market parties. We work together in various ways: in chain projects, in practical experiments, within the CB'23 Platform and through strategic collaborations, such as the Client Forum in the Construction Industry (Opdrachtgeversforum in de Bouw).

Internal organisational change includes facilitating and enabling colleagues to work in a circular way. We develop knowledge about working in a circular way in the organisation and share the insights. All Rijkswaterstaat employees are also taken through the importance and purpose of working circular and what that means for their own tasks and responsibilities.

##### Circular business operations

We are also working on making our own business operations circular. Rijkswaterstaat focuses on five purchasing categories: Office Equipment, Catering, Housing, ICT systems and Waste & Resource Management.



Strategy 'Towards climate neutral and circular public infrastructure projects'

## From policy ambitions to implementation strategies

A milestone in 2019 is that the policy ambitions for circularity and climate neutrality have been translated into implementation. To this end, Rijkswaterstaat, together with ProRail and the Ministry of Infrastructure and Water Management, developed a strategy 'Towards climate neutral and circular public infrastructure projects'. This strategy sets out the challenge for public infrastructure up to 2030. It also contains a proposal for a financing strategy, which will be further specified in 2020.

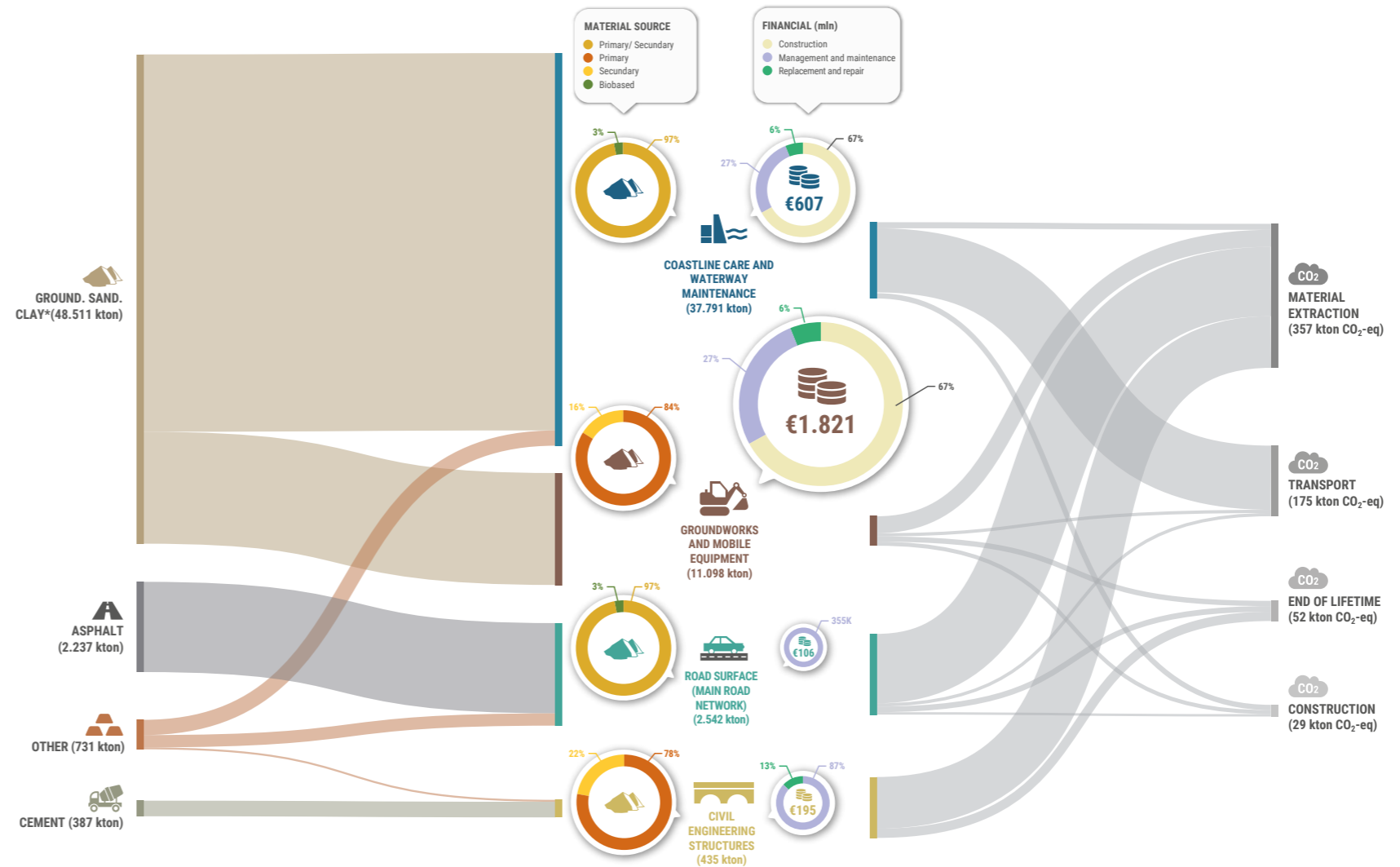
The strategy is elaborated in routes (transition paths) for the four areas of activity of Rijkswaterstaat with the highest CO<sub>2</sub> emissions and material consumption:

- Road surfacing: top, intermediate and bottom layers of asphalt;
- Civil engineering structures: concrete and steel facilities and structures, road furniture, installations, etc;
- Coastline care and waterway maintenance: coastal replenishment, floodplain projects such as river widening, hydraulic engineering for dykes, waterway maintenance in rivers and coastal waters (dredging);
- Groundworks and mobile plant and equipment: moving soil for roads and waterways and the construction of engineering structures, and fuel consumption for transport and heavy equipment.

The strategy also includes four ProRail transition paths, two of which are the same as those used by Rijkswaterstaat: Civil engineering structures and Groundworks, and mobile plant and equipment. These two paths will be defined jointly by both organisations. In 2020, we will work with private parties and local authorities to develop all transition paths into implementation strategies for the projects.

## Overview of CO<sub>2</sub> emissions and material use by RWS per transition path

Current CO<sub>2</sub> emissions from Rijkswaterstaat infrastructure works are approximately 612 ktonnes CO<sub>2</sub> eq. Most emissions are caused by the production of materials for road surfacing and civil engineering structures, and by transport for coastline care and waterway maintenance.



This flow is graphically reduced four times.

Source: Strategy IenW - Towards climate neutral and circular national infrastructure projects.



## What policy frameworks are we dealing with?

Working on circularity and climate neutrality is not optional, nor is it something that Rijkswaterstaat

does by itself. We implement the government policy, such as policy frameworks, agreements and agendas. The figure below shows the development of all policy documents at a glance.

There is a strong relationship between the tasks required to achieve a circular economy and those of climate change. The Impulse Programme for the *Circular Economy* departs from targets for material consumption, but integrates climate impact into these.



BOUWEN

### CONSTRUCTION AGENDA (2017)

- 2020: 100% energy-neutral new construction
- 2025: 10% productivity increase in the construction sector
- 2030: 50% reduction in use of primary raw materials
- 2030: 30% productivity increase and cost savings through radical innovation
- 2050: Energy-neutral built environment



### CONCRETE AGREEMENT (2018)

- 2030: Cooperation in the concrete chain for further sustainability
- 2030: Consistent demand of durable concrete
- 2030: 30% reduction in CO<sub>2</sub> emissions in the concrete chain (based on 1990)
- 2030: 100% high-quality reuse of the released concrete
- 2030: Creating a net positive value of natural capital in the concrete sector



CIRCULAR ECONOMY

### GOVERNMENT-WIDE CIRCULAR ECONOMY PROGRAMME (2016)

- 2030: 50% reduction in use of primary raw materials
- 2050: Fully circular economy, in which: Efficient and high-quality use of raw materials in existing chains
- Where necessary, new raw materials are produced sustainably, and renewable and publicly available raw materials are used
- New production methods are being developed, new products are being designed, new ways of consuming are being promoted and areas are being redesigned.



### RAW MATERIALS AGREEMENT (2017)

### TRANSITION AGENDA CONSTRUCTION ECONOMY (2018)

- 2030: All public procurement is circular
- 2030: CO<sub>2</sub> reduced with 50%
- 2050: CO<sub>2</sub> emissions 100% eliminated
- 2030: Final decision on mandatory material passport



### CABINET RESPONSE TRANSITION AGENDAS (2018)



### IMPLEMENTING CIRCULAR CONSTRUCTION ECONOMY PROGRAMME (2019)

2050: A circular construction economy



CLIMATE



### KLIMAATAKKOORD VAN PARIJS (2015)

Limit the temperature rise to 2°C from pre-industrial levels and try to keep it at 1.5°C

2015

2016

2017

2018

2019

### Development of relevant policy documents on the policy areas of construction, circular economy and climate in recent years

The figure shows that a lot has happened in the three policy areas Construction, Circular Economy (CE) and Climate. The trigger was the Climate Agreement of 2015, after which the CE policy area developed rapidly. In 2016, the government set out its ambition to become a circular economy in the government-wide Circular Economy Programme. More than 200 companies and other government bodies supported this ambition with the Raw Materials Agreement. The ambition was specified in transition agendas for five important sectors, including the Transition Agenda on the Circular Construction Industry (2018). This CE Transition Agenda contains an overview of all important actions. These actions have been made concrete in the Implementation Programme for the Circular Construction Economy 2019-2023.

A photograph of two construction workers in safety gear working on a concrete surface. The worker on the left is wearing a white hard hat and an orange high-visibility jacket with reflective stripes. The worker on the right is wearing a blue hard hat with stickers and an orange high-visibility vest over a black sweater. They are both kneeling and using tools to work on the concrete. In the background, there are construction vehicles, including a red truck with 'mammoet.com' on it, and a concrete mixer truck. The scene is outdoors with trees and a clear sky.

## Chapter 2 Our results in 2019

We are well on track! In 2019, the focus has shifted from pioneering to implementation. Together with supply-chain partners and co-clients, we have gained a lot of experience with working in a circular and climate-neutral way.

## Six programme tracks

The impulse programme consists of four specific and two process-oriented tracks. It also highlights circular business operations.





## Circular business operations

# Making an impact as *launching customer* and government-wide purchaser

As Rijkswaterstaat, we want to set a good example. We purchase in a circular manner, we are energy efficient and apply circularity as much as possible. We do this not only for our own business operations, but also for the products we procure for the entire national government, such as office furniture.

### Progress

#### Ambitions

By 2030, our business operations will be fully circular. Think of catering, office furniture, housing, waste processing and ICT. In doing so, we are setting a good example ourselves. Because Rijkswaterstaat is also a government-wide purchaser for a number of categories, and in that role concludes contracts for the entire central government, we can make a big impact.

#### Key results

- In 2019, we focused mainly on catering, housing, office furniture and ICT.
- We have a circular tender process for our catering. We will be addressing food waste and reducing plastic.
  - In the new contract for maintenance and management, we have set objectives for circularity in terms of buildings.
  - About 800 pieces of refurbished office furniture have been delivered, which saves a lot of raw materials and CO<sub>2</sub> by purchasing less new furniture.
  - The first sustainable laptops will be delivered in 2019. They are part of the first circular procurement for ICT awarded by the Rijkswaterstaat in 2018.

#### The situation in 2019

We are well on track to making our own business operations more sustainable. Particularly in the categories of catering, buildings, office furniture and ICT, we have taken steps with innovative circular contracts, in which we will start working with monitoring and material passports. We are showing that a lot is already possible, even under existing government-wide framework agreements. Now we need to gain more experience in these contracts, put the objectives into practice and also take steps in the other categories.

#### Looking ahead to 2020

We are going to work with lease cars, waste separation and the workplace ICT. From 2020, lease drivers will only be able to choose from electric cars instead of petrol and diesel cars. In our offices, we are going to separate waste more strictly in order to meet the target of a maximum of 35% residual waste. The government-wide tender for workplace ICT is being prepared. The first refurbished laptops are also expected to be offered in 2020.





## Background

Rijkswaterstaat is responsible for the procurement of a number of categories on behalf of the government. This is done with a clear tender process. This way, the central government can use its purchasing power to make a greater impact on circularity.

The most important categories are catering, office furniture and office supplies. For office equipment, for example, at the end of 2017 a circular contract was signed for approximately 100,000 workstations. For these workstations, existing furniture will be used for as long as possible, through maintenance, renovation and refurbishment.

In addition to taking care of government-wide purchasing, we ourselves are also users of a lot of products or services. Think, for example, of the vehicle fleet, buildings, ICT and waste management. Together with catering and office furniture, these are the most important categories in which we can reduce our environmental impact.



## showcase

### Innovative cooperation contract for circular catering

With the Circular Catering launching customer project, Rijkswaterstaat has challenged the market to work together intensively to make catering as circular as possible over the next eight years. In 2019 a contract was signed with caterer Albron to this end. Circular catering means, for example, less food waste, less plastic packaging and more vegetable proteins. We replace products that have a major impact on the environment – think of meat – with tasty and less harmful alternatives.

Together with Albron, Rijkswaterstaat has identified key performance indicators (KPIs) for the long and short term. A special ‘impact monitor’ by the caterer measures the scores and shows whether we are achieving the targets, after which we negotiate actions for improvement. For example, we want 80% of the range to be plant-based in 2027 compared to 20% animal; in 2020 the target is 50/50%. Disposables should be reduced by 70% in eight years, and by 40% in the short term. And for food waste,

***‘With this cooperation, we show that circular catering is possible. And the great thing is that we are already monitoring.’***

**Monique Ruiter-Boerkamp** – product owner catering



the target is a 10% reduction by the end of 2021 and 5% by the end of 2020.

Changes have already been made to the product range in the restaurants. For example, we offer less mono packaging, as is the case with cheese, which means less use of packaging. The range also consists of fewer types of products, which reduces the risk of wasting food. And the new catering concept includes a lunch deal: a healthy and tasty lunch at an attractive price, consisting of, for example, juice, soup and a sandwich. The milk and croquette are still available, but presented less attractively.

Catering is and remains an emotional product, which is why Rijkswaterstaat and Albron are also working together on the communication. As part of the collaboration, the managers jointly give their backing to the circular concept in the restaurants.



## Ambitions

The ambition for our business operations is to be fully circular by 2030. We provide criteria for procurement and focus on extending the service life and circular application of end-of-life products. To achieve this, we work with the circular principles and ask ourselves the following questions about everything we buy, use and dispose of. Do we really have to buy this, or can we do without, otherwise, or less? Is there a material that is less harmful or recycled? If there is something that we no longer need, does it still have value for someone else? Can we reduce a product's footprint over its lifetime and beyond? Which partners and suppliers are committed to sustainability, including in the design of their products and in their services?

## 2019 Results

### Buildings: circular maintenance contract for 650 properties

The new, multi-year contract for the maintenance and management of approximately 650 properties includes circular targets. In 2019, the first steps were taken together with our contractors, who will, for example, develop material passports for a number of our buildings.

### ICT: first sustainable laptops delivered

In 2018, Rijkswaterstaat issued and awarded the first circular tender for ICT: the laptops. This process focused on service-life extension, energy efficiency and interchangeability of components. The first laptops that meet these

requirements were delivered in 2019. This shows that Rijkswaterstaat can already do a great deal in the field of the circular economy, even within the existing government-wide framework agreement.

### Catering: a cooperation contract with a high circular ambition

Rijkswaterstaat has concluded an innovative cooperation contract with a caterer to make the catering circular within eight years (see showcase). Among other things, we will work with more plant-based and local food, create less food waste and use less plastic. Together with the caterer, circular indicators and a monitoring system have been developed that measures the progress. A milestone is the decision, taken in mid-2019, to open catering for all government organisations to this sort of tender process from now on.

### Office furniture: the first refurbished furniture has been delivered

In 2017, Rijkswaterstaat issued a challenging tender for the government-wide category of office furniture. We are now seeing the results. As of 2019, Rijkswaterstaat has received some 800 items of refurbished office furniture. In addition, 1,500 virtually new items of furniture from other government organisations were acquired after a quality check. This enables us to offer a high level of quality without having to use new materials.

