



Rijkswaterstaat  
*Ministry of Infrastructure and the  
Environment*

Annual Report  
Rijkswaterstaat

# 2016



Cover photo:

*Anchored dead trees in the Hemelrijkse Waard*

# Contents



	Foreword	3
1	2016 at a glance	4
2	Smooth and safe transport by road A single plan for city and motorway	8 14
3	Smooth and safe transport by water Building the world's largest sea lock	16 20
4	Protection against flooding Flood safety and spatial quality go hand in hand	22 26
5	Sufficient clean water More scenic areas, healthier water, greater flood safety and enhanced quality of life	28 32
6	A sustainable living environment First energy self-sufficient motorway in the Netherlands	34 38
7	Reliable and useful information More effective and more efficient traffic and road management	40 44
8	Changes in the organisation Children advise Rijkswaterstaat	46 50
9	Summary annual accounts 2016	52



# At the heart of society

2016 was a dynamic, challenging year for our organisation as we pursued the goal of making the Netherlands safe, accessible and liveable. Mobility is increasing nationwide. We are working with new safety standards to protect the country from flooding. And there is a new climate agreement spurring us on to work towards sustainability.

More than ever before, Rijkswaterstaat faces the challenge of integrating infrastructure into the living environment. I'm pleased to say that we're getting better at it. Many of the results we achieved in 2016 bear witness to that.

For example, the Room for the River Programme yielded further benefits in 2016. The projects not only made both the river basin and the country as a whole safer from flooding, but also improved the quality of life and created more areas of natural beauty.

We also focused on integrating roads into the landscape. Technological, logistic and sustainable innovation is a major feature of the Schiphol-Amsterdam-Almere Programme.

In Maastricht, the Netherlands' first double-decker tunnel came into service. Now, motorists can travel from Amsterdam to the French Riviera without encountering a single set of traffic lights. At the same time, the tunnel presents great opportunities to invest in the quality of life in the city of Maastricht.



We are proud of these achievements. But we cannot rest on our laurels. We still have a great deal of work to do. For example we need to make our national infrastructure smarter, more sustainable and more user-friendly. This calls for innovation in partnership with other parties, more than ever before.

Society is making greater demands on us. People want a government that brings them together and helps them to plan their living environment. And they also want us to be a customer-oriented service provider on the roads and waterways.

In order to meet these needs, Rijkswaterstaat wants to be at the heart of society. That is the ambition of Strategy 2020, our new organisational plan, which was set out in 2016. The strategy was mainly developed by our own staff. The challenge is to deploy their skills and knowledge to meet the new requirements of infrastructure users – flexibly, in close partnership and with a service-driven mindset.

In 2016, collaboration with the construction sector also took on new forms. Clients, contractors, government agencies and knowledge institutions are now working more actively together to guarantee quality for society in all its forms. The Market Vision published in 2016 provides a source of inspiration and acts as a catalyst.

But it wasn't only the results we achieved that made 2016 a special year for me. It was also my last full production year as director-general of Rijkswaterstaat. It was an honour and a pleasure to serve in this job for the past seven years.

During this time, both the Netherlands and Rijkswaterstaat underwent some significant changes. They began the period vulnerably, in crisis, but evolved towards a future-oriented society, with new partnerships, innovative challenges and fresh vigour.

These elements form a pattern throughout this annual report. I hope you will find it an interesting overview of Rijkswaterstaat's work in 2016.

mr. ing. Jan Hendrik Dronkers,  
director-general Rijkswaterstaat





# 1 2016 at a glance

Keep the Netherlands safe, competitive, accessible and liveable. That was the watchword of the second Rutte government. Rijkswaterstaat worked every day in 2016 to achieve this aim. Because we all want to live and work in safety behind the dikes and dunes. We want to travel safely and quickly to our destinations. And we want a constant supply of sufficient clean water in a country where quality of life is ensured. To achieve these objectives, Rijkswaterstaat had a budget of around 4.3 billion euros in 2016.

## Road construction projects

It was quiet on the Dutch motorways during the past few years. But since the end of the financial crisis, the volume of traffic has grown steadily, with congestion expected to increase by 38 per cent between 2015 and 2021.

Rijkswaterstaat is responding by working on bottlenecks in the road network. Busy roads are being widened, and new sections of road are being built to fill in the missing links in the main road network. The second Rutte government

instructed Rijkswaterstaat to construct 717 kilometres of new motorway lanes. By the end of 2016, 678 kilometres had been completed, 72 of them in that year.

In 2016, fifteen new sections of road came into service. The road tunnel in Maastricht and the extra lane on the Ede-Grijsoord section of the A12 were the most striking examples along with the Schiphol-Amsterdam-Almere corridor, where work is still in full swing.





*Wildlife crossing under the Ede-Grijsoord section of the A12*

In 2016, preparations were made to tackle several serious bottlenecks in the road network. In the next few years, for example, a new road will be built linking the A13 and the A16 near Rotterdam, and the A10 to the south of Amsterdam and the Utrecht ring road will be widened.

### **Better Use**

The second Rutte government also wants to improve traffic flow by making better use of existing roads. With its Better Use Programme, Rijkswaterstaat is collaborating with other public authorities and market parties on smart measures to reduce congestion in the country's busiest regions. In 2016, we took extra measures to link in with new social trends like urbanisation, computerisation, changing patterns of behaviour and a greater focus on quality of life. The aim is to achieve a 10 per cent reduction in door-to-door travel times in the busiest areas by 2017.

In 2016, Rijkswaterstaat also introduced extra measures to tackle traffic jams. Under the banner Fileaanpak 2020, Rijkswaterstaat is now working on measures such as faster salvaging of heavy goods vehicles after incidents, deployment of road inspectors at traffic congestion hotspots, and faster opening of rush-hour lanes. It is also working within the framework of Fileaanpak 2020 to explore which infrastructure measures are needed to tackle 34 congestion hotspots.

### **Better informed on the road**

Smart technology and real-time bespoke travel information are becoming increasingly important in managing mobility and ensuring more intelligent, more efficient and safer use of our roads. With the Connecting Mobility Programme, Rijkswaterstaat is working closely with other public authorities, market parties and knowledge institutions on new traffic management and intelligent transport systems, with cars in contact with each other and roadside traffic management systems. Our aim is to ensure even better use of the roads, improve services for travellers and reduce CO<sub>2</sub> emissions.

### **Smart Mobility in Europe**

To improve cross-border traffic flows, it is important that Europe's new traffic management systems are closely integrated. On 14 April 2016 the Ministry of Infrastructure and the Environment reached agreement on this subject with the European Union (EU) transport ministers. Together they signed a declaration and also set an agenda for the development of autonomous driving technology within the EU in the next few years. The aim is to work together on themes like uniform rules, technical standardisation, liability, privacy and computer security.

### **Main waterway network**

Making better use of the waterway network for goods transport is an environmentally-friendly way of relieving congestion on the roads. Rijkswaterstaat has therefore given the quality of the main waterway network a huge

## Main waterway network

- 3,460 kilometres of inland waterways
- 3,544 kilometres of waterways in open waters
- 93 locks
- 328 bridges



## Main road network

- 3,070 kilometres of motorways
- 1,650 kilometres of access and exit roads and connecting roads
- 2,876 viaducts,
- 48 wildlife crossings
- 27 tunnels
- 780 bridges
- 15 aqueducts



boost in recent years. Many of the main waterways have been widened, deepened and upgraded. Locks and sluices have been widened, and bridges have been reinforced and their clearances increased.

Rijkswaterstaat is also investing in better management of traffic flow on the shipping routes to the European hinterland. To ensure an open passage, traffic controllers in the traffic control centres use the latest technology to operate locks and bridges efficiently and to provide ships' captains with all the information they need.

### Room for the River

Rijkswaterstaat continually invests in protecting the Netherlands from flooding. 2016 was another successful year for the Room for the River Programme. More than 30 of the 34 projects had been completed by the end of the year. A large part of our river basin is now not only safer from flooding, but also more attractive and more liveable.

### Delta Programme 2017

The current safety standards for our dikes, dams and dunes mainly date from the 1960s. Climate change and rising sea level make extra protection necessary. In early July 2016, the House of Representatives approved a proposal to introduce new safety standards in the Netherlands in 2017. New flood safety policy looks not only at the risk of flooding, but also at its impact. In the next few years, extra targeted investments will be made in areas where floods could claim numerous victims and inflict severe economic damage.