## Looking ahead to 2020

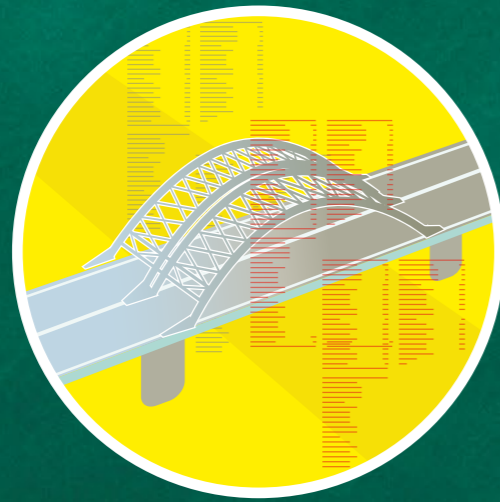
In 2020, we want to gain even more experience in the first category of circular contracts and explore other categories. At the end of 2019, for example,

Rijkswaterstaat decided that all our lease cars would henceforth be electric. This means that lease drivers can no longer opt for a petrol or diesel car. The cars will be replaced in 2020. We are also stepping up our efforts to separate waste in our offices. This is in order to achieve the government-wide target of a maximum of 35% residual waste.

2020 will see preparation of a government-wide tender for workstation ICT being prepared. Rijkswaterstaat ensures that sufficient attention is paid to sustainability. For example, we are investigating whether we can have our end-of-life Apple phones taken apart instead of shredding them. We will also be offering the first refurbished laptops in 2020.

With regard to buildings, we will assess more and more which sustainability measures will and will not be included. We are also going to apply circularity to the renovation and new construction of our road supports (e.g. salt warehouses) in Zevenaar, Den Bosch, Hengelo and Staphorst. This may include wooden instead of concrete floors in office buildings or reusable asphalt.





## Programme track 1: Data and measuring circularity

# The right information makes high quality reuse possible

Working in a circular way requires more insight into material data. Rijkswaterstaat is working with the sector to achieve this. Through the CB'23 Platform (Circular Construction 2023), for example, we are making sector-wide agreements on the measurement of circularity and material passports.

### Progress

#### Ambitions

Together with the construction sector, Rijkswaterstaat wants to have a data system available by 2030 to exchange construction material passports between parties in the supply chain. These material passports will contain detailed and transparent information on raw materials, equipment and structures. Indicators and measurement methods will also have been developed together with the sector in 2030 in order to determine the degree of circularity. This will enable value preservation and high-quality reuse of materials.

#### Key results

- In 2019, a study was carried out on the role of data in circular construction. Two scenarios will be elaborated in a data strategy for working in a circular way in 2020.
- Experience has been gained in practical experiments with, among others, Excess Materials Exchange and the Madaster Infra Learning Environment.
- The CB'23 Platform has provided national consensus on these issues with the delivery of a Circular Construction framework and the guidelines on construction passports and measuring circularity.
- Initial indicators have been developed for the degree of circularity of material use.

#### The situation in 2019

We know better what is needed for the collection and sharing of data and for measurement of circularity. Via the CB'23 Platform, we have worked together with the sector on a framework for material passport developers. A point of consideration is the further development and decision-making on the role and position of Rijkswaterstaat in the roll-out of a sector-wide data system for material passports. In practical terms, Rijkswaterstaat will mainly have to work on the clear delivery and processing of data.

#### Looking ahead to 2020

We will develop a data strategy in which we make choices about the role and position of Rijkswaterstaat in data collection. In the meantime, we will continue to invest in pilots schemes and projects, such as the bridge bank and a spare parts app for reusable materials from the operation and control of bridges and locks. We are also working on an initial insight into the material flows of Rijkswaterstaat, using the developed indicators. In addition, we are looking into the possibility of retrieving monitoring information on circularity in connection with the CO<sub>2</sub> Performance Ladder (see showcase).



## Background

High-quality reuse requires an understanding of the quantity and quality of the materials and assets and when they are available for reuse. With this information, you know if and when sections of an old bridge, for example, can be reused for a new bridge. In order to actually reuse materials on a large scale, the risks in relation to new construction must be eliminated. These can be removed by recording information about an object or material in a better and more detailed way. This way the quality and residual lifespan of the objects or materials becomes clear.

Rijkswaterstaat still has too little data about this. The data must also be available earlier to all parties in the supply chain. It concerns data such as: how long has the asset been in use? What materials does the asset consist of? What condition are these materials in? Market parties must be able to provide this information in the future when constructing or managing and maintaining structures. This way we can start using our work area and everything that has been built in the Netherlands and Europe as one source of primary commodities.

In addition to data, there is also a need for methods to measure the degree of circularity. This makes it possible to make choices based on sustainability and circularity. Which materials do we exclude? Which design solutions and material developments do we encourage? And which materials do we use in a project? It is necessary to develop circular indicators and measuring methods for this. This will also enable us to monitor our progress.

## showcase

### Working on climate neutrality with the CO<sub>2</sub> Performance Ladder

With the CO<sub>2</sub> Performance Ladder we are working on climate neutrality. This management instrument helps organisations to reduce their CO<sub>2</sub> emissions. Rijkswaterstaat uses the instrument within its own organisation to gain insight into its own CO<sub>2</sub> emissions and seize opportunities for reduction. We also use it as an award criterion in tenders. The Ministry of Infrastructure and Water Management, including Rijkswaterstaat, has been certified at level 4 since 2017. This means that Rijkswaterstaat is not only working on CO<sub>2</sub> reduction within its own organisation but also gradually on CO<sub>2</sub> reduction throughout the entire chain, with the ultimate goal of climate neutrality in 2030. By 2020, we want to reach level 5, the highest level. This means that we have drawn up a reduction strategy for a large proportion of our emissions and must also demonstrably achieve our targets.

The CO<sub>2</sub> Performance Ladder works on the basis of Plan, Do, Check and Act (PDCA cycle). This method can also be used to monitor the circular objectives. Now that we are certified at level 4, we are explicitly looking at the footprint of materials, from extraction to 'end-of-life'.



We monitor the CO<sub>2</sub> reduction measures in the projects, measure the results and make adjustments if necessary. Using the same methodology, it is also possible to monitor the effects of circular measures in the projects. The aim is to piggyback on the annual cycle of the CO<sub>2</sub> Performance Ladder in order to monitor circular targets.

**'The CO<sub>2</sub> Performance Ladder helps organisations to reduce their CO<sub>2</sub> emissions.'**

*Jan Klein Kranenburg – CO<sub>2</sub> Performance Ladder chain emissions project manager*



## Ambitions

In 2030, Rijkswaterstaat, together with the construction sector, wants to have a data system available to store and share detailed data on primary commodities materials, equipment and structures with parties in the supply chain. This will make it possible to track materials from extraction to demolition and how they are subsequently used.

As part of this process, applications are needed to match supply and demand of reusable materials, parts and assets. Physical storage locations for released materials (at raw material, component and asset level) can bridge the gap in time and location

Circular indicators and measurement methods have also been developed in 2030, together with the sector, in order to be able to determine the degree of circularity.

*How can we use the management area of Rijkswaterstaat and everything built in the Netherlands and Europe as one large source of primary commodities?*

We are working on those ambitions in four ways:

- We are developing a data strategy. This strategy defines the preconditions for the sharing and storage of material data between different parties and describes the role and position of Rijkswaterstaat.
- We are formulating the information needed for high-value reuse of objects. Exactly what data and information is needed?
- Together with other authorities, we are developing applications and physical storage locations to match supply and demand for materials, parts and structures that are available for reuse.
- We are developing a set of indicator to measure circularity.

## 2019 Results

### Forecast study on the role of data in circular construction

In 2019, a forecast was made into the role of data in circular construction. In this process, strategic insights from inside and outside the organisation were gathered through dialogue sessions about what a data strategy for circular construction might look like. Two scenarios have been developed for the role and position of Rijkswaterstaat in the development of material passports: Rijkswaterstaat could collect all information itself, or each party could obtain information itself and share this information with others, subject to conditions. These scenarios must be further investigated and developed into a CE data strategy.

Rijkswaterstaat can capitalise on smart integration with the system for land information that is currently being developed.

### Practical experiments with Excess Materials Exchange and Madaster

Among other things, in 2019 practical experience has been gained with Excess Materials Exchange and the Madaster Infra Learning Environment. This has provided more insight into the information needs for high-value reuse and the (financial) value of available materials.

### Platform CB'23 – national consensus reached on construction passports

One of the subjects on which CB'23 Platform is working is passports for the construction industry. Last summer, a guideline was delivered that should ensure the correct interpretation of the content of a materials passport. This is now being implemented and tested in practice. To this end, three working groups were started up in the autumn of 2019, focusing on data management, preconditions and passport variants. The Measuring circularity action team has also taken steps (see story Evert Schut on page 21).

Exploratory talks were also held with the 'Digideal Gebouwde Omgeving' and the 'Conceptenbibliotheek Nederland' in the context of CB'23. The aim is to include circularity in the digitisation of the sector.



### Options for CE indicators at a glance

In 2019, CE Delft conducted further research into indicators for circularity. The research lists the possibilities. CE Delft distinguishes between new material use (input side) and released material (output side). It is then possible to measure the degree of circularity for the input:

what proportion is secondary and what proportion is sustainable renewable material? And then, for the output: what proportion is suitable for high-value reuse or upcycling? In practical terms, Rijkswaterstaat will have to work mainly on the supply and processing of data.

### Looking ahead to 2020

We will continue to work on the data strategy in 2020. First, the role and position of Rijkswaterstaat must be determined. Then we will work on the challenges for setting up a sector-wide system (costs and lead time) and on opportunities for smart system integration. At the same time, we are working on pilot schemes and projects to clarify the information needs for the data system. Examples are the bridge bank and the spare parts App. This is also happening in a sector context with CB'23 Platform, Groene Netten Platform, CB-NL and the Digideal Gebouwde Omgeving.

In addition, we are developing a recommendation on the implementation of the indicators for material streams and will further develop the indicator for value retention. We are looking into whether it is possible to collect monitoring information on circularity in connection with the CO<sub>2</sub> Performance Ladder (see showcase). We will then investigate whether this form of project monitoring is an interim solution until a well-functioning material passport system has been developed.





Evert Schut | senior advisor circular economy

## ‘Guideline puts an end to endless discussions’

Evert is very proud of the ‘Measuring circularity’ guideline, which the CB’23 Platform completed in the summer of 2019. ‘There is now a consensus on the methodology and there is more clarity about the goals that we want to achieve with circularity.’

“ ‘When you talk about circularity, people have very different opinions’, says Evert. ‘For some circular economy is just a new word for sustainability, while others prefer the more concise interpretation of closing material cycles. It can become quite confusing for a contractor to understand his client during procurement when circular can mean just about anything. It has to be measurable, and that’s why you first need a definition.’

‘This is exactly what we did. We came to the conclusion that circularity is not an end, but a means. A means to three goals:

the protection of the environment, of raw material resources and of value. We used this principle in the agreements about the measurement method. To what extent do you achieve these goals in your product or project, or in the way you manage your assets? In 2019 our main focus was on the first three goals. Of course we already have effective methods to measure environmental impacts. However, we found that these could not readily answer all our questions concerning material flows. The guideline therefore contains agreements on how you can clearly map out the input and output. We are now working on the other two goals, which will be added to the guideline in 2020.’

‘A unique collaboration has been established, which has already led to results in the first year. It’s truly amazing that we achieved consensus on a vision so quickly and with so many parties – around 45.’ “Don’t we have the CB’23 Guideline method?”. I’ve heard people in the sector refer to the Guideline, even though they were not directly involved. So you can actually already work with it. And just as important: this guideline puts an end to endless

To have agreements for circular construction before 2023. The CB’23 Platform has been working on this with approximately 140 parties since 2018. Divided into three action teams for measuring circularity, the material passport and a framework (list of definitions) respectively.

discussions. We now have more clarity and agreement on what we want to achieve with circularity.’

”

[View the guidelines on the website of CB’23](https://platformcb23.nl/downloads)  
<https://platformcb23.nl/downloads>



## Programme track 2: Circular design

# Integrate circularity in every phase of the project

In order to design, build and manage our infrastructure in a climate-neutral and circular way, we need to take circularity into account in every phase of the project. This means that we think about the service life and future (re)use of a design in advance. We translate this into different design and maintenance strategies for different types of projects and objects.

### Progress

#### Ambitions

We want to design, build and manage our infrastructure in a climate-neutral and circular way by 2030. For this to happen, the circular principles must be incorporated in all Ministry's projects for Rijkswaterstaat, and in the budgets. The internal work processes of Rijkswaterstaat must also incorporate circularity as a guiding principle. This means that climate neutrality and circularity are taken into account integrally in every project phase, in addition to costs, planning and risks.

#### Key results

- The In-depth Guideline on CE for MIRT projects has been developed. Circular design principles for each MIRT project phase have been translated into practical advice.
- An approach has been developed for replacement and renovation projects (R&R) that translates circularity into specific measures.
- Promising measures have been identified for various objects.
- Experience has been gained with the formulation and implementation of circular ambitions, such as the A27 Houten Hooipolder project and the renovation of the Heinoord tunnel.

#### The situation in 2019

In 2019, the circular design principles were clearly identified for various project types and according to specific object categories (such as a bridge or dyke). Circularity is an important theme in more and more projects. Consideration is being given to alternatives for the use of new materials or to a future-proof, adaptive design. The focus is on the standard inclusion of circularity in the tender, the availability of sufficient funds and the further translation of circularity into the internal work processes.

#### Looking ahead to 2020

In 2020, we will expand the In-depth Guideline on CE for MIRT projects for the contract preparation and construction phase. For more than 40 R&R projects, an ambition level for sustainability will be chosen this year. We will help the projects with a high level of ambition to translate this into measures. We will also continue to train project advisors and gather project experience. We will continue to embed CE in asset management and identify promising measures for road surfacing and tunnels.

## Background

Rijkswaterstaat constructs and manages a large part of the Dutch infrastructure. We want to design, build and maintain this infrastructure in a climate neutral and circular way. This means that when we make a design, we already think about the service life, future use and reuse of materials and objects at the end of their service life.

In general, we aim for reuse at the highest possible level, for example the bridge as a whole instead of concrete granulate. This way you preserve the value of materials and prevent CO<sub>2</sub> emissions during transport, recycling and new construction. However, we cannot apply this to every asset. Steel bridges or viaducts, for example, can often be easily reused at asset or component level. But in the case of tunnels and road surfacing, high-quality recycling at the (raw) material level might be better.

In addition to the reuse of existing materials, we also look at the future functions of the asset in the design of projects to construct new infrastructure or replace existing ones. Are all parts still needed? Think of operations buildings for locks and sluice gates, which may no longer be needed in the future due to the development of remote control of such structures. And how can we design in such a way that we incorporate management and maintenance, demolition and reuse into future life cycles?

## showcase

### Project team Grebbedijk develops circular assessment framework

How do you work circular principles into a dyke reinforcement project? The Vallei en Veluwe water board was looking for an answer for the reinforcement of the Grebbedijk. The project team developed a 'circular assessment framework' for this: a 'scorecard system' for the circular design principles. With the 'prevention' design principle you can, for example, score positively if you conduct research into innovations to reduce the scale of the dyke reinforcement.

The assessment framework has been used to compare the promising alternatives in the field of circularity and to arrive at an alternative for dyke reinforcement. An obvious circular choice is, for example, the use of 'native' soil. But the assessment framework has also resulted in less

***'The assessment framework makes you much more aware of the effect of circular choices. For example, it turned out that with a certain innovation, stone cladding may no longer be necessary. That saves a lot of stone and is better for people and the environment.'***

**Marten Hoeksema** – technical manager, Grebbedijk reinforcement



obvious choices, such as responding to future developments for thermal energy from surface water.