### High Water Protection

Up to 2050 the water authorities and Rijkswaterstaat will work together on the dikes and dunes to bring them up to the new safety standards. More than 1,100 kilometres of dikes and 256 locks and pumping stations along the coast, lakes and major rivers will be upgraded in nearly 300 projects to be carried out throughout the country between now and 2028. On the basis of the new flood safety policy, Rijkswaterstaat and the water authorities will also seek innovative ways of making the Netherlands more water resilient and climate proof.

### Delta plan for freshwater

The quality of the water in the Netherlands has improved substantially since 2009. Yet the water still contains too many traces of medicines, microplastics, heavy metals and PCBs. The excellent chemical and ecological status envisaged by the EU Water Framework Directive must be achieved by 2027 at the latest. This calls for a different approach and closer cooperation. In 2016, a Delta plan for water quality and freshwater was therefore developed at the request of the House of Representatives. This means that the water authorities can tackle water quality across the board and at source. This approach will be fleshed out in a new Administrative Agreement on Water, with more specific long-term measures. Rijkswaterstaat will work in its capacity as the water authority for the national waters to implement the agreement, in close cooperation with its water management partners.



## Main water system

- 90,312 km<sup>2</sup> of surface water
- 35 kilometres of dunes
- 145 kilometres of dikes and dams
- 10 major dams
- 5 storm-surge barriers
- Afsluitdijk and Houtribdijk



## Rijkswaterstaat's mission

**Rijkswaterstaat is the executive organisation that sustainably develops and manages the national infrastructure networks on behalf of the minister of and state secretary for Infrastructure and the Environment.**

### Rijkswaterstaat works on:

- a sustainable living environment
- protection against flooding
- sufficient clean water
- smooth and safe transport by road and water
- reliable and useful information

### Social roles

Rijkswaterstaat manages and develops three main infrastructure networks in the Netherlands:

- the main road network
- the main waterway network
- the main water system

Rijkswaterstaat performs its day-to-day management tasks by fulfilling three social roles:

- a public-oriented network manager
- a leading project manager
- an effective crisis manager

## A circular economy

On 9 September 2016, the cabinet approved a government-wide programme for a circular economy. The aim is to cut the use of primary resources by at least 50 per cent by 2030. Working towards a circular economy is a priority of Rijkswaterstaat's sustainability strategy. Since the start of 2016, procurement has been circular, and use of materials part of our sustainable recycling strategy.

In January 2016, 80 parties – including Rijkswaterstaat – signed the Green Deal GWW 2.0, thus taking a major step towards a circular economy in the Netherlands by 2050. Under the Green Deal, parties share expertise and experience in the field of sustainability. And from now on, the sustainability of locks, bridges and roads will be considered at the design stage.

## Sustainability and quality of life

Within the government, Rijkswaterstaat leads the field in saving energy and reducing CO<sub>2</sub> emissions. More and more energy from wind, water, sun and even biomass is being produced in the land and water areas we manage. The ultimate aim is to achieve an energy-neutral infrastructure by 2030. Furthermore, Rijkswaterstaat wants to carefully integrate its infrastructure into the residential environment.

## Environment and Planning Act

Both government authorities and the general public want to work more easily, more efficiently and more actively on a sustainable living environment. The Environment and

Planning Act, which will enter into force in 2019, will give the right boost. The new act is based on the principle of trust, and aims at fewer, more transparent rules, with greater scope for initiatives and local solutions. The Administrative Agreement on the implementation of the Environment and Planning Act was approved in July 2015, and the Act was passed by the Senate in March 2016. Since 2015, Rijkswaterstaat has been responsible for coordinating its implementation, in close cooperation with the municipal, provincial and water authorities.

## Outdated infrastructure

Much of the infrastructure in the Netherlands is reaching the end of its lifespan and will have to be upgraded or replaced over the next few decades. The costs could rise to around 10 billion euros between now and 2040. Apart from work on bridges, locks, dams and viaducts, roads will need resurfacing and the technical installations in tunnels will need replacing. In 2016 Rijkswaterstaat finished renovation work on the road surface of the A27 between Stichtse Brug and Almere, and also upgraded the bridge at Ewijk. We also started preparing the renovation and replacement work that will be needed in the 2018-2020 period.



## 2 Smooth and safe transport by road

Road transport is the lifeblood of the Dutch economy. Optimal access to the economic centres is therefore vital. Private motorists must also be able to reach their destinations safely and quickly. As the road authority and developer of the main road network, Rijkswaterstaat is committed to achieving these aims.

Every day around three million motorists take the roads in the Netherlands. But not all roads are able to cope with the volume of traffic. This leads to traffic jams and much aggravation among road users. In addition, slow-moving or stationary goods vehicles are bad for our transport-oriented economy. Traffic jams cost the Dutch transport industry around 800 million euros a year. Dutch transport policy therefore has two goals: reliable journey times and better accessibility. This chapter explains what Rijkswaterstaat did

in 2016 to ensure traffic flow on the main road network is smooth and safe.

### **Working on accessibility**

To eliminate traffic bottlenecks, Rijkswaterstaat is building new stretches of road and widening existing roads with additional lanes. We also want to make better use of existing capacity not only through smart technology, but also by working closely with market parties, public authorities and



*The new aqueduct and rerouted A1 motorway at Muiden*

road authorities in the region. Traffic management plays an important role in keeping traffic moving and traffic jams to a minimum. Good maintenance is also essential. Rijkswaterstaat works on a daily basis to keep the motorways reliable, accessible and safe.

### More intensive use

In 2016 Dutch road users travelled 69.9 billion kilometres on the main road network, 3.1 per cent more than in 2015. This more intensive use led to an increase in the number of accidents and incidents, which in turn caused more traffic jams. As a result, congestion (length x duration of traffic jams) rose to 11.6 million kilometre-minutes in 2016, a 13.1 per cent increase compared to 2015. Road users made 10.6 per cent more journeys than in 2016.

## Construction

**Forecasts show that traffic will continue to grow between now and 2020. To cater for this growth, Rijkswaterstaat will continue to eliminate traffic bottlenecks. In 2016 we laid a total of 72 kilometres of asphalt – to widen roads, eliminate congestion hotspots and fill in missing links in the main road network.**

In 2016, Rijkswaterstaat opened a total of fifteen new sections of road at twelve locations throughout the country. The most striking examples were the road tunnel in Maastricht, the Ede-Grijsoord section of the A12 motorway and sections of the Schiphol-Amsterdam-Almere corridor.

### Opening of the A2 tunnel in Maastricht

On 15 December 2016 the King Willem-Alexander tunnel, which carries the A2 motorway under Maastricht, was opened to traffic. This is the first double-decker tunnel in the Netherlands. Each deck has two sections. The lower two are for through traffic, the upper two for traffic entering or exiting the city. With the opening of the tunnel, the time it takes to cross Maastricht has been reduced from 30 to 3 minutes. Furthermore, the motorway no longer slices Maastricht in two, and local residents now have much less traffic noise to contend with. At the moment, an average of 50,000 vehicles pass through the tunnel each day. But the tunnel was built to cope with growth. It can handle up to 100,000 vehicles every 24 hours. In mid-2017, the junctions adjoining the tunnel were completed. The King Willem-Alexander tunnel cost 890 million euros to build (for more information, see page 14).

### Opening of the A12 between Ede and Grijsoord

In July 2016, the widened section of the A12 motorway between Ede and the Grijsoord intersection was officially opened to traffic. The road has been widened on either side with an additional lane, so that each carriageway now has





## Road projects completed in 2016

- A B** A12 Ede-Grijsoord, right (May), left (June)
- C** A9 rerouted at Badhoevedorp, first stage, left (June)
- D** A44 FloraHolland exit, right (July)
- E** N50 Ens-Emmeloord, both directions (Aug.)
- F G** Schiphol-Amsterdam-Almere corridor, Diemen-Almere Havendreef section (various)
- H I** A59 bridge over Drongelens canal, left (Sept.) right (Oct.)
- J** A2 tunnel at Maastricht, both directions (Dec.)
- K** A9 rerouted at Badhoevedorp, main Haarlem to Amstelveen carriageway, left (Dec.)
- L** A12/A20 Gouweknoop parallel structure, both directions (Dec.)

three permanent lanes. At the Grijsaard intersection, the loops connecting the A12 and the A50 have been widened and now have two lanes. Since the new section was opened, traffic flow, road safety and access to the region have all improved. The viaduct over the Arnhem-Utrecht railway line has also been renewed, and wildlife crossings have been constructed above and below it. To enhance natural values along the road, a wildlife underpass, four badger tunnels and two overpasses for pine martens have been constructed. A heathland network has also been created to link reptiles' habitats. And in various places, embankments have been constructed to integrate the road into the landscape.

### New junction at Moordrecht

The permanent traffic jam on the Moordrecht exit on the A20 motorway disappeared for good on 9 March 2016, and traffic can now move more safely and more smoothly. With the construction of a new road linking the A20 and the N456 at Moordrecht, road traffic is now separated from rail and bicycle traffic. Since the project was launched in 2011, three level crossings have been replaced by eight high-quality structures, which were installed without causing serious inconvenience to motorists or local residents. For example, the viaduct on the A20 over the Middelweg was replaced in a single weekend. In addition, the project was completed seven months ahead of schedule. Half of the concrete used to construct the viaduct over the Middelweg was recycled, making it the 'greenest' concrete structure in the Netherlands.

### Schiphol-Amsterdam-Almere corridor

Rijkswaterstaat has been working for several years on a major road-widening project between Schiphol, Amsterdam and Almere. To reduce congestion, additional lanes are being built over a stretch of 63 kilometres on the A9, A10, A1 and A6 motorways. The aim is to guarantee access to the northern Randstad in the future, too. At the same time, Rijkswaterstaat is also improving quality of life along the corridor. Higher noise barriers are being constructed along large sections of the road and low-noise asphalt is being used to surface the road.

In 2016, the Schiphol-Amsterdam-Almere road construction programme reached a milestone with the opening of a new section of the A1 motorway. In August, the five-lane carriageway to Het Gooi came into service, followed in September by two tidal flow lanes and the five-lane carriageway to Amsterdam.

On 22 Augustus 2016, Rijkswaterstaat opened the rerouted section of the A1 motorway between the Diemen intersection and Muiderberg. Motorists travelling from Amsterdam could use the new bridge over the Amsterdam-Rhine Canal for the first time. The new Vechtzicht aqueduct near Muiden also came into service on the same day. The aqueduct is 620 metres long and 65 metres wide, making it the biggest in Europe. Now that it is completed, motorists on the A1 motorway no longer face delays at the bridge.

In the weekend of 20 and 21 August, Rijkswaterstaat worked on one of the most complicated infrastructural operations ever, when the new A1 to Amersfoort and Almere was connected to the new aqueduct, and the bridge over the Amsterdam-Rhine Canal was partially opened. At the same time, the old railway bridge over the A1 was demolished and the railway line reconnected to the new railway bridge at Muiderberg. A team of 1,000 workers from both Rijkswaterstaat and the various contractors involved in the project worked 24 hours non-stop to get this huge job done.

In 2016 widening work was also in full swing on the Diemen-Almere Havendreef sections of the A1 and A6 and the A9 motorway between the Holendrecht and Diemen intersections (the Gaasperdammerweg). In late 2016, preparations started for widening the Almere Havendreef-Almere Buiten-Oost section of the A6.

## Smarter use of capacity of existing roads

**Construction of additional lanes cannot accommodate all the extra traffic. More asphalt alone will not reduce congestion. Smarter use also needs to be made of the capacity of the existing infrastructure.**

### Better Use

Since 2010, central government, the regional authorities and market parties have been working together within the Better Use Programme to make smarter use of existing infrastructure and reduce congestion in the busiest regions.

In June 2016, the results of the first Better Use Programme were presented to the House of Representatives. The report showed that more than 300 projects had been implemented between 2011 and 2015. On an average working day, 48,000 fewer cars and heavy goods vehicles took to the road in the rush hour. Motorists travelled at different times, or chose a different means of transport for their daily commute. This led to 19 per cent fewer delays on the busiest routes in the rush hour.

Other measures also contribute to reducing congestion, including construction of new rush-hour lanes, reconstructed junctions, new types of road signs and travel information apps. Cooperation with market parties and regional authorities is therefore highly effective in reducing congestion. For this reason, the Ministry of Infrastructure and the Environment, Rijkswaterstaat and the regional authorities are planning to invest in additional smart, new measures. For extra information, see chapter 1 under the heading 'Better Use'.

### Amsterdam Practical Trial

Rijkswaterstaat is working with its partners and with market parties and research institutions to explore opportunities for better, smarter traffic management. Tests on the Amsterdam ring road aim to show how innovative roadside and in-car technologies can reduce congestion in busy areas. By combining data, motorists can be provided with personalised travel information, and led to their destinations by the fastest route. Rijkswaterstaat is running the Amsterdam Practical Trial in partnership with the municipality of Amsterdam, the province of North Holland and the Amsterdam metropolitan region.

### Incident management

Whenever an accident or other incident occurs on the road network, Rijkswaterstaat ensures it is dealt with safely and quickly. Around 260 road inspectors patrol the motorways in their bright yellow vehicles to help road users reach their destinations smoothly and safely. The inspectors are often the first to arrive at the scene of an incident. Their job is to ensure that emergency services – the ambulance and fire services and the police – can work in safety, and that the rest of the traffic has smooth, safe passage. Road inspectors check the roads for damage, oil spills and lost loads so that rapid action can be taken to make the road safe again.

### Truck Platooning

Truck Platooning is a smart new transport innovation that was very much in the spotlight in 2016. With this system, trucks travel the motorway in convoy. The driver in the lead vehicle determines the speed and the route, and the other trucks follow fully automatically. Truck platooning could make goods transport safer, more efficient and more environmentally friendly.

As holder of the EU Presidency in the first six months of 2016, the Netherlands was keen to get Truck Platooning on the European political agenda. So Rijkswaterstaat organised the European Truck Platooning Challenge. Starting on 29 March 2016, six convoys of trucks departed for Rotterdam from six cities in Sweden, Germany and Belgium. The fifteen tractor-trailer combinations taking part were welcomed in Rotterdam on 6 April by 400 guests from EU member states, including the Minister of Infrastructure and the Environment, Schultz van Haegen. Experience gained during the Challenge proved useful for the informal Transport Council meeting in Amsterdam on 14 April. The council took the first steps towards closer European cooperation in the field of transport and regulations. In the future, truck platoons can be expected to transport goods from the Port of Rotterdam to destinations all over Europe.

## Management and maintenance

**We all want to arrive at our destinations quickly and safely by the route we have planned. This calls for reliable, well-maintained roads, infrastructure and traffic management systems.**

### A continuous process

The quality of the national infrastructure is good. Users of Waze, Google's navigation app, gave the Netherlands the highest score in the world on criteria like quality, safety, accessibility and comfort.

For Rijkswaterstaat, management and maintenance are continuous processes that need to be planned with intelligence and care. Maintenance work is carried out before a road or other part of the infrastructure fails to meet the quality standards. Additional damage can thus be prevented and the life of the infrastructure extended. Where possible, maintenance work is combined. This keeps the costs down and makes the maintenance process safer and easier to plan and manage. And it prevents unexpected inconvenience for road users.

### Minimising inconvenience

Rijkswaterstaat seeks to minimise the inconvenience caused by road works. In 2006, it was agreed with parliament that road works could not account for more than 10 per cent of total congestion. At 3.5 per cent in 2015 and 2.9 per cent in 2016, the percentage of traffic jams caused by road works was far below the agreed norm.

### Renovation of the Velsler tunnel

The Velsler tunnel is an important link for traffic in North Holland. However, the tunnel was 60 years old in 2016 and urgently in need of major maintenance work. In that year, Rijkswaterstaat therefore radically renovated the tunnel. Before the renovation, heavy goods vehicles with high loads regularly got stuck in the tunnel, inconveniencing road users and causing damage. The tunnel's clearance has therefore been raised by 12 centimetres. In addition, the various technological installations and escape routes have been replaced. The Velsler tunnel was re-opened to traffic on 16 January 2017. It will be fit for service for years to come.