Another special feature is that the project team used the DuboCalc calculation tool to compare alternatives in the exploratory phase. This mapped the sources of emissions for each alternative. For example, the project team was able to compare the environmental impact of different solutions for the piping problem. Usually this is only done in the implementation phase. The circular assessment framework is now being made suitable for broad application in projects of Rijkswaterstaat and Water Boards.



Rijkswaterstaat is facing the biggest maintenance operation ever. More than 130 bridges, tunnels, locks and viaducts will have to be replaced or renovated in the years ahead. The maintenance task will be carried out in parts. At present, parts 1 to 3 are in progress and part 4 is coming up. Part 4 is the same size as the first 3 together. It concerns 40 projects, with an expected budget of around 1.5 billion EUR. In the coming decades, this programme will ensure a continuous flow of work, in addition to the regular maintenance and construction tasks.

In addition to sustainable design, the sustainable management of our assets – a waterway, a road or an object – is also very important. We call this asset management. The longer we retain its value, the greater the environmental gain. Asset management plays an important role in the transition to working in a circular way within Rijkswaterstaat. The manager is at the heart of maintaining the value of our infrastructure and individual assets. By developing circular maintenance strategies, we enable asset managers to make choices so that the materials that make up an asset remain in use for as long as possible and, at the end of the asset's service life, reusable materials can be upcycled.

The challenge is to apply all the circular measures, design principles and maintenance strategies in the three major project types of Rijkswaterstaat, each of which has its own dynamics and process.

- MIRT projects (Multi-Year Programme for Infrastructure, Spatial Planning and Transport) are large-scale spatial planning or expansion projects that go through a number of fixed phases: initiative, exploration, plan development and realisation.
- Replacement & Renovation (R&R) are projects to replace and renovate all our existing properties (see box on the left), most of which were built in the 1950s and 1960s. In the coming years, there will be a large R&R programme, in which circularity is part of the assignment. This involves the replacement of bridges and viaducts, with enormous opportunities for high quality reuse, for example.
- Management & Maintenance (M&M): these are projects for the regular management and maintenance of our waterways, roads and assets.

### Ambitions

By 2030, we want to design, build and manage our infrastructure in a climate-neutral and circular way. To achieve this, circularity must be included in all Ministry's projects to Rijkswaterstaat and in the budgets. Circular management is also included at every stage of the process. This means that climate neutrality and circularity are taken into account in every project phase in addition to costs, planning and risks. We work with circular design principles and maintenance strategies and manage the environmental impact and costs over the entire service life of our infrastructure and, where possible, thereafter.

*With a circular design, you think in advance about the service life and future (re)use of materials, and other such aspects.*

We work on these ambitions in three ways:

- By developing circular design principles (see figure on page 26) with an elaboration into specific measures for different asset categories. We implement these in project assignments and internal work processes.
- Developing circular maintenance strategies and translating them into specific measures for contract teams and asset managers.
- By gaining practical experience in various projects and pilot schemes. Rijkswaterstaat's colleagues are advised on how to shape circularity in their projects. This varies from providing guidance, to thinking along about, for example, the (technical) functioning of circular design principles or contract requirements for the specific project or asset.

### 2019 Results

#### Circularity in the project

Embedding circularity in the processes starts with a clear tender from the Ministry of Infrastructure and the Water Management to Rijkswaterstaat. Rijkswaterstaat has developed 'guideline' frames of references for circular economy and climate, which the Ministry can incorporate in its projects to Rijkswaterstaat.







### In-depth Guideline on Circular Economy for MIRT projects

Rijkswaterstaat has developed a guideline in which the circular design principles have been translated into the various MIRT project phases. The guideline contains project-specific advice, instruments and examples. This makes the circular (design) principles an integral part of the design process and decision making. MIRT projects cover a long period of time, so it is important to include circular design choices at an early stage. Also, in these large spatial planning projects, it is possible to gain significant benefits from circularity.

### Circular approach for replacement and renovation projects

An approach has been developed for replacement and renovation projects of bridges, tunnels, locks and viaducts in which the circular design principles have been translated into steps and specific measures.

The approach is currently being tested on a number of projects and adjusted where necessary.

### Circular asset approach

The design principles are also elaborated for each asset category (such as bridges and viaducts). This approach identifies promising measures for bridges and viaducts, locks, and protection of the banks of waterways and dykes, which can be used in projects. This allows us to see what impact these measures have on sustainability and costs.

### Circular asset management: development of standard requirements for clients

The regional managers play an important role in the management & maintenance (asset management) of our network (waterways and motorways) and the assets. In order to make it easier to incorporate circular objectives in their maintenance contracts, standard requirements for clients in terms of circular economy have been developed. An example of such as requirement is: 'Create a design in which assets, specific elements and materials with a residual service life are used as best as possible in the project, or in the surrounding area'.

### Practical experience in projects and pilot schemes

Experiences have been gained in more than 48 projects and pilot schemes (see project map on page 51). Advice was given in 2019 on the possibilities offered by CE in various projects, such as the A27 Houten Hooipolder project and the renovation of the Heinenoord tunnel. These projects and the wharves of the Merwede Canal,

the Kleirijperij project, the A6 Lelystad Almeren and the Reevesluis project were evaluated. The experiences of the circular viaduct were looked at in more detail (see table The story of the first viaduct on page 27).

### Looking ahead to 2020

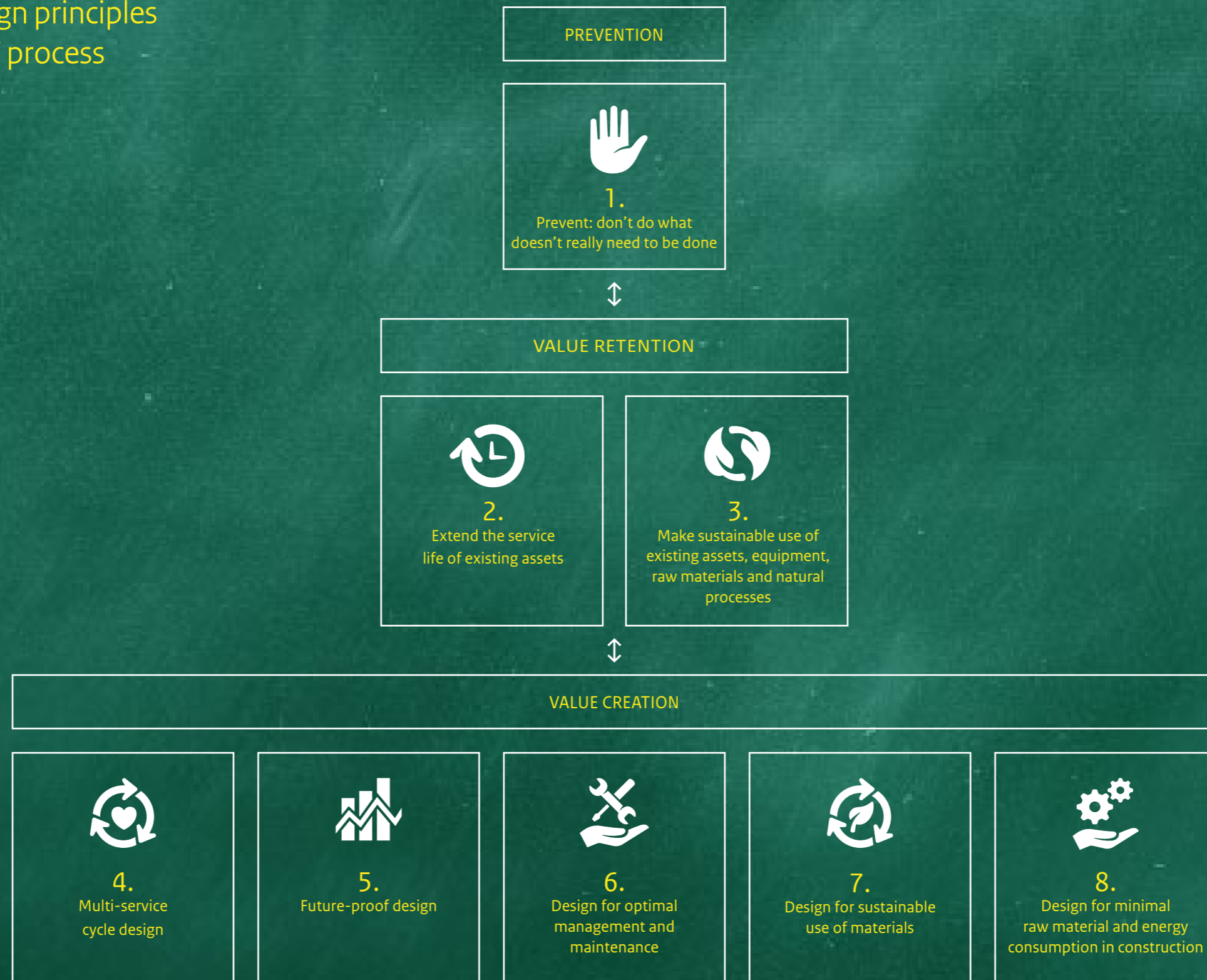
The circular design principles will be incorporated in many different places in 2019. In 2020, we will take them further, for example by elaborating them for the road system and for tunnels. We will also extend the In-depth Guideline on CE for MIRT projects for the tender preparation and construction phase. It remains important for the Ministry of Infrastructure and Water Management to incorporate the CE's guiding tender definitions in projects, so that an increasing number of projects have ambitions for circularity in their project tenders.

An ambitious level of sustainability will be chosen this year for the upcoming maintenance task (part 4) of more than 40 R&R projects. We will help projects with a higher level of ambition to translate this into measures. We will continue to train project advisors, and in 2020, we will collect and evaluate the experiences of projects. These insights will be taken into account and further developed in other projects.

In addition, we will take circularity more explicitly into account in asset management, i.e. the management and maintenance of our roads and waterways. Together with the regional divisions, we will determine which maintenance projects will be the focus of attention.



# Circular design principles for the MIRT process



# The story of the first circular viaduct

‘What now remains of the circular viaduct are eight elements, four structural beams and a pile of grout as waste. Waiting for reuse in any number of future projects.’

This is stated in the learning history of the first circular viaduct that Rijkswaterstaat built together with contractor Van Hattum en Blankevoort and prefab builder Consolis Spanbeton. Everyone working on innovations understands that the construction of the first circular viaduct was not easy. And that the result – even more than the technology – depends on the people who worked on it.

In the learning history, all the people in this story were interviewed. From all the various stories and puzzle pieces, one story has been reconstructed

to share the lessons learnt. The circular viaduct was tested between December 2018 and September 2019 by the site traffic at the construction of the Reevesluis and is being reassembled at another location. Rijkswaterstaat is still in discussion about the redevelopment. Within this project, we experimented with a new technique and a new way of working together. In the full recommendation, we share the most important insights and lessons from the design, construction, monitoring and dismantling of the viaduct.

[Go to the website for the learning history and the full recommendation \[www.rijkswaterstaat.nl\]\(http://www.rijkswaterstaat.nl\)](#)  
> [Construction of circular viaduct in Kampen](#)





Barbara van Offenbeek | senior advisor circular economy

# ‘It was really cool to make the practical changeover’

**She travelled throughout the country in 2019 to visit 40 projects of the Replacement and Renovation Programme. This gave a good picture of the circular opportunities and the practical changeover of working circular into projects. ‘There is now a basis to really get started with the circular design principles in the projects.’**

“ Sustainable solutions must also be incorporated in the projects, according to the Minister of Infrastructure and Water Management at the beginning of 2019. As sustainability advisor, Barbara was part of the team that did the initial work for the projects. She visualised the sustainability opportunities.

‘Circular opportunities appear to be plentiful. Renovation: that in itself is circular, because you extend the service life of an asset and thus maintain its value. Circularity becomes interesting, especially when it comes to replacement. You can look at a more future-proof design. Take the replacement of the viaducts on the A44. You would like to make these viaducts

adaptable for future extensions, for example with a modular design. Reuse also offers a lot of opportunities, because a lot of materials will become available. The parts of tunnel installations that are still in good condition, for example, can be stored in a national storage bank. So that in the event of a malfunction in a similar asset, you can quickly get your hands on the desired part.’

These opportunities were discussed in the preliminary phase. ‘Gradually I got a clearer picture of the practical implementation of the circular design principles within the R&R projects. We immediately used that knowledge to develop a sustainable approach for R&R. In this way, all project teams will soon be able to work with circularity and energy themselves.’

Whether the project teams will also capitalise on the circular opportunities, will become clear in the coming year.

‘I do see that circularity is starting to be considered as more logical. And now is the first time that there is a broad basis for the projects to get started with this. We have insight into the possibilities for each project.



This has been explicitly commissioned on the basis of policy. The approach is a nice tool for the projects to get started. In addition, there is a team of advisors ready to help the projects further with circularity. It was really cool to make this practical changeover. And the great thing is: R&R is a programme. So, what you learn for one tunnel, for example, can be applied to the next tunnel. That way, we can really benefit from the change in scale.

[View the sustainability approach developed for the R&R projects](#) (note: internal link)

[intranet rws.nl > circularity in current work processes](#)





## Programme track 3: Circular material use

# Endless reuse of materials

If we want to reduce our primary raw material use by 50%, we have to make different material choices. Rijkswaterstaat is working on this with a strategic materials policy, knowledge and innovations and supply-chain cooperation.

### Progress

#### Ambitions

Contribute to the national target of using 50% fewer primary raw materials by 2030. Rijkswaterstaat focuses on the materials with the greatest environmental impact: soil, asphalt, concrete and steel. In 2030, we will apply materials in such a way that they can be used again in the future cycles.

#### Key results

- The main features of the strategic materials policy have been defined. This policy ensures that Rijkswaterstaat will continue to have the necessary materials in the future, and makes it clear what our role is in material chains and how we will make material choices in projects.
- Supply-chain cooperation with the timber sector has been worked out in a joint programme plan to stimulate the use of wood.
- Some thirty innovation projects for sustainable asphalt, concrete, steel and wood have been started, thanks to the funding from the Climate Agreement.

#### The situation in 2019

We have laid the foundations for the development of a strategic materials policy. This will help Rijkswaterstaat with circular material choices. A point for consideration is the fact that we have not yet mapped out the **availability** of materials and equipment. Value retention has also not yet been sufficiently developed. Transition Paths have been developed for the categories in which Rijkswaterstaat has the greatest CO<sub>2</sub> impact and consumes the most materials – road surfacing, civil engineering structures, coastline care and groundworks. These provide market parties with clarity about the course of Rijkswaterstaat, priority and division of roles in order to be able to work in a climate-neutral and circular manner by 2030.

#### Looking ahead to 2020

In 2020, the strategic materials policy will be developed, and a calculation will be made as to what is still needed to translate it into the projects. We expect to gain insight into the availability of material supplies in our work area and the concept of value retention, thanks to two ongoing studies into this. In addition, Rijkswaterstaat will work with the sector to develop roadmaps for the four transition paths up to 2030. We will also remain fully committed to testing and validating circular innovations via the Climate Envelope.



## Background

Circular material use means that we apply materials in such a way that they can be reused in future cycles at a high quality level. For our most important materials, we need to identify what is needed to use them in a circular way. A number of materials are becoming scarce and will not always be available. Or these materials cause too great an environmental impact, so we will have to look for alternatives. The important themes for circular material use are scarcity, environmental impact, risks related to circular economy, value retention, primary/secondary/renewable materials and availability of materials.

Many new solutions and innovations still need to be developed for the high-quality recycling of materials or the replacement of unsustainable raw materials in products. That is why we are stimulating new technologies and innovations for recycling, sustainable production and extending the service life of materials. Examples include research into completely renewable asphalt and its service life.