### Merwede bridge

On 11 October 2016, Rijkswaterstaat closed the Merwede bridge on the A27 motorway to all goods vehicles heavier than 3,500 kilogrammes. Hairline fractures had been found in the load-bearing structure. Over the next two months, Rijkswaterstaat reinforced the joints in the bridge using steel plates. The bridge was re-opened to all traffic on 29 December. A special communications team helped to keep inconvenience for road and waterway users and local residents to a minimum.

The joints in the Merwede bridge are now fit for years of service. However, in March 2017, the Ministry of Infrastructure and the Environment decided to replace the bridge, together with two other steel bridges on the A27 motorway, the Hagestein bridge and the Keizersveer bridge. Rijkswaterstaat studies have shown that these bridges can best be replaced by new, concrete structures. This will prove cheaper in the long run, with lower maintenance, than upgrading the steel structures. Smooth traffic flows are also more likely to be guaranteed. Work on the three bridges will probably start in 2021.

### Technical failure

Technical failure affected a striking number of Rijkswaterstaat's bridges, tunnels and rush-hour lanes in 2016. By mid-November 2016 131 incidents had been recorded – twice as many as in 2015. The complex IT systems used in new structures like the Botlek bridge proved to be particularly vulnerable. Technical failure in older structures was mainly caused by IT components reaching the end of their service life.

Rijkswaterstaat systematically monitors the status of these structures and their systems. In 2016 we worked hard on measures to make structures less vulnerable to technical failure, for example by standardising IT solutions. And we actively try to keep delays for road and waterway users to a minimum. The number of traffic jams caused by technical failure was only 1 per cent of total congestion on the national road network.

### 130 kilometres per hour

In 2016, the speed limit was raised on many sections of motorway. By the end of 2016, the speed limit on 1,496 kilometres of motorway was 130 kilometres per hour, of which 54 per cent all day and 8 per cent only in the evening and at night. The percentage of roads with a 130 kilometre-per-hour speed limit rose by 13 per cent in 2016, from 49 per cent to 62 per cent.

### Winter maintenance

To prevent ice forming on the road, Rijkswaterstaat has 542 salt spreaders and 350 snow ploughs at its disposal. In the winter of 2015/2016 1,200 members of staff worked to keep the motorways clear. They spread a total of 41,213 tonnes of salt on 362,100 kilometres of asphalt.

In 2016, Rijkswaterstaat tested and used two innovative new salt spreaders. These machines are for use during heavy snowfall and severe ice formation to keep the roads clear and safe. The first of them, the Firestorm, can remove the most persistent sheets of ice from the road by spraying a hot saline solution onto them. The ice immediately starts to thaw, making the road easier to navigate. The second of these machines, the Filesproeier, can be used in heavy snowfall and where a traffic jam has formed. From the hard shoulder, it sprays salt beneath the vehicles, across the width of two lanes.



### Safety on the main road network

In working on the main road network, the safety of road users, road workers and local residents has priority. If safety is threatened, we introduce speed limits, carry out repair work or make improvements. Besides maintaining roads in good condition, traffic management also contributes to motorway safety. The same applies to Rijkswaterstaat's close cooperation with traffic enforcers, and the increasingly sophisticated technology in cars and heavy goods vehicles.

#### *A new strategy is needed*

In past years, the number of road deaths in the Netherlands dropped steadily. In 2015, however, there was a sudden rise – to 621. That was 51 more than in 2014. Local and provincial roads account for the majority of casualties – 51 per cent of the total. And though the Dutch motorways are among the safest in Europe, road deaths are increasing there, too. This underscores the need for a new strategy. The Ministry of Infrastructure and the Environment is now charting the

causes and risks in order to take targeted, proactive measures. The first steps were taken in 2016 to develop this new strategy. Information on road safety in 2016 was not yet available when this annual report was published.



Repair work on the Merwede bridge



## A single plan for city and motorway

### A2 King Willem-Alexander tunnel

The King Willem-Alexander tunnel in Maastricht is the first double-decker road tunnel in the Netherlands serving both through traffic and regional and local traffic. The A2 motorway no longer forms a barrier, which clears the way for urban and spatial development.

#### For more information

[www.rijkswaterstaat.nl/jaarbericht](http://www.rijkswaterstaat.nl/jaarbericht)



*'Once we'd made the decision to go underground, the spotlight was on safety'*

**Joyce Vreede**  
safety officer Rijkswaterstaat

**'Are you ready?'** This was the question infrastructure minister Schultz van Haegen asked Rijkswaterstaat's traffic control centre in Helmond on 15 December 2016. It was the cue to open the barriers to the King Willem-Alexander road tunnel in Maastricht. The tunnel was then opened to traffic. The last set of traffic lights on the A2 motorway could be switched off and Maastricht's city centre was no longer split in two by the busy road. Better access and quality of life go hand in hand in this project. The safety of the tunnel's users was an important issue right from the design stage.

The King Willem-Alexander tunnel in Maastricht is unique. It is the first double-decker tunnel in the Netherlands, with the lower two sections for through traffic and the upper two for local and regional traffic. It is a highly robust solution to the problem of the urban and international accessibility of Maastricht and the wider region. Now 80 per cent of traffic on the A2 motorway passes the former bottleneck unhindered through the tunnel.

### Green Carpet

For many years, the A2 motorway in Maastricht gave rise to a variety of problems. It was not only a bottleneck and congestion hotspot, but also a source of air pollution and noise nuisance. In addition, the road formed a barrier between two of the city's residential areas. The King Willem-Alexander

tunnel is therefore much more than an infrastructure project. It is part of the Green Carpet plan, an overarching vision for the city and motorway. This plan aims for easy access to Maastricht and smooth traffic flows on the A2 between the Geusselt and Europaplein intersections. It also creates new opportunities for the development of local neighbourhoods, for example through better road safety and quality of life in east Maastricht.

### Preparations

The question minister Schultz van Haegen asked over the intercom at the entrance to the tunnel was well chosen. It was a reference to all the preparations, work, tests and drills that had preceded the opening of the tunnel.



'Safety in the tunnel was a major issue,' says Joyce Vreede, local safety officer for Rijkswaterstaat. 'That's why staff members from Rijkswaterstaat, the fire service and other emergency services followed an incredibly intensive programme. They attended courses, underwent training and took part in drills to ensure that they worked as a team, knowing exactly what to do if ever disaster struck in the tunnel.'

### Tunnel standard

As Vreede points out, safety was a major theme within the project from the moment the decision was taken to go underground. 'And then it's not really about the technical installations needed in the tunnel. Because a great deal is already laid down in the regulations on the safety of road tunnels and the National Tunnel Standard. For example, the Standard requires tunnels to be equipped with emergency exits, ventilation, an intercom system with loudspeakers, first aid boxes and lighting of a particular strength. So in fact there's no need for clients, contractors or safety regions to discuss these issues.' Hans Godding was closely involved in the tunnel project as a representative of the South Limburg safety region. 'The talks you have with each other – starting at the design stage – are chiefly about the safety concept you plan to use and how you'll put it into practice,' he says.

### Against the traffic flow

One of the subjects that led to much discussion was how the emergency services should reach the scene of an incident. Godding: 'The safety region had a different view from Rijkswaterstaat,' says Godding. 'Rijkswaterstaat works on the basis of the National Tunnel Standard. The usual procedure is that a firefighting vehicle on the way to the scene of an accident stops at the entrance to the tunnel, contacts the traffic controller and then enters the tunnel in the same direction as the traffic. But the priority for us was to be at the tunnel within five minutes, and to be able to enter it against the traffic flow. In addition, we wanted to be alerted faster than usual, by computer. And on our way to the tunnel we wanted to be provided with all available information – visual and otherwise – about the situation at the scene. The safety concept was ultimately

based on these principles. But that did mean Rijkswaterstaat had to adapt some of its normal procedures. That is quite special.' 'For example, traffic controllers in the traffic control centre have to carry out procedures in a different order than they are used to,' says Vreede. 'So training programmes will have to pay extra attention to that.'

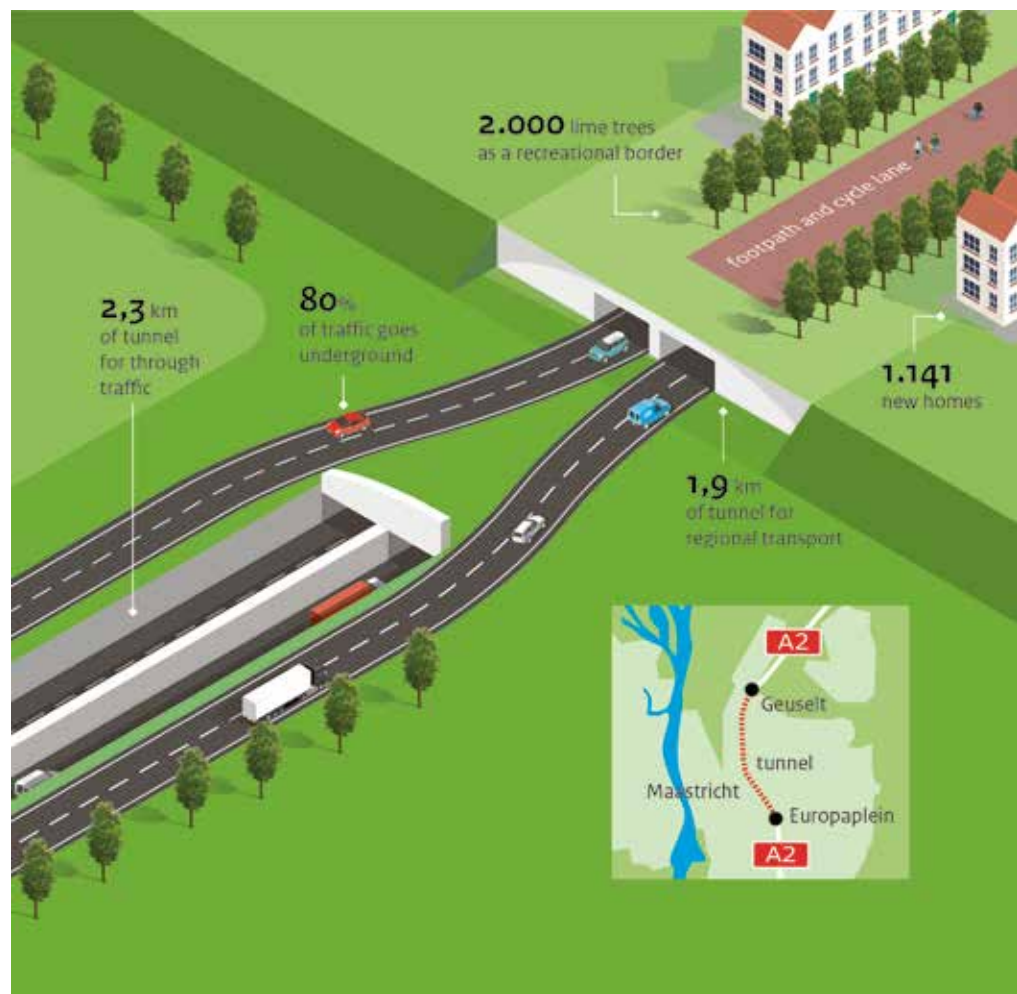
### Good marriage

'Around 700 people took part in the training programme for the King Willem-Alexander tunnel,' says Godding. 'Everyone whose job may entail dealing with a disaster in the tunnel was involved. From Rijkswaterstaat staff members to paramedics, firefighters and police officers up to and including local heads of operations. Through the training programme, in which practical drills play an essential role, you build a good marriage. That's crucial because you must be able to trust each other.'



*'Drills are crucial. You must be able to trust each other.'*

**Hans Godding**  
team leader disaster control and crisis management South Limburg Safety Region







# 3 Smooth and safe transport by water

Transport by water is of essential economic importance. Inland shipping carries bulk goods, containers, cars and manufacturing products to destinations in the Netherlands and the European hinterland. It is also an environmentally-friendly alternative to road and rail transport. A large modern vessel can carry as much cargo as several hundred heavy goods vehicles. And the capacity of the inland waterway network is still far from fully used.

## Construction

**Larger ships are carrying more goods by water. In 2016, Rijkswaterstaat again invested actively and effectively in improving the capacity of the main waterway network.**

## Third chamber Princess Beatrix lock complex

In 2017, work will start on expansion of the monumental 77-year-old Princess Beatrix lock complex near Nieuwegein. A third chamber will be added, and the Lek canal widened so that shipping can pass the lock smoothly and safely far



Parallel dam in the River Waal

into the future. Another reason for us to widen the Lek canal is to create more moorings for inland waterway vessels.

The new third chamber will be more than 270 metres long, 25 metres wide and 5.8 metres deep. This means that ships with a draught of up to 4 metres will be able to pass through the lock, which will be taken into service in 2019. The lock complex will also be sustainable and energy self-sufficient. This is one of the six projects in the Rijkswaterstaat's Lock Programme, which also includes work on the Limmel lock, construction of a second chamber in the Eefde lock complex, the sea access project at IJmond, the Terneuzen sea lock project and the Afsluitdijk (Barrier Dam) project.

### IJmuiden sea lock

On 7 September 2016 work started in IJmuiden on construction of the world's largest sea lock. The new lock will be 70 metres wide, 500 metres long and 18 metres deep and will replace the Noorder lock, which dates from 1929. It will ensure better access to the Port of Amsterdam for increasingly larger sea vessels. The new lock is expected to open to shipping in late 2019 (for more information, see page 20).

## Waterway traffic management

**The Dutch waterways are becoming busier and busier. It is therefore becoming increasingly important to oversee and manage traffic flow on the entire waterway network. Rijkswaterstaat works to achieve this from its traffic control and operating centres.**

Rijkswaterstaat is working to professionalise traffic management on the water. The ultimate aim is nationwide corridor management, providing support, guidance and facilities to enable a smooth, safe passage along the main shipping corridors to the European hinterland.

### *Standardised operation and assistance*

Corridor management on the waterways ensures a smooth, safe, obstacle-free passage. Rijkswaterstaat manages 10 traffic control centres, 93 lock complexes and 115 bridges. A major step towards corridor management is to standardise and link operating systems and centralise shipping traffic control. The traffic controllers working in the control centres are now developing into contact points for ships' captains, operating locks and bridges and providing assistance and information. Corridor-based operation and assistance presents many advantages for inland shipping, in terms not only of navigation, but also of business and logistics. This makes shipping a more interesting alternative to road transport.

### CoRISMa

Under the banner CoRISMa, Rijkswaterstaat has developed a plan to achieve reliable journey times for shipping on the European waterways. The plan gained EU approval in 2016. Our corridor management concept will thus become the European standard. By sharing information across borders, journey times for international shipping will also become more reliable. CoRISMa is inexpensive because it uses Rijkswaterstaat's existing programmes and systems. This Dutch initiative was developed with five other western European countries, thanks to an EU grant. A follow-up project in eastern European countries is now planned.

### Smart Shipping

Developments in shipping and the waterways are in full swing in the Netherlands. In 2016, Rijkswaterstaat started working with market parties and knowledge institutions in the maritime sector on a practical demonstration of Smart Shipping, with fully automated passage and smart operation of locks and bridges, and smart loading and unloading systems. Smart Shipping is attractive because it is safer, less expensive and more sustainable, contributing to the development and competitiveness not only of the Dutch shipping sector, but also of the Netherlands as an innovation centre.

In 2016, Rijkswaterstaat also started investigating opportunities for inspection and measurement craft to sail autonomously, without a captain on board. The Netherlands can use this experience to play a pioneering role in developing Smart Shipping, similar to the role it now plays in relation to self-driving cars.

### Lock stewards

For many recreational boaters, passing a lock is no simple matter. Large cargo ships and small pleasure boats have to manoeuvre together in a limited space. Once again therefore, Rijkswaterstaat decided to station stewards at a number of busy or complex locks during the 2016 summer season. A total of 60 stewards helped recreational users choose the right place in the lock chamber and enter and exit the lock. They also provided assistance in passing the lock, with instructions and information and by answering questions.

### Zones for recreational craft

From a large, fast-moving ship, small slow-moving crafts are often difficult to see. That often leads to dangerous situations. In March 2016, Rijkswaterstaat started demarcating special channels for recreational craft along the main fairway, similar to cycle lanes. The aim is to separate recreational craft from professional shipping and thus improve safety on the national waterways.