The Ministry of Infrastructure and Water Management, Rijkswaterstaat and ProRail developed the strategy 'Towards climate neutral and circular public infrastructure projects'. This strategy sets out how we will achieve the goals for 2030, through four transition paths: road surfacing, civil engineering structures, coastline care and waterway maintenance.

## showcase

### Supply-chain cooperation timber sector on a roll

Supply-chain cooperation with the timber sector made a good start in 2019. In 2018, a study had already been carried out with all parties on how timber could be used more. After all, timber is very suitable for circular construction because it is a renewable material. The study was developed into a joint programme plan in 2019 and more clients became involved.

The programme plan includes agreements on aspects including improving the image of timber applications. There is still a persistent preconception about wood: that we are destroying the rain forests. Nowadays, however, timber is a sustainable alternative. If one tree becomes a source of income, the rest of the forest can be left alone. It has also been agreed to pay more attention to knowledge and research. In higher education, for example, a lot of catching up is needed. In addition, the chain partners discussed the further stimulation of the application possibilities of timber innovations. Of interest in this respect is the launching customer project of Rijkswaterstaat Circular Road Furniture. Noise barriers, gantries and crash barriers may well be an area in which wood innovations can be applied.



The collaboration will be confirmed in 2020, whereafter the implementation of the programme plan can start. See also the [Tegenlicht documentary Houtbouwers](#), which argues that construction with timber is on its way. The documentary mentions the report 'The potential of biobased construction', which also contains research carried out by Rijkswaterstaat into biobased innovations.

**'Can we already supply wood for Rijkswaterstaat's projects?', the sector asked during the study. 'We had not counted on so much involvement and enthusiasm, and it went faster than expected.'**

*Jeroen Nagel – circular economy advisor*

The transition paths are linked to the material chains, because of the various materials that are used in, for example, a bridge, a tunnel or road surfacing. They provide market parties with clarity about the course of Rijkswaterstaat, priority, division of roles and cohesion. Determining a clear role and position in supply-chain initiatives supports the expectations of the cooperation. Through initiatives such as the Concrete Agreement (Betonakkoord), the Asphalt Impulse (Asfaltimpuls) and the transition paths, we are working with the sector to make materials more sustainable.

### Ambitions

We at Rijkswaterstaat want to contribute to the national ambition of using 50% fewer primary commodities by 2030. We are looking at the materials with the greatest environmental impact. In 2030, we will use materials in such a way that they can again be used in future cycles at a high-quality level.

We are working on these ambitions in three ways:

#### Strategic materials policy

The strategic materials policy is an important part of Rijkswaterstaat's overarching vision of the circular economy. The policy gives concrete substance to a number of important material topics and thus gives the Rijkswaterstaat the tools to realise its circular ambitions and, if necessary, to strengthen or adjust them.

The policy enables us to focus our material choices on circularity, i.e. phasing out non-circular materials and

### *Circular management based on material choices means a radical change from the current approach*

preventing the use of scarce and unsustainable materials in our projects. This means a radical change in the way we now deal with materials, i.e. focusing on costs and leaving the materials that become available to the contractor.

#### Development of new knowledge and innovations

We promote new technologies and innovations for recycling, sustainable production and service-life extension of materials, and for the use of alternatives. In order to apply circular material innovations in projects, it must be possible to assess them in a clear manner. We are developing an assessment model for this purpose. In addition, we are working on a maturity and benchmark model. Such a model provides insight into how innovations score relative to each other and how mature the market already is in the broad application of the innovation.

#### Supply-chain collaboration and transition paths

Supply-chain collaboration is essential in making materials more sustainable. Initiatives such as the Concrete Agreement (Betonakkoord), the Asphalt Impulse (Asfaltimpuls) and the Green Deal Sustainable Infrastructure (Green Deal Duurzaam GWW) are examples of how collaborative efforts are being made to make materials more sustainable. The transition paths make it possible to work together using these initiatives.

### 2019 Results

#### Development of key strategic materials policy

The main points of the strategic materials policy were developed in 2019. These consist of a number of generic, circular material themes, such as scarcity and availability of materials, environmental impact of materials and risks of materials that cannot be reused.

#### Thirty innovation trajectories launched

Together with the sector, substantial investments were made in the development of knowledge and new innovations for the dominant material flows used by Rijkswaterstaat and ProRail. Funding from the Climate Envelope of the Ministry of Economic Affairs and Climate Policy was used to test and validate innovations. This funding was used to launch around thirty innovation projects for sustainable asphalt, concrete and steel. New initiatives have also been developed with the timber and biomass sector. For example, traffic signs are made from residual organic waste, such as pruning waste or clippings from roadside verges. At the Westkop treatment plant on the Grevelingendam near Bruinisse, there is a barrier made of biobased material.

Furthermore, in 2019, an approach has been developed for an 'innovation file' to benchmark innovations. Such a file relates to a specific asset (e.g. a bridge, lock or tunnel) and assesses the innovation in terms of Environmental Cost Indicator (ECI), CO<sub>2</sub>, Material Circularity Index (MCI), costs, data quality, impact per asset and impact in relation to the total management area.

### Supply-chain approach extended to renewable materials

The supply-chain approach has now been successfully extended to the timber sector, which has taken up the challenge of quickly using timber as a renewable material for the infrastructure sector. The steel sector is also positive towards such an initiative but is still significantly less advanced. Supply-chain initiatives are also working on the development of wood as a building material for construction and provide insight into its potential. One example is NIBE's research into the potential of biobased materials in construction.

### Looking ahead to 2020

In 2020, the strategic materials policy will be developed, and an assessment will be made as to what is still needed to expand the policy. We will do this together with internal and external stakeholders. In doing so, we will make use of the cooperation built up in the supply-chain initiatives.

We also expect to have a better picture of the availability of materials in 2020. To this end, we are investigating the demand for materials in the coming decades and the development of the supply of primary, secondary and renewable materials. At the end of 2019, a study was also launched on how Rijkswaterstaat can implement the principle of 'value retention'. We expect the results in 2020. We are working closely with the CB'23 Platform and the Netherlands Environmental Assessment Agency (PBL), who have this subject high on their agenda.

Furthermore, together with the sector, we will use the transition paths to clarify which innovations are most promising and which knowledge is still needed. To this end, we will draw up roadmaps to which we will link funding from the Climate Envelope. The funding will also be used to encourage and validate various material innovations in 2020.





**Ron Peddemors** | programme manager,  
Sustainable road surfacing transition

## ‘The global roadmap has been plotted’

The entire asphalt chain in the Netherlands will be climate-neutral and circular by 2030, according to the ambition of the Sustainable Road Surfacing transition path. In 2019, the global roadmap was drawn up for this purpose. Programme manager Ron Peddemors believes in it. ‘The sector has sufficient believers to go a long way.’



‘There’s nothing wrong with our asphalt. Safety and comfort are top notch, even when it rains. We are even known for it.’

The challenge is to make road surfacing of this quality in a different way, without CO<sub>2</sub> emissions and without the use of primary raw materials. It will not be possible to bring about such a transition from the existing organisation, which is why a temporary programme approach was launched in 2019: From asphalt to sustainable road surfacing.’

But our programme has the potential, and it is our aim to offer added value in a number of areas. Internally, for example, I want to link resources to our tasks. Working on these four transitions means incurring extra costs for a while.



So it makes sense if these costs are also included in the budget of the Ministry of Infrastructure and the Water Management. If this succeeds, 2022 will be the first year that we also have implementation funds to purchase more sustainable asphalt mixtures.’

‘Coordinating the purchasing strategy with other road authorities such as provinces and large municipalities is a second point. With a joint procurement strategy, we can offer leaders in the field of more sustainable mixtures a better prospect of long-term sales. A third point is investment in a long-term knowledge programme in order to be able to monitor the new mixtures properly and, for example, to make predictions about their service life. Exploring alternatives to asphalt is a fourth point of added value. What other materials are possible?’

And what does that mean for the reuse of this new material and the existing asphalt? We want to organise brainstorming sessions for this in 2020.’

Road surfacing is one of the four transitions in the strategy ‘Towards climate neutral and circular public infrastructure’. It is a category that accounts for a significant percentage of the CO<sub>2</sub> footprint (30%) of tRijkswaterstaat, just like the other three categories: civil engineering structures, coastline care and waterway maintenance; groundworks and other mobile equipment. [See also page 10](#)

‘Working on a transition does not immediately generate concrete results. But we have now plotted a global roadmap. The task is clear. Our added value has been determined. And we’ve built the organisation, consisting of a broad team of experts from Rijkswaterstaat. On 10 December, I spoke at the Asfaltdag (Asphalt day). I stated our dream: the entire asphalt chain of the Netherlands will be climate-neutral and circular by 2030. And I asked: who believes in this? There were about fifty of them, out of about four hundred attendees. So, sufficient believers to go a long way. Of course, I’m a believer myself. There is so much energy around this subject. The sector has long understood that this is no longer a hype, but an emergency. A necessity for a liveable future. And I think that’s a fantastic subject to work on.’





## Programme track 4: Circular tendering & purchasing

# Rewarding leaders and encouraging the following group to become more sustainable

How can we stimulate the sector to design and implement infrastructure projects in a circular way? And how do we give room to innovation? These are the key questions in circular tendering and purchasing. The answer is: we set the bar ever higher with award criteria and we stimulate innovation in our role as *launching customer*.

### Progress

#### Ambitions

We want to tender all infrastructure projects in a circular way and give environmental effects greater importance, with the aim of making our infrastructure projects climate-neutral and circular by 2030. Procurement in a circular way must be integrated into the purchasing instruments and we want to be launching customer for circular and climate-neutral innovations.

#### Key results

- The first contracts for Longt-term Variable Maintenance were awarded on the basis of sustainability (ECI). As a result, in 2019 a circular asphalt mixture for porous concrete (zoab) will be applied on a large scale on the A7 and A37 motorways.
- More and more projects tenders have contract requirements for "circular" road furniture.
- With the launching customer projects, Rijkswaterstaat gives room for innovation. In the Circular Viaduct project, for example, we worked with other government authorities, knowledge centres and companies in an Open Learning Environment.

#### The situation in 2019

More and more tender procedures have award criteria relating to environmental costs and principles for circularity. This means that we are raising the bar ever higher. Practice has shown this to be the case. In Long-term Variable Maintenance contracts, the award criterion relating to environmental costs (ECI) has led to more circular projects. In addition to the Long-term Variable Maintenance contracts, this award criterion was also applied in four other projects in 2019: A9 Badhoevedorp Holendrecht, ViA15, N3 Dordrecht and Onderhoudsbagger Westerschelde.

#### Looking ahead to 2020

In 2020, we will apply the ECI value in an increasing number of contracts as an award criterion. For example, in performance-realted contracts for fixed maintenance of roads and wet infrastructure. We will also continue to work on innovation in launching customer projects. As a follow-up to the Circular Viaduct project, an innovative tender for circular viaducts will be drawn up in 2020: Strategic Business Innovation Request (SBIR). SBIR is a method of procurement with which the government stimulates innovations in the market and can finance them at an early stage.



## Background

Circular procurement means that we use the right purchasing instruments to drive the circular economy. For each circular solution, we look at the most suitable contract form, the award criteria and the contract requirements.

We use the instruments from the Sustainable Infrastructure approach (aanpak Duurzaam GWW) approach, such as the CO<sub>2</sub> Performance Ladder and DuboCalc.

The CO<sub>2</sub> Performance Ladder enables you to assess whether a market party is working sustainably in the field of CO<sub>2</sub> emissions. We also use this instrument to reduce our own CO<sub>2</sub> emissions. With DuboCalc you can use the Environmental Cost Indicator (ECI) to assess which market party can carry out the project most sustainably. A good example is the tender for the Blankenburg connection: a new road between the A20 and A15 to improve Rotterdam's accessibility. In this tender, the use of DuboCalc led to sustainable propositions, such as solar panels, reuse of concrete and asphalt and the use of economical equipment.

However, circular procurement is more than just the incorporation of sustainable award criteria. Increasingly sustainable minimum requirements are also needed to encourage the "following group" in the market to become more sustainable. In addition, it is important to stimulate technological innovations, for example by facilitating test locations and pilot schemes.

## showcase

### More circular asphalt thanks to award at ECI value

Awarding contracts based on sustainability; it works! In 2019, a circular asphalt mixture was applied on a large scale for porous concrete (zoab) during major maintenance on the A7 and A37 motorways. The new mixture is distinguished by its high percentage of old asphalt (50%) and has been validated by the Asphalt Quality Desk.

In order to make the porous concrete suitable for high recycling percentages, contractor KWS has used a biobased rejuvenator (a type of oil). The more sustainable mixture leads to approximately 35% lower environmental costs and more than 30% lower CO<sub>2</sub> emissions during the production of the asphalt. The sustainability gain was achieved because Rijkswaterstaat used the Environmental Cost Indicator Value (ECI) as an award criterion in the tender for long-term variable maintenance. This was also done in three other tenders for long-term variable maintenance of roads and in the road projects A9 Badhoevedorp - Holendrecht, ViA15 and the N3 near Dordrecht. The award criterion is also increasingly used for 'wet projects', such as the tender for foreshore defence for the Oosterschelde and Westerschelde. The ECI value is part of the DuboCalc calculation method. With this method,



Rijkswaterstaat is able to calculate the environmental costs of all materials from extraction to demolition, expressed as an ECI value, prior to tendering. The lower the ECI value, the lower the environmental costs. With a lower ECI value as the award criterion, Rijkswaterstaat then challenges market parties to offer more sustainable materials and equipment. The ECI value is also being used more and more frequently to compare variants during the design phase. This makes it possible to work on a sustainable design at an early stage of the project.

**'Visible, more sustainable tenders by awarding with an ECI value.'**

*Marjolein van der Klauw – sustainable purchasing advisor*



It is therefore a matter of encouraging both the front-runners and the "following group" to become more sustainable. And we do this by adapting our purchasing instruments and by stimulating innovation as launching customer.

### Ambitions

We want all infrastructure projects to be put out to tender in a circular way and to give greater weight to environmental impacts, with the aim of making the projects climate-neutral and circular by 2030. To that end, Rijkswaterstaat will develop the right purchasing instruments in the years ahead to work with the private sector towards circular solutions. We are also launching customers for circular and climate-neutral innovations.

We are working on these ambitions in three ways:

#### Application instruments from the Sustainable Infrastructure Approach

We apply instruments from the Sustainable Infrastructure approach (aanpak Duurzaam GWW), such as the CO<sub>2</sub> Performance Ladder and DuboCalc via the Environmental Cost Indicator (ECI). We want to give more weight to the origin and environmental impact of materials and their reuse at the end of the service life of products and materials. For example, we encourage the producer or processing party to put the products, components or raw materials back into a new cycle at the end of their service life or use phase, while retaining as much value as possible.

#### Adapting purchasing models, contracts and award criteria

We are adapting our purchasing models, contracts and award criteria: stricter requirements for all the parties and award criteria that encourage low environmental costs for front runners. We are also working on expanding our purchasing instruments for exploratory surveys, planning studies and maintenance work. By asking for the application of circular design principles at all stages, market parties are being challenged to take steps together with us. We also apply circular business models to create the right incentives for market parties. In addition, we encourage chain cooperation to achieve the most circular solutions.

#### Launching customer

We want to be launching customer for circular and climate-neutral innovations. This means that we want to be the first party to apply innovations on a large scale, giving companies the opportunity to bring innovations to the market. Market parties will have the space to test, validate and apply innovations on a large scale. Where necessary, risks are shared between Rijkswaterstaat and the private sector to make new innovations possible.

### Rijkswaterstaat raises the circular bar and encourages innovations as launching customers

Nine projects were designated as launching customer projects in 2018. A number of these projects focus on circularity, such as the circular viaduct, circular road furniture, sustainable asphalt and concrete and InnovA58.