In April 2016, channels for recreational craft were demarcated with buoys in the Western Scheldt, the Grevelingenmeer and the Veerse Meer. Dedicated channels are also planned in the IJsselmeer, the Randmeren and the Waddenzee, and will be demarcated using a total of 1,700 buoys.

Since 2010, Rijkswaterstaat has been conducting trials with dedicated channels for recreational and professional craft in the River Waal at Nijmegen. Experience has been positive: there is less chance of a collision.

### New moorings

On 6 December 2016, 1,500 metres of new moorings were opened in the harbour basins at the entry to the Hansweert lock complex, enough to accommodate eleven large inland waterway vessels. Captains can take a rest here, or moor their ships overnight. This contributes to safety on the waterway. Extra moorings are being constructed at other locations in Zeeland and North Brabant – at the Empel and Hintham locks in the Máxima Canal, and at the Schijndel lock complex in the Zuid-Willemsvaart.

## Management and maintenance

**For smooth and safe use of the main waterway network, the waterways need to be navigable and well maintained.**

### Locks to be operated by remote control

The West and Oost locks at Terneuzen were thoroughly modernised in 2016. The locks' power, control and operating systems have been completely renewed, making them fit for service for years to come, without the need for major maintenance. The Terneuzen locks are important for commercial shipping traffic to and from the port of Ghent. Modernisation will also enable the locks to be operated remotely from the nautical control centre on the Western Scheldt.

### Bridge on the A50 at Ewijk renovated

In late 2016 work on the old Waal bridge at Ewijk was completed. In May 2013 a new bridge was taken into service, and the old bridge has now undergone radical renovation. Together, the two bridges form the Tacitus bridge. The clearance of the old bridge had to be raised to accommodate the increasingly taller ships using the River Waal. The cables on which the bridge is suspended were also replaced. The work took much longer than planned because replacing the cables proved more difficult than expected.



### New Waterway to be deepened

Ships are becoming larger and larger. Rotterdam must upscale if it is to continue competing with other ports. Rijkswaterstaat is therefore deepening the New Waterway, the canal built 150 years ago to connect Rotterdam with the North Sea. More than three million cubic metres of soil will be excavated, and the resulting deeper shipping channel will be fit for use for many years to come. The total operation, including dredging of the Botlek harbour basins, will cost 60 million euros. The Ministry of Infrastructure and the Environment has earmarked 35 million euros for this operation, and the Rotterdam Port Authority will contribute 25 million euros.

### Eemshaven acquires highway to the sea

In October 2016 work started on the expansion of the shipping channel from the North Sea to the Eemshaven and the ports of Delfzijl and Emden. When the job is finished in late 2017 ships with a draught of 14 metres will be able to reach the ports. The channel needs deepening for better access to the Eemshaven.

### Parallel dam in the River Waal

On the section of the River Waal between Wamel and Ophemert, Rijkswaterstaat has constructed a dam running parallel between the river and the shore. Work was officially completed in March 2016. The dam is 10 kilometres long and

will enable water to be discharged more rapidly when levels in the river are extremely high. It will also benefit shipping, since recreational craft can now sail in a separate channel from commercial shipping, improving safety on the waterway. And Rijkswaterstaat will not need to dredge as often because the dam enables the river to maintain its depth more naturally. Less dredging considerably reduces the costs of maintenance and causes less inconvenience to waterway users. Experience with the parallel dam will be evaluated in the next three years (see also chapter 4).

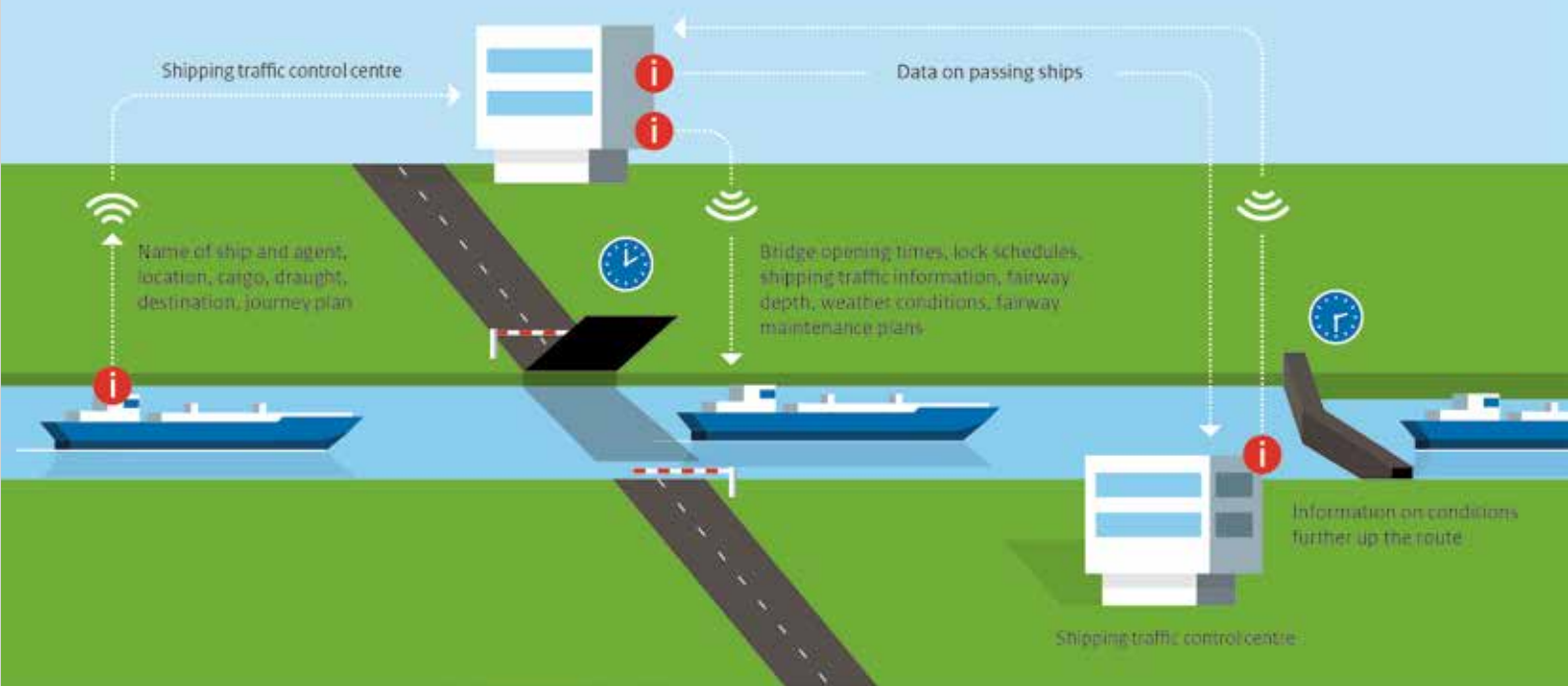
### Ice-proof buoys

In late 2016, Rijkswaterstaat replaced the buoys in the IJsselmeer and Markermeer with buoys that can be left in the water all year. In the past, we replaced the summer buoys with winter buoys whenever a long period of frost was forecast. However, these winter buoys had no lights. The new buoys are equipped with a solar cell, providing sustainable, ice-proof lighting. In 2017 various waterways in South Holland and Zeeland will be equipped with ice-proof buoys.

Ultimately, they will be installed in the entire main waterway network. They are safer and more sustainable. And because we don't have to replace them as often they are less expensive.

## Corridor management

*Smoother, safer transport that is more efficient to plan*





## Building the world's largest sea lock

### IJmuiden sea lock

A large new sea lock at the entry to the North Sea Canal near IJmuiden is essential for the development of goods transport and the ports in the Amsterdam region. At 500 metres long, 70 metres deep and 18 metres wide, the new lock will be the largest in the world.

### For more information

[www.rijkswaterstaat.nl/jaarbericht](http://www.rijkswaterstaat.nl/jaarbericht)



*'Concern made way for fascination.'*

**Jan Rienstra**  
environmental manager Rijkswaterstaat

After nearly 100 years of faithful service, the Noorder lock in IJmuiden needs replacing. A new, larger sea lock – the largest in the world – will accommodate the mega-sized ships of the future. This will improve access to the port of Amsterdam and the businesses located along the North Sea Canal, giving the economy in the region a major boost. It is a challenging task, because shipping needs to maintain free passage through the lock complex while work is in progress. At the same time there must be no threat to the lock complex's flood defence function. If all goes to plan, the new lock will open to shipping in 2019.

The new sea lock is being constructed between the existing locks. The stability of the existing locks must therefore be maintained – for shipping and because they are part of the flood defences. Jan Rienstra works as an environmental manager at Rijkswaterstaat. 'We asked the consortiums that submitted tenders for the work to come up with measures that would keep the risk of instability to a minimum,' he says. 'They could score points not only for preventing inconvenience to shipping, but also for reducing the impact on local residents.'

### Extremely inventive

The consortium OpenIJ submitted the best tender and won the contract for the work. In order to keep the risk of instability to a

minimum, they opted for application of a smart construction method. According to Rob Gordijn OpenIJ's environmental manager, 'We'll be building many of the walls for the new lock (the chamber walls) underground. With this construction method there's no need to drive piles into the ground. That's a good thing because pile-driving is noisy and causes vibrations. And vibrations could cause damage to the existing locks. That problem doesn't occur with the method we'll be using.'

In order to apply this method, 400,000 cubic metres of sand had to be deposited at the spot where the lock will be built. 'We then dug deep trenches – some of them 40 metres deep – which we keep open and

stable using bentonite,' says Gordijn. 'That is a special clay that prevents the walls from collapsing during the work. Next we'll install the steel reinforcement bars and fill the trenches with concrete. Using this construction method – which is not so much innovative as highly inventive – we can ensure that the locks remain open to shipping, without running the risk of damage. And there's no inconvenience to local residents, because there are no vibrations and we make no noise.'

### Preventing inconvenience and nuisance

Inconvenience and nuisance will also be prevented by opting for the caisson method in constructing the casings for the lock gates. 'These casings are huge cement structures,' Gordijn tells us. 'The sliding door which has to seal the chamber is more than 70 metres long and around 25 metres wide. If we were to construct the casing for the door at the depth where it will ultimately be located we would need a huge cofferdam. We have decided to construct a smaller, shallower cofferdam in which we will build the door casings in stages. Every time we finish a section, the soil beneath will be sucked away. The completed section will then sink to the bottom. The structure will ultimately stand at a depth of 25 metres. That is another smart way of avoiding the need for pile-driving, with accompanying vibrations and noise nuisance.'

### Eiffel Tower

Local residents are kept informed at regular meetings with the two environmental managers. 'It's good to see that local residents' initial concerns about inconvenience and damage have made way for interest and fascination,' says Rienstra. 'It's as if they're witnessing the construction of the Eiffel Tower. People in the immediate vicinity feel like they've got ringside seats. When we asked if they'd like us to install a sort of container wall to reduce further inconvenience, they immediately rejected the idea.'

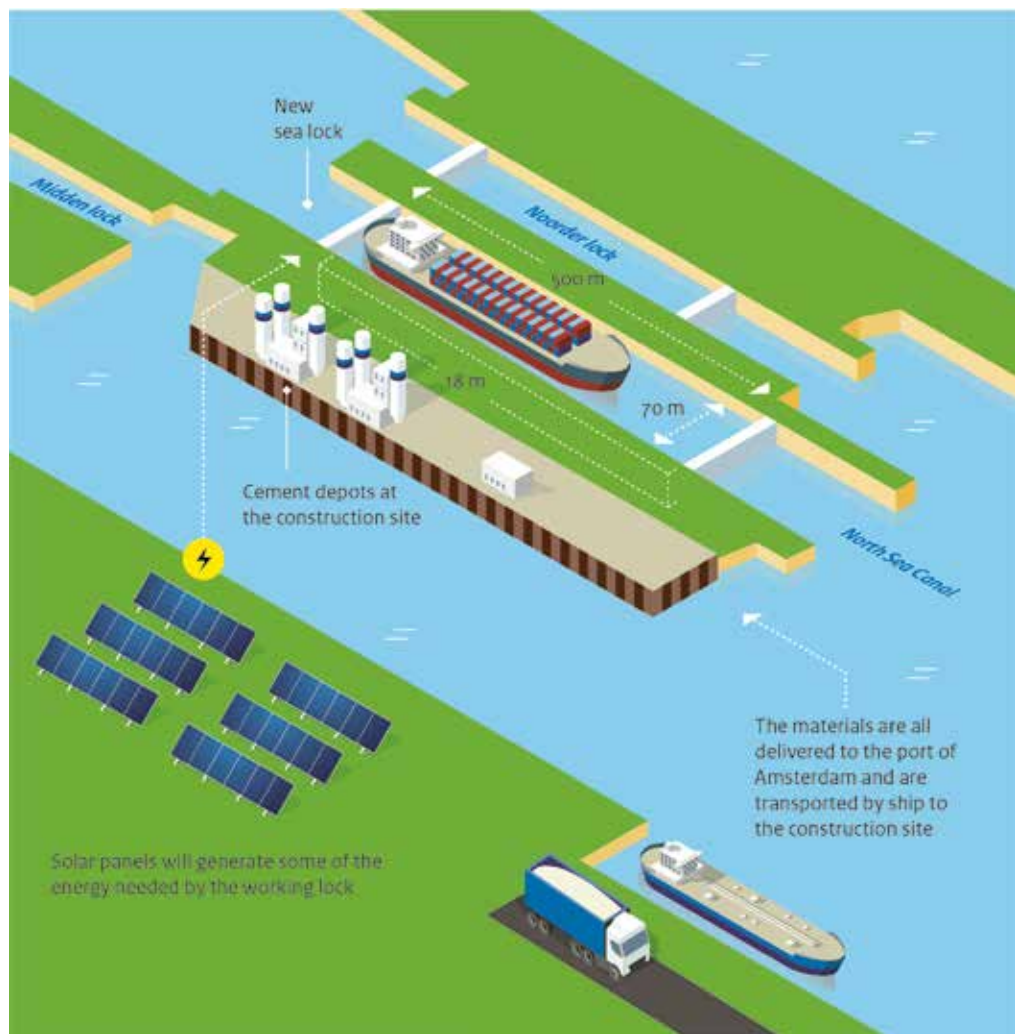
### Clarity

Of course, we are not only communicating with local residents. It's business as usual during the renovation. Keeping shipping moving smoothly and safely calls for continual harmonisation – with Amsterdam Port Authority and Central Nautical Management, for instance. 'Both Rob and I regularly meet with the many people involved in managing shipping traffic – with traffic controllers, lock masters, pilots, tugboat operators, line handlers and the Amsterdam business association, to name but a few,' says Rienstra. 'We provide as much information as we possibly can,' adds Gordijn. 'Every day we announce which ships will be in the area the following day for the consortium and what they will be doing. That takes time, but it prevents misunderstandings. Everyone concerned knows what's going on. Minute by minute, if necessary.'



*'Our solution isn't so much innovative as highly inventive.'*

**Rob Gordijn**  
environmental manager OpenIJ







## 4 Protection against flooding

Living and working in a delta is something that the Dutch take for granted. But without all the dunes, dikes, dams and storm surge barriers managed by Rijkswaterstaat, nearly 60 per cent of the country would be permanently under water or regularly inundated. These primary flood defences protect us from flooding by the sea and rivers.

The Netherlands is at risk of flooding from the major rivers, the lakes, the North Sea and the Waddenzee. Climate change poses an additional threat. Current climate scenarios indicate that by 2100 the sea level will rise by up to 85 centimetres. To make matters worse, the west of the Netherlands is subsiding and there is a greater risk of storm surges. We expect more extreme weather conditions with more and longer periods of rain.

To protect the Netherlands against flooding in the long term, a number of major programmes are now under way. They include the River Maas Programme, the Room for the River Programme and the High Water Protection Programme. Rijkswaterstaat is working on these programmes with other water management authorities to protect the Netherlands from flooding now and in the future.



Recreation near the Sand Motor off the coast at Ter Heijde

## High water protection

**The Delta Programme uses new safety standards for the primary flood defences. Since 2007, Rijkswaterstaat and the water authorities have been taking measures to strengthen them, with work on more than 3,500 kilometres of dikes, dams and dunes and eighteen locks, barriers and pumping stations. In carrying out this work, they constantly seek innovative, sustainable and affordable solutions.**

### Beach nourishment

The sandy Dutch coast is a major defence protecting the north and west of the country from flooding. To keep the Dutch coast up to strength, sand is deposited on the beach and underwater at locations where wind and waves have caused erosion. This operation is known as beach nourishment, and we have been carrying it out every year since 1991.