### 2019 Results

#### Awarding at ECI value in maintenance contracts pays off

The first contracts for long-term variable maintenance were awarded on the basis of sustainability (ECI value). The result is that in 2019, a circular asphalt mixture for porous concrete (zoab) was applied on a large scale on the A7 and A37 (see showcase). This immediately leads to more reuse of asphalt and lower CO<sub>2</sub> emissions. Furthermore, more and more projects are being put out to tender with contract requirements for circular road furniture, with which we are also driving the transition to biobased products, for example for hectometre posts and road signs.

#### Launching customer projects give circularity a boost

Results were also achieved in the launching customer projects. For example, within the Circular Viaduct project, an Open Learning Environment Circular Viaducts & Bridges has been developed together with other authorities, knowledge centres and companies, intended to share current knowledge about circular viaducts and bridges (see story [Frederieke Knopperts on page 38](#)). In 2020, Rijkswaterstaat will launch an innovative call for tenders: a Strategic Business Innovation Research (see forward view 2020).



### Circular bar raised

Circular procurement is incorporated in the purchasing instruments of Rijkswaterstaat, such as the project procurement plans, contract requirements in the contracts and the award criteria for tenders. In 2019, the Ministry of Infrastructure and Water Management adopted the strategy 'Towards climate neutral and circular

public infrastructure projects'. This confirms the objective that by 2030 all projects must be climate neutral and circular. This means that more and more projects with ECI value will be awarded and that more and more circular requirements will be drawn up.



### Looking ahead to 2020

In 2020, we will apply the ECI value to more contracts as an award criterion. For example, in performance contracts for fixed maintenance of roads and wet infrastructure. We will also continue to work on innovation in launching customer projects. For the InnovA58 project, for example, an innovation strip will be set up at the Kloosters service area for new types of asphalt, energy generation and lighting. Various studies have been carried out for circular roads signs and guide rails. The results will be announced in 2020.

As a follow-up to the Circular Viaduct project, Rijkswaterstaat will actively support companies in elaborating and developing innovations. An innovative tender for circular viaducts will be launched in 2020. In this so-called Strategic Business Innovation Research (SBIR), the government co-funds a research and development programme for innovations. Various parties develop multiple solutions at the same time. This increases both the market and the number of available solutions. The innovations are the first to be applied in a number of projects that have been announced in advance. Validation takes place immediately in these projects.



Frederieke Knopperts | programme manager Impulse Programme for Circular Economy

## *‘A unique process, which certainly bears repeating’*



**Sharing information about circular construction together with sixty people from different organisations. That’s what the Open Learning Environment Circular Viaducts and Bridges – an initiative of Rijkswaterstaat and the Bouwcampus – has been working on over the past year. There is already a great deal of knowledge, but it is fragmented over various parties. The Open Learning Environment has brought people and knowledge together.**

“The idea for the Open Learning Environment arose from the collaboration between Rijkswaterstaat, Van Hattum en Blankevoort and Spanbeton for the development of the first circular viaduct’, says Frederieke Knopperts. ‘When we decided to build the first circular viaduct near Kampen in 2018, the question immediately came up: What will come after this prototype? And how do we scale up as quickly as possible? Because circular bridges and viaducts were also being experimented with in other places in the Netherlands, we were looking for the most versatile thing – in terms of collaboration

and solutions.’ Sixty participants from market parties, governments and knowledge centres shared their knowledge and experiences of circular construction in the Open Learning Environment for nine months. They looked for more depth in six thematic lines: business and value case, procurement and tendering, supply-chain cooperation, material, design, technology and data. Frederieke: ‘The strength of a thematic line is that you sit around the table with a varied group: from a contractor, bank, engineering firm to a municipality – each with their own knowledge and perspective, of course.’

The project will be completed in November 2019. The various thematic lines presented their results and issued a recommendation on the further development of circular bridges and viaducts. As a follow-up to the Open Learning Environment, Rijkswaterstaat will continue to invest in the further development of circular viaducts. Ideally, a limited number of variants of circular bridges and viaducts will be developed. A suitable solution for a number of different situations, so that supply-chain partners do not always have to reinvent the wheel. A bridge that can be dismantled. for example, is not necessary for

a rural road that will probably remain the same for the next eighty years. But for the Amsterdam ring road, where adjustments are regularly made, such a bridge could be very suitable. It was a unique process to share open knowledge with so many different parties. Usually, the approach is who pays the piper calls the tune. But in this process, we at Rijkswaterstaat consciously chose to focus very little on the substance. This sometimes took a little getting used to, but in the end, it was the right thing to do. It has resulted in a lot of specific useful information and, in addition, the link between all those supply-chain partners is very valuable. So, I think the Open Learning Environment certainly bears repeating!

”

**For more information:**  
[debouwcampus.nl > issues > open learning environment circular viaducts](https://debouwcampus.nl/issues/open-learning-environment-circular-viaducts)



## Programme track 5: External cooperation

# Learn and develop together

The Implementation Programme for the Circular Construction Economy, the guidelines of the Platform CB'23, the 'Together Circular' (Samen Circulair) strategic alliance with ProRail and the bilateral cooperation with Germany. These are striking examples of the external cooperation that Rijkswaterstaat sought out in 2019.

## Background

When it comes to external cooperation, the main question is 'How can we achieve our ambitions together with other partners and thus accelerate the transition?'. Think of (co-)clients and governments agencies, market parties and knowledge centres, with whom we collaborate at both national and international level. Production chains are spread across several countries and the Dutch economy is heavily dependent on international raw material streams. Increasingly, policy and decision-making that is important for circular construction is taking place at the European level. Rijkswaterstaat is therefore seeking for partnerships and cooperation with other countries.

In the transition to a circular economy, we learn a lot from working with other parties. Our approach is therefore focused on learning and developing together.

We work together in a variety of ways:

- in chain projects and practical experiments, such as the Asphalt Impulse (Asfaltimpuls) and the Concrete Agreement (Betonakkoord);
- within knowledge and network platforms, such as the CB'23 Platform and Holland Circular Hotspot;
- through strategic collaborations, such as the 'Together Circular' (Samen Circulair) alliance with ProRail and the Client Forum in the Construction Industry (Opdrachtgeversforum in de Bouw).

## Right preconditions

The emphasis is on a number of ongoing activities aimed at creating the right national and international preconditions to work in a circular way throughout the chain, and in the long term throughout the sector and across borders.

The efforts and activities are organised around the goals we want to achieve together with the external partners:

- developing and exchanging knowledge;
- developing and advising policy;
- creating support and making clear agreements;
- participating in knowledge consortia and networks.

### Developing and exchanging knowledge

The focus is on broad exchange of knowledge and experiences from projects. We do this mainly with co-clients and knowledge centres, and internationally from bilateral cooperation and participation in EU knowledge organisations.

## Results

- **Establishment of three learning networks Climate-Neutral and Circular procurement:** Buildings, Infrastructure and Timber. Local and regional authorities can learn from experts and exchange experiences with each other. Rijkswaterstaat is at the forefront of the learning networks Construction and Civil Engineering (GWW).
- **Implementation of 'Together Circular' (Samen Circulair) with ProRail (2019).** A partnership with ProRail has been created and underscored in the form

of the ‘Samen Circulair’ alliance. This resulted last year in cooperation within the Climate Envelope, the Clients Forum (Opdrachtgeversforum), and we developed the strategy ‘Towards climate neutral and circular public infrastructure’ together.

- **Bilateral cooperation for knowledge exchange** with countries sharing a common ambition, such as Germany, Belgium, Finland, Sweden and Denmark. The basis for this contact is laid at international events, such as the Holland Circular Economy Week or the World Economic Forum.

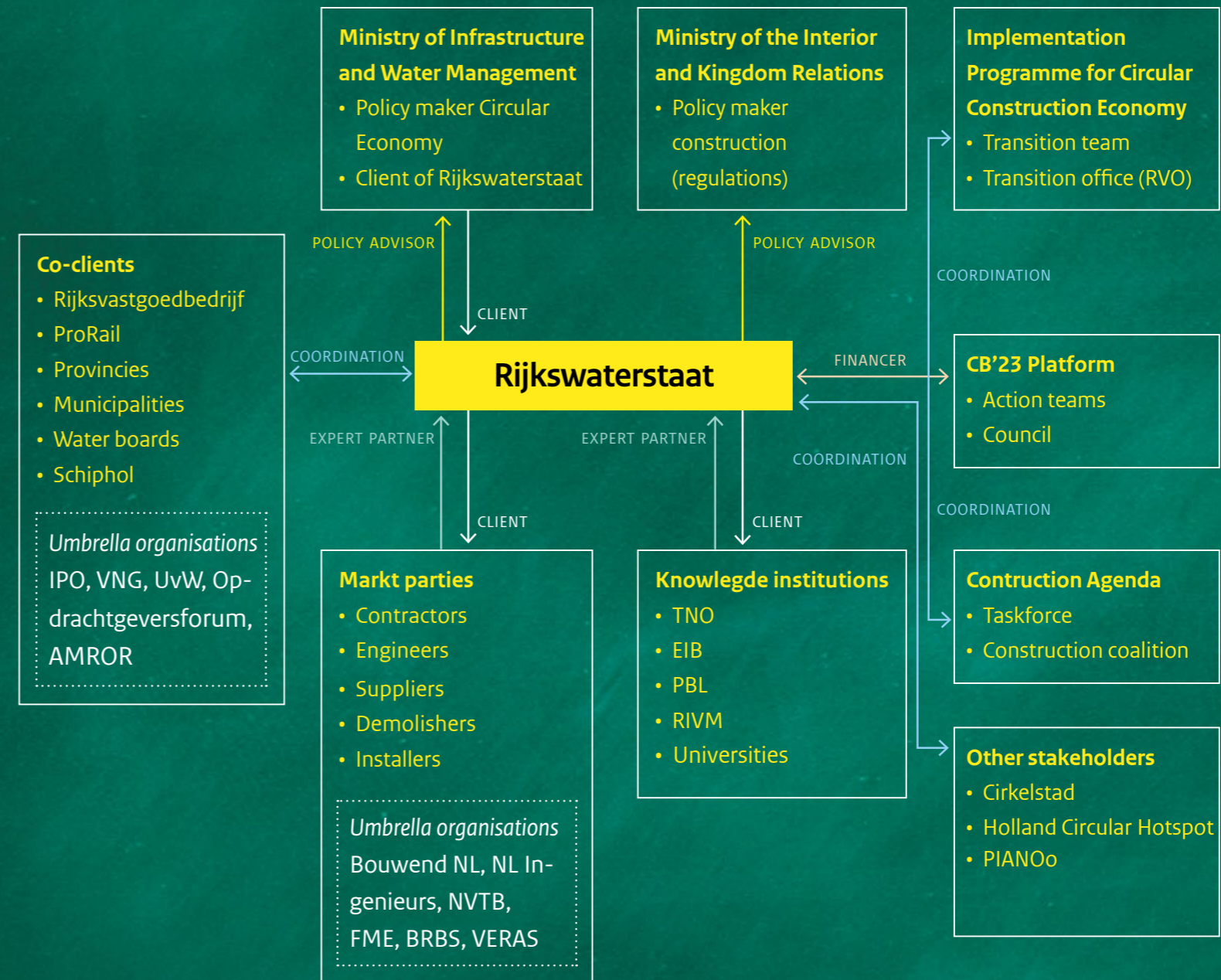
#### Contributing and influencing policy

We actively promote our circular vision and goals to existing networks and organisations involved in the existing networks. The aim is to influence the development and to create support for circular developments. At European level, we cooperate in the field of legislation and regulations.

#### Contributions

- **Support of the Implementation Programme for the Circular Construction Economy.** This programme is the most important policy development for the circular economy in the building and infrastructure sectors. The programme is directed by a Transition Team, of which Rijkswaterstaat is part. This way, we safeguard the ambition and contribution of Rijkswaterstaat and the infrastructure sector in national developments.

An impression of the national parties with which Rijkswaterstaat collaborates to realize the transition to CE







- **Influencing European and international policy and standards for circular construction** through, not least, CEN. CEN (Committee for Standardisation) takes up private legal agreements on construction standards, resulting in the familiar CE mark. Agreements are prepared in technical committees. The contribution from the Netherlands is made via NEN (Dutch Standardization Institute). Rijkswaterstaat is a member of the NEN committee, which has formal voting rights. We are also the Dutch representative in a working group on sustainability in the infrastructure sector, of which circularity is a part (working group 6 of TC 350).

#### Creating support and making clear agreements

In order to take steps, support is needed from all external stakeholders. Setting up and maintaining networks can contribute to this. In addition, it is important to make clear agreements with the sector, for example about the definition of circularity, how to measure circularity, or the information in a material passport. Internationally, we are also focusing on strengthening the market for secondary and renewable raw materials and Dutch innovations.

#### Results

- **Vision process with the sector.** We have started the process towards a roadmap to develop a clear picture of working in a circular way together with the sector. In this process, a direction will be chosen for specific dilemmas/issues. The results will be incorporated and specified in the elaboration of the four transition paths of the "Towards climate

*'We exchange knowledge about working in a circular way with other clients, for example via the Opdrachtgeversforum.'*

**Claartje Vorstman** – senior advisor circular economy

neutral and circular public infrastructure' strategy.

- **Knowledge sharing with other clients.** We share knowledge about working in a circular way with other clients, for example through the Clients' Forum (Opdrachtgeversforum). This is a platform where public clients, such as Rijksvastgoedbedrijf, ProRail, Schiphol, provinces and municipalities, coordinate and determine the direction in which they put out their tenders. Rijkswaterstaat is also a participant and co-initiator of the Circular Economy working group. In October, the working group delivered a publication containing project evaluations of circular projects of ProRail, Schiphol, the Rijksvastgoedbedrijf and Rijkswaterstaat.
- **Implementation of the Circulair Bouwen 2023 (CB'23) Platform.** In the summer of 2019, the platform presented three guidelines for measuring circularity, construction passports and a framework for circular construction. These were drawn up in action teams with participants from the construction sector and tested in broad consultation. This led to agreement and support for the necessary agreements. The 41 guidelines are now being implemented and tested

in practice. In October 2019, new action teams started to further develop the subjects of circularity measurement and construction passports. Rijkswaterstaat chairs Platform CB'23 and participates in the management board, action teams and working groups.

- **Cooperation for Dutch circular infrastructure innovations.** Together with the Dutch Consulate in Munich and the Netherlands Enterprise Agency, we started an exploratory process in 2019 to explore the German market potential for Dutch infrastructure innovations and knowledge. A market study was carried out and presented to a group of entrepreneurs during a meeting in the summer of 2019. This resulted in a follow-up at the beginning of October in Munich, where several Dutch companies were given the opportunity to promote their approach and innovations. It also resulted in stronger ties with our 'sister organisations' in Berlin and in North Rhine-Westphalia, and in better connections with German government agencies in this field.

#### Participating in knowledge consortia and networks

Rijkswaterstaat has a great deal of knowledge about circular works in the infrastructure sector. This knowledge is constantly updated and shared in the various networks and with other organisations.



## Results

- **Organisation of the fourth edition of the Week of the Circular Economy at Rijkswaterstaat.**

This is an annual, national campaign in which Rijkswaterstaat participates with a week programme full of inspiring activities. Participation

in this week has led to an attractive expansion and diversification of our network, more cross-sectoral cooperation and a broad dissemination of knowledge and awareness of the circular economy.

- **Contribution to the Market Day 2019**

Every year, Rijkswaterstaat organises market days to engage in talks with contractors outside the project

context. Working in a climate neutral and circular way was an important part of the Market Day in 2019. The theme will become a structural part of the Market Day in the years ahead.

- **Collaboration with Cirkelstad (Circular City).** This is a platform for leaders in the circular and inclusive construction sector. Rijkswaterstaat strengthened and underscored its partnership with Cirkelstad in 2019. We are now a partner in three Cirkelstad regions, where knowledge is exchanged with other members. We are also a participant in 'Accelerating Together' (Samen Versnellen). In this initiative of Cirkelstad, large clients and contractors bring in projects to be evaluated (among themselves). This is done using an audit system developed by TUDelft/Aceez. The results are thus also recorded centrally so that overarching lessons can be learned and analyses can be made.

- **Participation in the working group Innovation of CEDR (Conference of European Directors of Road).** CEDR is the collaborative organisation of European road authorities. The theme of the working group is 'Resource efficiency and the circular economy'. In this working group we can set out research questions in cooperation with the sister organisations of Rijkswaterstaat within Europe. In this way, expertise is gained and ultimately disseminated to relevant stakeholders.





## Programme track 6: Internal organisational change

# Driving a culture change

Working in a circular manner requires not only substantive knowledge development but also an internal organisational change. Examples of the approach of Rijkswaterstaat in 2019 include the learning history of the circular viaduct, a basic course on sustainability and training ambassadors to advise on working circular.

## Background

Internal organisational change is mainly about facilitating and enabling employees to work in a circular way. We share the knowledge and insights about working this way within the organisation, but also outside it. The most important studies and reports can be found on the internet ([afvalcirculair.nl](http://afvalcirculair.nl)) and are widely available. All Rijkswaterstaat employees are taken through the importance of working circular and what it means for their own tasks and responsibilities.

The activities are organised around the principles of internal change strategy:

- learning by doing;
- active communication;
- aligning with important developments in the organisation;
- use of figureheads and leading projects.

### Learning by doing

New products, knowledge or methods are developed, applied and tested in practice with the employees who work with them. Examples are the translation of the circular design principles into objects, measurement methods or the In-Depth Guideline on CE for MIRT projects. All knowledge and experience gained is actively shared. In 2019, the following results have been achieved:

## Results

- **Evaluation of six projects working with CE.**  
The wharves on the Merwedekanaal, Kleirijperij project, A27 Houten Hooipolder, A6 Lelystad Almere,

Reevesluis project and the Heinenoordtunnel.  
See: [opdrachtgeversforum.nl](http://opdrachtgeversforum.nl) > But how?

- **The Integral advice prototype circular viaduct and the Learning history for the circular viaduct.** The full recommendation incorporates the most important insights and lessons for the design, construction, monitoring and dismantling of the viaduct. For the learning history, all those involved were interviewed and one story was reconstructed. See: [www.circulairviaduct.nl](http://www.circulairviaduct.nl). This website also includes a video showing the assembly and disassembly of the viaduct.
- **Development Knowledge Agenda.** In this early phase of the transition to a circular economy, a lot of knowledge is still needed. The Knowledge Agenda Circular Economy shows what knowledge Rijkswaterstaat is seeking and what is already available. It also indicates which studies or projects will be used to answer these knowledge questions in the coming period. The knowledge agenda therefore forms the starting point for discussions with universities and other institutions. Building on each other's knowledge and applying it in specific projects is the quickest way to learn.

### Active communication

By actively communicating what is already possible, we create enthusiasm and support to start working with the circular economy. There are already 48 projects that put circularity into practice, see project map. We use events, such as the Week of the Circular Economy, to motivate those involved and to share knowledge. We explain the various organisational units of





Rijkswaterstaat in terms why working in a circular way is important, and translate this into their own tasks and responsibilities, for example through presentations and workshops with different departments.

### Results

- **Renewed intranet.** The internal website for all Rijkswaterstaat employees (DuLo intranet) has been renewed, is more transparent and the content is more focused on the recipient. Employees know what and where information can be found. With the renewed DuLo intranet, we activate employees, increase interaction and involvement. For example in the form of interviews and videos with employees about their

experiences when applying sustainability in their own work processes.

- **Presentations at various units of Rijkswaterstaat.** By thinking actively with regional units, we make working with circular principles more concrete. The organisational units are: Rijkswaterstaat Major Projects and Maintenance (GPO), Bridges and Viaducts department and the cost pool, and Rijkswaterstaat Western Netherlands North, Western Netherlands South, Northern Netherlands and Eastern Netherlands, team Water Framework Directive (WFD) and Rijkswaterstaat Sea and Delta.
- **Basic course on Sustainability and the Living Environment, including the CE.** This one-day basic course gives employees a varied and interactive introduction to sustainability and the living environment. The course gives a broad picture of developments, instruments and possibilities in the field of sustainability. This course is aimed at experts and sustainability coordinators. After the course, participants have the basic principles to include sustainability in their daily work.

### Aligning with dominant developments and HRM strategy

Many processes and programs are running within Rijkswaterstaat. By connecting to and by applying circular working methods in these developments, we ensure that the circular economy is included in the content.

### Most important trajectories

The most important trajectories for working circular are:

- **Market in Transition.** In the years ahead, Rijkswaterstaat will face a number of major assignments and social challenges in an increasingly complex setting. Our Minister recently shared with the Lower House of Parliament the need to distribute risks more fairly between market parties and the government. The aim is to create a market situation in which there is room for innovation in order to contribute as much as possible to the social challenges of our time. This was supported by a study by McKinsey & Company in 2019. The market parties and the relevant policy departments must jointly shape the necessary change. Rijkswaterstaat's response to this is the 'Market in transition' approach. The 'Towards climate neutral and circular public infrastructure projects' strategy is an integral part of the approach.
- **Launching Customer.** We agreed with the minister in 2018 that Rijkswaterstaat would act as launching customer for nine innovations. These nine innovations are intended as a visible step towards a climate-neutral and circular Rijkswaterstaat in 2030. Great results were already achieved in 2019. Within the Circular Viaduct project, for example, an Open Learning Environment for Circular Viaducts & Bridges was developed together with other authorities, knowledge centres and companies to share current knowledge about circular viaducts and bridges. An overview of the progress of these nine projects can be read here.



- **New Service Level Agreement for the management and maintenance of the national infrastructure 2022-2025.** Every four years, the Ministry of Infrastructure and Water Management and Rijkswaterstaat make agreements about the management and maintenance of the national infrastructure and the budgets available for measures and personnel. These agreements are laid down in a Service Level Agreement (SLA) and the budget. In order to achieve our targets, circularity and climate neutrality must be integrated in an increasingly structural manner in all awarding of contracts and budgets. It was decided in 2019 that this will be made concrete in the new SLA period (2022-2025).

#### Use of figureheads and leading projects

Good examples help to set the change in motion. We are using figureheads and leading projects for this purpose. Figureheads are employees with an exemplary role, who convey the circular message and initiate change. Leading projects are projects that make circular work concrete. The launching customer projects are examples of this.

#### Results

- **Update Project Map (2019).** In 2018, we drew up the first project map with 30 projects that are already working with circular principles. In 2019, we updated the information and there are a total of 48 projects and pilot schemes on the map.

- **Development approach and training project.** We train ambassadors to give advice on working circular in order to further set the changes in motion.
- **Best practices.** We have recorded personal stories and showcases of projects on sustainable road surfacing, Replacement and Renovation, Grebbedijk, Beatrixsluis, Open Learning Environment and CB'23 Platform.
- **Cultural research.** Rijkswaterstaat carried out cultural research in the field of HRM. This study offers insight into the intervention possibilities to steer more via the 'soft' sides of the transition.

*We train ambassadors to give advice on working with circular principles in order to set the changes further in motion.*

Think of the role management can play, or the need to work more collaboratively and solution-focused. Attention is also paid to the management of certain skills of employees in recruitment and selection.





# Chapter 3

# Our recommendations for 2020

Read what the Rijkswaterstaat will focus on in 2020 and what further steps will be needed to implement circular working methods.

### We are proud of the following results:

- Implementation of the CB'23 Platform and development of three guidelines for a more common understanding of the conceptual framework in the construction sector. There is also a great deal of interest in the follow-up.
- Development of the 'Towards climate neutral and circular public infrastructure projects' strategy, together with the Ministry of Infrastructure and Water Management and ProRail; a beacon which we will be working on over the next ten years.
- Addition of circular and climate-neutral ambitions in the contract awarding for major replacement and renovation projects (such as bridges and viaducts) and development of a practical guideline on how projects can get started.
- Construction and extensive evaluation of the first circular viaduct. Sharing knowledge in the Open Learning Environment on Circular Viaducts and Bridges, where we will now start a SBIR for circular bridges and viaducts.
- Development of the In-depth Guideline on CE for MIRT projects, with which we want to make circularity a part of our design and decision-making process, and help colleagues of Rijkswaterstaat to start working with CE (themselves).
- Elaboration of the circular design principles for various asset categories, such as locks, bridges, viaducts, dykes, road surfacing and tunnels.
- Development of a first indicator for CE to monitor all the Rijkswaterstaat material flows.
- Start of thirty innovation projects together with ProRail for concrete, steel, wood and asphalt via the Climate Envelope.
- Start of a new supply-chain initiative with the wood sector: a potentially sustainable alternative.
- 48 projects in which we work with circular principles.

A circular economy is taken more and more seriously. It is no longer an ambition that is just 'added to', but an ambition that is taken seriously and that can count on increasing commitment and concrete investments. Think of investments in further knowledge and innovation development and in sustainable solutions.

### Looking ahead

In 2020, we will focus on incorporating climate-neutral and working circular in the project plans and budgets. With the 'Towards climate neutral and circular public infrastructure' strategy, there is a solid basis to implement this together with the Ministry of Infrastructure and Water Management and ProRail.

#### Identifying cost-effective measures

In order to be able to achieve the targets for 2030, we need to get a better picture of the measures that yield the most CO<sub>2</sub> reductions. Rijkswaterstaat uses the cost curves tool to get a picture of the reduction potential of measures and the costs per tonne of CO<sub>2</sub> avoided. We now have an initial estimate of the costs and cost effectiveness of measures.

#### Creating more room for innovation tasks in production

In the coming years, a lot of knowledge will have to be developed and new innovations will be needed. It is crucial that there is room for these innovation tasks within current production. This is the only way we can gain the learning experience needed to standardise certain working methods.

*'I expect 2020 to be another good year, in which we will start working on the strategy and the elaboration of the transition paths and lay the foundations for the next ten years'*

**Frederieke Knopperts** – programme manager Impulse Programme Circular Economy

At the moment, we as an organisation are still experiencing tension between our regular production requirements and the contribution we make to knowledge development and innovation. Often this contribution is seen as 'an additional task' or we implicitly give too little support to deviate from the current procedures or frameworks.

#### Incorporating climate-neutral and working circular in contract awards

For projects, it is important that the transition to circularity and climate neutrality is consistently and explicitly included in the contract awarded by the Ministry of Infrastructure and Water Management to Rijkswaterstaat. This enables integrated considerations to be made in projects, and climate neutrality and working circularly will no longer be an 'additional task'. This explicit contract awarding requires an intensive dialogue between policy (the Ministry of Infrastructure and Water Management) and implementation (Rijkswaterstaat) about what is already possible at what cost.





# Chapter 4 Let's get started!

Do you want to work in a circular and climate neutral way yourself? To get you started, we have made an overview of useful documents and links.



## Guidelines

### Principles for circular design

An important intermediate step towards being circular is working in a circular way. This means that circularity has been given a place in all processes, working methods and contracts within the organisation. The [eight principles for circular design](#), which Rijkswaterstaat and consultancy and engineering firm Witteveen+Bos have developed in co-creation, are a tool to encourage this. Curious to find out more? Take a look at the [Inspiration guideline circular design](#) with ten example cases and the [Inspiration book for an integrated circular design approach](#), developed together with IPV Delft.

### In-depth Guideline on Circular Economy for MIRT projects

Rijkswaterstaat has set ambitious circular targets for 2030. Guidance on these objectives has also been included in the contract awarding. The 'In-depth Guideline on CE' helps to give substance to these objectives in projects of the Multi-Year Programme Infrastructure, Spatial Planning and Transport (MIRT). Read [here](#) how we want to make circularity part of our design and decision-making process, and get insights and tips to get started.

### Guideline on MIRT Sustainability for themes: Energy/CO<sub>2</sub> and Climate Adaptation

This guideline contains practical information on how to take early advantage of opportunities for energy saving, greening or climate resilience. It is also suitable

for non-MIRT projects and provides a list of possible measures.

**Guideline on climate-neutral and circular procurement**  
How do we achieve integral effect monitoring for climate-neutral and circular procurement? What are the challenges and actions we need to take in the coming years? Commissioned by Rijkswaterstaat, the consultancy firm Metabolic mapped out various measuring instruments in the field of Socially Responsible Procurement (SRP) and outlined what is needed to achieve a clear effect monitoring for climate neutral and circular procurement. Curious about the findings? Then take a look at this [link](#).

### Guideline on circularity in work processes

Would you like to know more about how we ensure that our assets retain their value for as long as possible? And how we make circularity part of all MIRT, R&R and SLA assignments and financial projections? [Here](#) you will find all the tips and tricks on the topic of circularity in current work processes. *Note: the link is only accessible to Rijkswaterstaat.*

### Circular procurement E-book

Clients can achieve higher sustainability ambitions if they ask more functional questions. This is evident from the publication Circular Procurement in 8 steps. This practical guideline helps purchasers, policy advisors and project leaders to independently initiate and implement a circular procurement process. The publication was made by consultancy firm Copper8 in cooperation with Rijkswaterstaat and can be

downloaded directly via this link: [E-book Circular Procurement in 8 steps](#).

### Guidelines of CB'23 Platform

The ambition of CB'23 Platform is to draw up national, building sector-wide agreements for circular construction before 2023. Download the following guidelines [here](#):

- Framework for circular construction: towards an transparent use of language and clear frameworks;
- Construction passports: requirements for a harmonised framework;
- Measuring circularity: requirements for a uniform measurement method.

## Inspiration

### Learning history: first circular viaduct

The realisation of the first circular viaduct was not without a struggle. The result turned out to depend on the people working on it, even more than on the technique. The stories of those people are bundled in a [Learning history about the first circular viaduct](#).

### But how?! Circular projects at (semi-)public clients

Many public clients are experimenting with circular strategies, circular tendering and how to get the market partners involved in this process. In order to learn from each other's projects, the Clients' Forum (Opdrachtgeversforum) started a study in 2019 into circular projects at four (semi-)public organisations: the Rijksvastgoedbedrijf, Schiphol, Rijkswaterstaat and ProRail.



What were the ‘drivers’ and barriers to construct in a circular way? You will find out in this [report](#).

### [Rijkswaterstaat as launching customer for sustainable innovations](#)

Rijkswaterstaat acts as [launching customer](#) in innovation projects. This means we want to be the first to apply innovations on a large scale to give businesses the opportunity to bring innovations to the market. Nine innovation projects have been selected to speed up the process. Wondering how we approach this and what the latest updates are? This [brochure](#) will bring you up to date.

### **Policy documents**

Working in a circular and climate-neutral way is not something that Rijkswaterstaat does on its own. We implement government policy, which is translated into policy frameworks, agreements and agendas. The list below lists the development of the relevant policy documents.

- [UN Paris Climate Agreement](#), 2015
- [Government-wide circular economy programme, 2016](#) (NL and EN)
- [Construction Agenda](#) (Bouwagenda), 2017
- [Raw Materials Agreement](#) (Grondstoffenakkoord), 2017
- [Draft Climate Agreement](#) (Ontwerp Klimaatakkoord), 2018
- [Transition Agenda Circular Construction Economy, 2018](#) (NL and EN)

- [Concrete Agreement](#) (Betonakkoord), 2018
- [Climate Agreement](#) (Klimaatakkoord), 2019
- [Implementation programme for Circular Economy 2019-2023](#), 2019 (NL and EN)
- [Implementation Programme for the Circular construction Economy](#), 2019
- [Strategy ‘Towards climate neutral and circular public infrastructure projects’](#), 2019
- [Objectives circular economy 2030: operationalisation, concretisation and reflection](#), PBL, 2019
- [Circular economy mapped out](#), PBL, 2019 (NL and EN)

### **Latest insights and contact**

Would you like us to think along with you about, for example, the (technical) impact of circular design principles or contract requirements for a specific project or asset? Or would you like to be helped on your way with handouts or simply learn more about our programme? Please contact us via [circulair@rws.nl](mailto:circulair@rws.nl), check our intranet or [www.afvalcirculair.nl/rwscirculair](http://www.afvalcirculair.nl/rwscirculair) for the latest insights and publications.





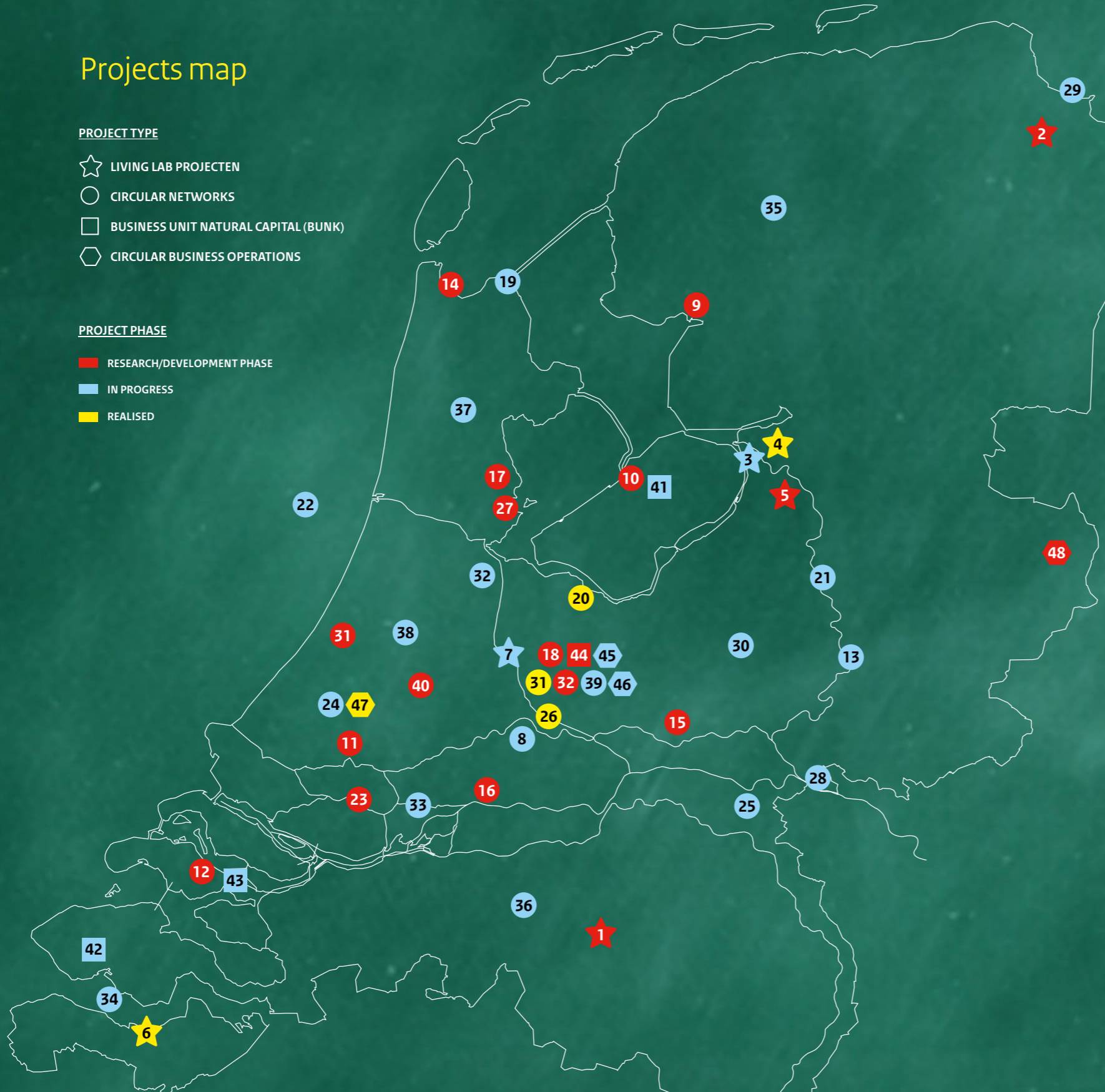
# Projects map

## PROJECT TYPE

- ☆ LIVING LAB PROJECTEN
- CIRCULAR NETWORKS
- BUSINESS UNIT NATURAL CAPITAL (BUNK)
- ⬡ CIRCULAR BUSINESS OPERATIONS

## PROJECT PHASE

- RESEARCH/DEVELOPMENT PHASE
- IN PROGRESS
- REALISED



## LIVING LABS

- 1 InnovA58
- 2 N33 Zuidbroek Appingedam
- 3 Circular control building Reevesluis lock
- 4 First circular viaduct (near Kampen)
- 5 Viaduct Hoog Burel and Hattemberbroek
- 6 District bulding in Terneuzen
- 7 Circular office layout of national government

## CIRCULAR NETWORKS

- 8 Reuse of arch bridge Vianen
- 9 Main waterway Lemmer Delfzijl: circular bank protection
- 10 A6 Almere Buiten Lelystad
- 11 Van Brienoordbrug bridge: renovation fixed arch bridges and mobile construction
- 12 Renovation Krammersluizen locks
- 13 Expansion Sluis Eefde
- 14 Renovation and widening Balgzandbrug
- 15 Flood protection programme
- 16 A27 Houten Hooipolder
- 17 Exploratory Corridor Study Amsterdam Hoorn
- 18 Multi anual Noise Abatement
- 19 Programme Project Afsluitdijk
- 20 A27/A1 UtrechtNoord junction Eemnes
- 21 Self Supporting River System (SSRS)
- 22 Rijksrederij
- 23 Heinenoordtunnel
- 24 Pilots foreseeable maintenance
- 25 Junction Ressen Oudbroeken (ViA15)
- 26 Beatrixsluis Lekkanaal canal
- 27 Exploratory dyke reinforcement Monnickendam/Gouwzee
- 28 Overnight mooring Spijk
- 29 Kleirijperij (Innovation Eems Dollard 2050)
- 30 Circulair road furniture

- 31 Plan development A4 Haaglanden N14 and exploration A4 Burgerveen N14
- 32 A9 Badhoevedorp - Holendrecht
- 33 N3 Dordrecht
- 34 Foreshore protection Westerschelde Oosterschelde
- 35 Long-term Variable Maintenance Noord-Nederland
- 36 Long-term Variable Maintenance Zuid-Nederland
- 37 Long-term Variable Maintenance West-Nederland Noord
- 38 Long-term Variable Maintenance West-Nederland Zuid
- 39 Wharves on the Merwedekade
- 40 A20 Nieuwerkerk aan den IJssel - Gouda

## BUSINESS UNIT NATURAL CAPITAL (BUNK)

- 41 Replacement poplars A6 Lelystad
- 42 Performance contract Dry
- 43 Showcase rest area Westkop
- 44 HollandsRIETJE

## CIRCULAR BUSINESS OPERATIONS

- 45 Real estate management: circularity in the management and maintenance contract
- 46 Circular catering introduced in all company restaurants of Rijkswaterstaat
- 47 Pilot projects circular procurement ICT
- 48 Circular design of roadside support

# Overview of our circular projects

## LIVING LABS

Living Labs are practice-oriented development, testing and learning environments. An important starting point is that we develop, test and monitor innovations as much as possible on or around the project.

### 1 InnovA58 Completion: 2023

The aim is to realise all material flows as circular as possible. Parallel to the regular design, the engineering office has made a circular design. A complete circular design turned out to be not (yet) possible. It has become 'as circular as possible'. This gives us insight into the possibilities and dilemmas of circularity in road design. The engineering office has also drawn up circular design principles. These have been further developed. Various variants have been assessed on sustainability and feasibility and they have been applied in various projects. This has provided knowledge on how to measure circularity and what this means for the CO<sub>2</sub> reduction of a circular design over multiple use cycles. The principles and knowledge gained will be included in the further development of the living lab InnovA58 (starting in 2020) as part of the launching customer projects.

### 2 N33 Zuidbroek-Appingedam Completion: 2023

Circular economy is of paramount importance in the doubling of the N33 Zuidbroek-Appingedam motorway. The project is included in the EU curriculum CircPro. In addition, four measures will be implemented:

- As much reuse as possible of the road and structures to be disposed of. Extra time will be reserved for this in the construction phase.
- As much circular road furniture as possible, by reusing conventional road furniture or the use of biobased products.
- Exploration if sludge from the EemsDollard can be applied in the project.
- The project functions as a location for the design of a future-robust circular structures, for the Innovation Demand (SBIR) for circular viaducts.

### 3 Circular control building of Reevesluis lock Completion: 2021

Within the scope of the contract that had already been concluded, a study was carried out during the implementation phase into the incorporation of sustainability measures. This led to the following measures:

- Ecocrete was used, concrete in which the coarse aggregates were replaced by concrete granulate. In this project, Ecocrete was only used in the underwater concrete, but in time, this can also be applied more widely.
- In addition, a circular control building has been developed. One of the possible future scenarios is that the Reevesluis lock will be remotely controlled from another location. The control room (the top layer of the building) has been made modularly demountable. As a result, it can be remounted at a different location as a control room, but can also become a home or catering building, for example. The starting points for this design can also be applied to other lock projects.

### 4 First circular viaduct (near Kampen) Completion: 2019

A prototype of a circular viaduct was built in the autumn of 2018. Until September 2019, it was tested by work traffic on the construction site of the Reevesluis project. The viaduct is circular because it is reusable at a different location and adaptable. The design consists of concrete 'Lego blocks' in standard dimensions. These are connected to each other with steel pre-tensioning cables. This way there is no waste, no new raw materials are needed and used raw materials are reused in the highest quality way. In addition, the elements are hollow to make them as light as possible. The experiences were made public at the end of 2019 and shared in a transparent 'Open Learning Environment'. Sixty participants from market parties, government bodies and knowledge centres share their knowledge and experience about the circular construction of viaducts and bridges. Rijkswaterstaat will encourage further development, for example with the SBIR procurement method.

### 5 Viaduct Hoog Burel and Hattemerbroek Completion: Hoog Burel 2022, Hattemerbroek unknown

The preferred alternative for both projects has been drawn up on the basis of RAMSSHEEP criteria and on the basis of the status of the viaducts and customer requirements and wishes. The opportunities for sustainability were explicitly taken into account and a future-proof solution was sought, suitable for unlimited use. This has led to the following circular principles:

#### Hoog Burel

- We formulate sustainability ambitions, lay them down in the assignment and translate them into contract requirements. We look at the possibilities for the reusability of parts (handrails) and materials.
- We apply the best price/quality ratio (QPR) criterium, aiming for a low ECI value.

#### Hattemerbroek

- The current viaducts can be maintained. Originally it was assumed that one of the two viaducts had to be replaced.
- The possibilities to include a circular approach in the project will be explored.

### 6 District building Terneuzen Completion: 2017 (2019)

During the demolition of the district building, the materials and raw materials that were released were reused as much as possible in the highest quality way. Employees of a social workshop treated them and made them suitable for reuse. Some 30%-40% of the harvested materials were used to build a new children's and youth clinic. In the new building this represents 25%-30% of all materials. Other released materials have been used by companies, such as wholesalers. The materials that are left over are at the work placement company and will be used at the clinic for the next renovation.

### 7 Circular office design of national government Completion: 2018

Rijkswaterstaat buys office furniture for the entire national government. In 2017, we signed a contract with two suppliers for circular office furniture for around 100,000 workplaces. Existing furniture will be refurbished for reuse. Only when that is really not possible, we purchase new circular furniture. The use of the so-called 'Rijksmarktplaats' stimulates the reuse of surplus goods by governments. In 2019, the facilities organisation of Rijkswaterstaat refurbished more than 800 pieces of office furniture and reused more than 1,500 pieces.

## CIRCULAR NETWORKS

We design, construct and maintain our network of waterways and roads in a circular manner. We do this together with market parties.

### 8 Reuse of arch bridge Vianen Completion: unknown

This bridge is to be demolished.

**Circular:** It was investigated whether the bridge could be reused as a whole or in parts and a feasibility study was carried out. Various options for reuse were investigated, such as the bridge Suurhoffbrug, which is to be built temporarily. And for the bicycle bridge sections, it was investigated together with regional partners whether they could be reused. But these options were not suitable for organisational, logistical or technical reasons. A market initiative to realise residential construction on the bridge was also assessed. This initiative also had financial uncertainties and insufficient support from regional partners. The demolition of the bridge has now been tendered and market parties are being stimulated via QPR criteria to reuse the bridge at a high level of quality and to monitor where the parts of the bridge end up for a period of five years.





### 9 Main waterway Lemmer - Delfzijl: circular bank protection

**Completion:** 2027

There are new performance contracts for maintenance. This often concerns the modification or replacement of bank revetment.

**Circular:** More insight has been gained into life cycle costs (LCC) and life cycle analysis (LCA) of the solution variants in the study.

### 10 A6 Almere Buiten - Lelystad

**Completion:** unknown

This project concerns the widening of the A6 from two to three lanes due to the expansion of Lelystad Airport.

**Circular:** Rijkswaterstaat has drawn up a book of opportunities for sustainability, including various circular opportunities. One idea, for example, is to set up a regional raw materials bank with the province of Flevoland as director. In the near future it will be investigated how these opportunities can be included in the project.

### 11 Van Brienoordbrug: renovation of fixed arched bridges and movable construction

**Completion:** unknown

This project concerns two bridges, one of which is in need of renovation and the other one is in need of conservation, and the renovation of the movable bridge sections. With the deployment of a new bridge, the bridge to be conserved must be temporarily conserved somewhere else without causing any nuisance. When that is done, we will put this bridge back in place and the new bridge will replace the one to be renovated.

**Circular:**

- For the bridge to be renovated, we will carry out an exploratory study in order to reuse it elsewhere in its entirety or as high quality as possible.
- Movable parts: we are investigating whether we can standardise certain moving parts. This is an important step to enable interchangeability of parts.

### 12 Renovatie Krammersluizen

**Completion:** unknown

In order to maintain safety and availability on the main waterway network, the locks Krammersluizen are being renovated. Part of this is an innovative fresh/saltwater separation (IZZS). Apart from the renovation, the site around the Krammersluizen has been used to generate wind energy.

**Circular:**

- We take circular economy into account by looking at the reuse of released materials and by including circular aspects in the design.
- Faster locking will allow more ships to go through the lock, allowing us to postpone the construction of an additional lock.

### 13 Expansion of lock 'Sluis Eefde'

**Completion:** 2020

Rijkswaterstaat is expanding the lock complex Sluis Eefde with a second lock to reduce waiting times and improve accessibility to the port of Twente.

**Circular:**

- Other use of DuboCalc in the tender: the material and energy components were disconnected and assessed separately. As a result, the return on investment for sustainability for both the use of materials and energy for transport was included separately in the assessment of the tender.
- A flexible lower limit was used in the tender for the Environmental Cost Indicator (ECI), giving bidders additional incentives to submit environmentally friendly solutions.

### 14 Renovation and widening of bridge Balgzandbrug

**Completion:** unknown

The old bridge is too narrow and is being widened. The foundation is very robust and will be reused.

**Circular:**

- DuboCalc will be included in the tender.
- Various materials (including wood and composite) have been compared with each other. Value Engineering techniques were used to optimise variants for sustainability. All variants were calculated on different indicators for CE.
- Even a wooden bridge design has been further elaborated and proves to be feasible in terms of profile and weight, so it remains possible as one of the variants.

### 15 Floodprotection programme

**Completion:** continuous

Get the flood protections in order that were rejected in the (extended) Third Assessment for flood protections. In essence, this is the Flood Protection Programme: a programme in which central government and water boards work together intensively to protect the Netherlands against flooding.

**Circular:** Sustainability is explicitly included in the contract awarding. We investigate what a circular economy means for dyke design, earthmoving and bank revetment. Over the next few years, we will gain both research and practical experience with this. Lessons from one project can be translated into subsequent projects.

### 16 A27 Houten - Hooipolder

**Completion:** 2022

This concerns the widening of the A27 motorway where three bank connections will be replaced by new bridges.

**Circular:** Circularity is taken into account in procurement criteria/QPR and contract requirements. In addition, in the Amsterdam-Rotterdam-Rijkswaterstaat context, we are looking for opportunities to reuse the freed-up bridges Keizersveerbruggen elsewhere.

### 17 Exploratory Corridorstudy Amsterdam - Hoorn

**Completion:** unknown

This is a MIRT exploration of possible measures to improve accessibility in the area between Amsterdam and Hoorn. It concerns roads such as the A7 and A8, but also bicycle connections and railways.

**Circular:** Circular economy has been part of the MIRT study and of the assignment at the engineering office. The study looked, for example, at the extent to which different variants provide for the capacity increase and what this means for the use of materials. This approach can help to make considerations between capacity increase and material use.

### 18 Multi-yearprogramme for noise abatement

**Completion:** 2023

In order to reduce noise pollution along national roads, the Multi-Year Noise Abatement Programme (MJPG, Meerjarenprogramma Geluidssanering) develops noise measures throughout the country.

**Circular:** In the coming years, various noise barriers will have to be replaced or installed. We are investigating the reusability of existing barriers, more sustainable use of materials and demountable design (modular design with standard elements) of the noise barriers. In addition, we are looking at the ECI value in procurement.

### 19 Project Afsluitdijk

**Completion:** 2022

The Afsluitdijk will be reinforced and raised. The discharge capacity of water to the Wadden Sea will also be increased.

**Circular:**

- DuboCalc has been included in the tender. This resulted, among other things, in the use of specially designed concrete blocks for the protective cladding of the lower part of the dyke (Levvell-blocks). These have a low Environmental Cost Indicator value (ECI value) and are made of a durable concrete mixture.
- Along the road, the contractor uses a new type of guide rail to ensure that the central reservation remains narrower. This leaves room for a wider emergency lane without widening the dyke. This results in cost savings as well as material and CO<sub>2</sub> savings.

### 20 A27/A1 UtrechtNoord and Eemnes junction

**Completion:** 2018

In order to improve accessibility and traffic flow, the A27 motorway between Utrecht-Noord and Eemnes junction and the A1 motorway between the Eemnes junction and Bunschoten were widened.

**Circular:** We investigated whether we could reuse materials and whether we could use sustainable materials, in particular sustainable asphalt. A new asphalt mixture ensures a longer service life. We also used a foundation of hydraulic mixing granulate, which meant that we had to make (and transport) less thick asphalt. Both result in CO<sub>2</sub> savings. These innovations for asphalt were introduced during implementation and financed from the Climate Evelope of the Ministry of Economic Affairs and Climate Policy.



## 21 Self Supporting River System (SSRS)

**Completion:** 2021

The SSRS programme seeks concrete opportunities and smart partnerships for affordable, reliable and sustainable river management, in which the river manages and maintains itself as naturally as possible.

**Circular:**

- Reuse of released sediment and biomass in site management.
- Pilot Van Berm tot Bladzijde: Fibres are made from grass clippings and processed into cardboard/paper.
- Pilot Flexibele kribben: these breakwaters are made up of X-stream blocks, a modular and adaptive system. Because of the chosen design, less dredging is required. The flexible breakwaters can also be built steeper than traditional breakwaters, so less material is needed.
- Pilot Rivierhout voor sedimentsturing: research is being carried out into whether barriers of river wood can prevent bank erosion, which can reduce dredging effort.
- Pilot Grazers als maaiers: to explore whether the use of sheep instead of mowers leads to more sustainable mowing management, a multi-year trial was started in 2016 with the deployment of a flock of sheep along the Twente canals.

## 22 Rijksrederij

**Completion:** continuous

The ships of the Rijksrederij must be replaced. Obsolete ships disappear or are replaced by a smaller number of Multi Purpose Vessels (MPVs).

**Circular:**

- We pay a lot of attention to making the MPVs more sustainable, for example there is a green passport for used materials.
- In the design and construction of the new ships, attention is paid to high-quality reuse of materials.
- We are working on the development of a strategy for involving circularity in decisions on the phasing out of obsolete vessels.
- Optimisation of ship deployment. As a result, fewer ships will sail, which will also be used more efficiently.
- Reduction of CO<sub>2</sub> emissions by sailing on a mixture of 30% biofuel (old deep-frying fat) and 70% normal gas oil.

## 23 Heinenoordtunnel

**Completion:** 2020

The first Heinenoordtunnel is in need of a major refurbishment. The renovation concerns the concrete tunnel construction and the technical installations.

**Circular:**

- Sustainability is taken into account in the realisation phase, among other things in limiting scarce and environmentally unfriendly raw materials in installations, standard dissipation of the installations and steering towards reuse of released installations.
- The ambition is 'no waste' and a circular service building. There is research into the feasibility and (financial) consequences of this.
- Knowledge about the possibilities for circular dimensioning in tunnels is being further disseminated.

## 24 Pilots voorspelbaar onderhoud

**Completion:** 2020

The aim of the pilots is to maintain bridges, locks and tunnels exactly on time and therefore more efficiently.

**Circular:**

- Due to the information from the sensors, the maintenance of the installations is carried out more precisely and only when it is really necessary. As a result, we only replace most parts when they are really broken. In this way, we extend the service life of parts, increase the reliability of our installations and reduce delays.
- Due to the positive results of the first pilot at the locks Bernhardsluizen, it was decided to start three other pilots at the locks Kreekrasluizen and at Eefde and IJmuiden.

## 25 Junction Ressen - Oudbroeken (ViA15)

**Completion:** 2022-2024

This project concerns the extension of the A15 to the A12.

**Circular:** The call for tenders includes the environmental cost award criterion (ECI value) with a flexible lower limit. The contract is based on an energy neutral project and possibilities for circular road furniture.

## 26 Beatrixsluis Lekkanaal

**Completion:** 2019

In order to allow more large ships to pass the Princess Beatrix lock, we built a 3rd pond and widened the canal Lekkanaal.

**Circular:** Part of the project was a learning process with the material passport.

## 27 Pre-exploration dyke reinforcement Monnickendam/Gouwzee

**Completion:** unknown

The result of this pilot is an approach for an 'Integral scope determination of water safety'. Integral consideration was given to water safety, spatial quality and sustainability. A number of tools were developed, such as a timeline and a spatial analysis.

**Circular:** By approaching tasks integrally, links can be made between material flows or in functions. In this way material can be saved. This will be worked out in more detail.

## 28 Overnight mooring Spijk

**Completion:** 2022

This concerns the construction of a new overnight port on the river Waal for approximately fifty berths.

**Circular:**

- Extensive sustainability opportunities were raised during the design process. Considerable environmental savings can be achieved with the reuse of rubble. The rubble in the reference calculation contributed 50% to the total ECI value.
- In the tender, the requirements have been broadened: no certificate is requested for the rubble, but the contractor can demonstrate the quality by means of inspections, which makes the application of reused quarry stones possible.
- The contractor was given an incentive to reuse released rock on site.

## 29 Kleirijperij (Innovation Eems Dollard 2050)

**Completion:** 2021

Too much silt is present in the Eems Dollard. As a result, the water quality is not good, and biodiversity is declining. A lot of silt accumulates in the harbours, which means that moderate dredging work is usually required. On the other hand, there is a need for clay in the area to reinforce the sea dykes and to raise agricultural land. By extracting silt from the Eems Dollard and converting it into clay, a win-win situation is created. In the Kleirijperij pilot project, The Rijkswaterstaat, together with many other partners, is investigating various ways of converting the sludge into clay. If this is successful, scaling up is on the horizon.

**Circular:**

- High-quality reuse of material.
- CO<sub>2</sub> reduction through less dredging.

## 30 Circular road furniture

**Completion:** continuous

The Rijkswaterstaat distinguishes 11 categories of road furniture such as guide rails, public lighting, sound barriers and signs. For all these categories a circular alternative should be available in 2025. Available alternatives will be promoted within Rijkswaterstaat and new alternatives will be developed with the market.

**Circular:**

- Reuse of existing products such as signs, guide rails, gantries and lighting poles.
- Increasing the recycling value of the metals from which a lot of road furniture is made.
- Increasing the dismountability of the products.
- Execute products in bio-based materials, such as wood, bamboo or biological waste streams.
- Better separation of the waste streams and higher quality application.



**31** Plan elaboration A4 Haaglanden - N14 and Verkenning A4 Burgerveen - N14  
**Completion:** 2020

In this plan elaboration and exploration, measures to improve traffic flow on these roads are investigated and elaborated.  
**Circular:**

- Further research into circular options for the structures.
- A Material Flow Analysis (MFA) of the project will be made.

**32** A9 Badhoevedorp - Holendrecht  
**Completion:** unknown

This project consists of the widening of the A9 with a sunken location near Amstelveen.  
**Circular:** The tender was awarded in 2019 with an award criterion for environmental costs (ECI value).

**33** N3 Dordrecht  
**Completion:** unknown

The N3 near Dordrecht has to be renovated.  
**Circular:** The tender was awarded in 2019 with an award criterion for environmental costs (ECI value).

**34** Foreshore protection Westerschelde Oosterschelde  
**Completion:** unknown

This project consists of strengthening the foreshores of the Westerschelde and Oosterschelde.  
**Circular:** The tender was awarded in 2019 with an award criterion for environmental costs (ECI value).

**35** Lon-term Variable Maintenance Noord-Nederland  
**Completion:** unknown

All the asphalt in parcels East and West in the region Noord-Nederland of Rijkswaterstaat is in need of major variable maintenance (GVO).  
**Circular:** This was the first contract for GVO that was awarded with an award criterion for environmental costs (ECI value). The project was awarded in 2018. The work started in 2019, including a sustainable porous concrete (zoab) mixture with 50% recycled asphalt.

**36** Long-term Variable Maintenance Zuid-Nederland  
**Completion:** unknown

This project concerns the major variable maintenance of all the asphalt in parcels West, Middle and South-East in the region Zuid-Nederland of the Rijkswaterstaat.  
**Circular:** Tender in 2019 with an award criterion for environmental costs (ECI value).

**37** Long-term Variable Maintenance West-Nederland Noord  
**Completion:** unknown

Major variable maintenance of all the asphalt in parcels South and North in the region West-Nederland Noord of the Rijkswaterstaat.  
**Circular:** Tender in 2019 with an award criterion for environmental costs (ECI value).

**38** Long-term Variable Maintenance West-Nederland Zuid  
**Completion:** unknown

Major variable maintenance of all the asphalt in the region West-Nederland Zuid of Rijkswaterstaat.  
**Circular:** Tender in 2019 with an award criterion for environmental costs (ECI value)

**39** Merwedekade  
**Completion:** 2021

The foundations of the quay walls have reached the end of their service life and are therefore being replaced.  
**Circular:**

- As much local reuse of materials as possible.
- Concrete aprons are demountable and therefore easy to replace in case of damage.

**40** A20 Nieuwerkerk aan den IJssel - Gouda  
**Completion:** unknown

A plan is being worked out for the widening of the A20 between the Nieuwerkerk a/d IJssel and Gouda junction from 2 x 2 to 2 x 3 lanes.  
**Circular:** The assignment for the study and plan development explicitly includes an assignment to further

investigate how existing elements and materials in the study area (soil, bridges, road surface, portals, crash barriers, etc.) can be used in the design variants of the project decision. This is to prevent and reduce the use of primary raw materials.

## BUSINESS UNIT NATURAL CAPITAL (BUNK)

The Business Unit Natural Capital (BUNK) looks at the Natural Capital of Rijkswaterstaat with different eyes. BUNK creates new earning models and added value for the wood and grass flows that are released within our projects.

**41** Replacement of poplars A6 Lelystad  
**Completion:** 2019

Along the A6 motorway at the Lelystad exit, there were approximately 7,000 poplars that had reached the end of their lifespan. There was a chance that the trees would eventually fall over, which was a danger to safety. They were replaced in cooperation with Staatsbosbeheer.  
**Circular:** In addition to the replacement of the poplars, 2,000 extra poplars were planted. The wood of the poplars is sold within the Netherlands by BUNK.

**42** Performance contract Dry  
**Completion:** 2021

The Droog performance contract regulates the management and maintenance of the roads and related matters.  
**Circular:** In this new contract, priority has been given to sustainability. Biobased materials are used in the replacement of road furniture. A learning environment has also been included for qualitative harvesting, i.e. harvesting under the right specifications and conditions, so that the raw material can be used in a valuable/high-quality way.

**43** Showcase Servicearea Westkop  
**Completion:** continuous

Westkop has been set up as a showcase for biobased innovations. The aim is to introduce road users to biobased applications. This makes it the most sustainable car park in the Netherlands.  
**Circular:** The car park has been equipped with the following biobased innovations: picnic benches of roadside grass and tomato plants, biobased crash barrier, beehive hotel and sustainable building blocks (of plant remains).

**44** HollandsRIETJE  
**Completion:** unknown

A drinking straw made from reed from Rijkswaterstaat work area. This will be further developed into a chain next year. Rijkswaterstaat caterer is interested in using the straws in the company restaurant.  
**Circular:** Use of released material (reed) from the company's own acreage.

## CIRCULAR BUSINESS OPERATIONS

We organise our own business operations circularly. We do this, for example, by purchasing circular office furnishings, catering and ICT equipment.

**45** Circular Property management  
**Completion:** 2023

In May 2018, the new contract was signed for the maintenance and management of the 650 real estate properties managed by Rijkswaterstaat: district offices, traffic centres, wet and dry support points, lighthouses, etc.  
**Circular:** The new maintenance contract sets higher sustainability and circularity requirements, which will be concretised and tightened during the term of the contract.





## 46 Circular catering introduced in all Rijkswaterstaat's company restaurants

**Completion:** 2026

In October 2019, a new catering concept was introduced in all Rijkswaterstaat company restaurants. Spearheads of this are: enjoy, healthy and circular.

**Circular:**

- We use more vegetable, healthy and sustainable products. In addition, we want to use local products as much as possible, reduce residual waste and use high-quality residual flows.
- We also reduce food waste. To this end, the company restaurant in Utrecht measures at a detailed level what is thrown away and what part of it was still edible. It has been agreed with the caterer that we will continue to improve every year. This is reflected, for example, in the protein transition: in 2025 we want 80% of all protein in our restaurants and our banqueting (catering for meetings) to be vegetable. At the moment this is about 35%. By 2020, it should be 50%.

## 47 Pilot projects circular procurement ICT

**Completion:** 2019

This concerns the tendering of the pilots for circular tendering of ICT: Mobile Only and Video Chain.

**Circular:**

- In the Mobile Only pilot, we focus on refurbished laptops and on extending the use and thus the life span of the laptops.
- The Video Chain pilot works with circular principles (e.g. uniform components) with which tenderers can earn extra points in the tender.

## 48 Circular design of road supports

**Completion:** 2021

In the coming years, a lot of renovation and new construction will take place at our road supports (e.g. salt warehouses). The first five have already been newly built. Sustainability was already on the agenda in this design. Nevertheless, we have adapted the design based on these experiences.

**Circular:** A few examples:

- Instead of concrete floors, there will be wooden floors (in office buildings) or asphalt that can be reused (at the unloading points of the salt).
- The retaining walls and floors of the salt shed are disconnected from the main load-bearing structure, allowing walls and floors to be replaced without having to modify or demolish the structure.
- Stony inner walls of (office) buildings are replaced by wooden walls.

In addition, all these supports will be free of gas, solar panels with energy neutrality as a starting point and we will apply higher insulation values than required by law (Dutch Building Decree).

## Colophon

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