In 2016 the beach at eight locations along the Dutch coast was nourished with a total of 8.5 million cubic metres of sand. That is equivalent to around 5.5 times the content of the Kuip football stadium in Rotterdam.

Beach nourishment took place in 2016 on Texel, on the beaches between Bloemendaal-Zandvoort and Bergen-Egmond, and on the islands of Goeree (Westhoofd and Brouwersdam), Schouwen (Renesse) and Walcheren (Westkapelle-Zoutelande and Dishoek-Vlissingen).

## Zeeland is superstorm-proof

On 7 November 2016, a unique coastal defence project was completed in West Zeeland Flanders. In 2003, this 15-kilometre stretch of coast between Breskens and Cadzand-Bad had been found to be one of the ten weak links in the Dutch coastal defences. Completion of the project brings the Dutch coast up to strength for the next 50 years, and proofs it against superstorms (for more information see page 26).

### The Sand Motor works

Rijkswaterstaat continually invests in know-how to make our maintenance operations on the Dutch coast better, more sustainable and more cost-effective. In 2011, a peninsula of sand – the Sand Motor – was pumped up off the coast at Ter Heijde. The aim was for wind, waves and sea-currents to spread the sand to the north and south. An interim evaluation of the project published in 2016 concluded that 80 per cent of the sand is still in place off the coast, but is now beginning to spread. The coast is becoming wider and young dunes are slowly forming. The Sand Motor itself houses an increasingly diverse wildlife, and is becoming a popular nature and recreation area. After only five years, it is too early to say whether the Sand Motor is proving more effective and sustainable than established beach nourishment methods. But in the Netherlands, the concept is in any event feasible at locations where the coast needs large volumes of sand, and people want new recreation areas.

## Dikes

Many of the dikes in the Netherlands need to be strengthened to meet the new safety requirements. However, the tried and tested method of raising and widening the dikes would be too demanding and costly. Rijkswaterstaat and the water authorities are therefore investigating other ways to strengthen them, for example by proofing them against the impact of waves breaking over the top. Though we may occasionally get wet feet, the dikes will still protect us against storm surges and strong waves. But because they don't give way, a catastrophic disaster is much less likely.

## Afsluitdijk

The Afsluitdijk (Barrier Dam) will be wave-proofed after 2017. To protect the Netherlands against flooding now and in the future, the 80-year-old dike will be strengthened and upgraded, with new sluices and pumps to drain off more water. The new, smart dike will generate energy and boost nature, the regional economy, recreation and tourism. The tendering procedure for a strong, energy-neutral Afsluitdijk started in November 2016.

## Tidying up the floodplains

At high water, when the river discharges into the floodplains, vegetation can form an obstacle, causing the water level, and the risk of flooding, to rise. In 2012, Rijkswaterstaat started tidying up the flood plains. Where the river flows fastest, we are clearing a total of 1,400 hectares of shrubs and trees in an area stretching from Maastricht to Kampen and Rotterdam.

In 2016, we cut back the rough vegetation at more than 1,000 locations. By the end of the year, we had cleared 64 per cent of the total planned at the start of the project, more than achieving the envisaged minimum flood safety target. Rijkswaterstaat works in close consultation with the owners and managers of the land in the flood plains, who have proved to be very understanding. The work led to questions from and concern among local residents at only 1 per cent of the locations. We expect to complete the project in 2017.



## Safe dike status

In 2016 six projects under the High Water Protection Programme were completed. The following projects have achieved 'safe dike' status:

- 1 Capelle/Moordrecht
- 2 Diefdijk
- 3 sand asphalt protection layer on Noorderhavendam
- 4 part of the Hollandse IJssel storm surge barrier
- 5 Engelen lock
- 6 Emanuel polder



## More room for the rivers

**The rivers in the Netherlands are confined by ever-higher dikes and water levels rise as discharges increase. The risk of flooding is growing as the climate becomes more extreme and it cannot be mitigated solely by raising the dikes. Water levels must be lowered by giving the rivers more room.**

### Safety and spatial quality

By implementing the Room for the River Programme in close cooperation with market parties, knowledge partners, local authorities and the public, Rijkswaterstaat is increasing the discharge capacity of the Rhine and its distributaries from 15,000 to 16,000 cubic metres per second. Highest priority has been given to the safety of the four million people in the river basin, but nature, recreation and the economy will also benefit from the measures.

### Results

The Room for the River Programme is steadily yielding results. Another fourteen projects were completed in 2016. By the end of the year, 31 of the 34 projects had been completed. Two more projects are expected to achieve the high-water safety targets in 2017.

On 14 December 2016 the Room for the River IJsseldelta project entered a new stage when central government, the Overijssel and Flevoland provincial authorities and the Zuiderzeeland water authority agreed to bring the plans forward. The project will be completed by 2022 instead of 2025. Once the measures are in place, water levels in the IJssel will drop at high water by more than 50 centimetres at Zwolle and over a metre to the south of Kampen.

### Room for the River projects completed in 2016

Dike improvement Lower Rhine / Betuwe / Tielers-Culemborgerwaarden

Dike improvement Lek / Betuwe / Culemborgerwaarden

Dike relocation at Cortenoever

Lowering floodplain in Scheller and Oldeneler Buitenwaarden

Dike relocation at Westenholte

Room for the River IJsseldelta project, lowering summer bed

### Lower groynes and dam in the River Waal

Groynes are part of the river landscape. They keep rivers in place and maintain their depth. But through erosion of the shipping channel the groynes in the River Waal are too high in some places. And they form an obstacle to water discharge. In the past few years, 462 groynes on the section between Nijmegen and Gorinchem have been lowered. And between Wamel and Ophemert, a 10-kilometre long dam has been constructed running parallel between the river and the shore. Rijkswaterstaat officially completed the work in March 2016. Through this combination of measures, water can be discharged more rapidly into the sea when levels in the river are extremely high. This will reduce water levels in the River Waal by between 6 and 12 centimetres, improving flood safety in the area between Nijmegen and Gorinchem. The parallel dam will also benefit waterway users, and will cut the cost of river maintenance. Experience with it will be evaluated in the next three years (see also chapter 3).

### Water storage in Volkerak-Zoommeer

It could happen: a violent northwesterly storm and a storm surge at sea, while the major rivers are discharging surpluses of melt and rainwater through the Netherlands. To protect the country from flooding, the storm surge barriers constructed as part of the Delta Works are closed off. But that means the water from the Maas and the Rhine can no longer reach the sea, so that water levels rise in the Haringvliet and Hollandsch Diep. Statistically, this combination of extreme weather conditions, a storm surge at sea and extremely high river discharges occurs only once every 1,430 years. But the safety of four million Dutch people is at stake.

By designating the Volkerak-Zoommeer as a water storage basin, water from the rivers can be held there temporarily if necessary. The basin is the largest in the Netherlands, and it was taken into service in January 2016. The Brabantse Delta water authority carried out the work for Rijkswaterstaat. The project cost 70 million euros.

### River Maas Programme

Floods in 1993 and 1995 were a wake-up call for the Netherlands: high water protection along the River Maas was inadequate. The River Maas Programme was launched to improve the situation. In the Zandmaas and Grensmaas projects, Rijkswaterstaat is strengthening embankments, deepening and widening the river bed, excavating high-water channels and lowering the floodplains. In 2016, the high-water safety targets for the Zandmaas project were achieved with completion of work to lower the summer bed on the Sambeek section of the river. The high-water safety targets were also achieved at Lomm, and the Lateraal-West detention basin is now operational.



## Flood safety and spatial quality go hand in hand

### Strengthening the West Zeeland Flanders coastal defences

West Zeeland Flanders was one of the weak links in the Netherlands' coastal defences. Many parties have worked together successfully on projects that combine work on the coastal defences and area development.

#### For more information

[www.rijkswaterstaat.nl/jaarbericht](http://www.rijkswaterstaat.nl/jaarbericht)



*'Safety is up to standard, and the regional economy has received a boost.'*

**Roeland Hillen**  
programme director HWBP-2

The coast of West Zeeland Flanders is safe again. Up to November 2016 this stretch of the Dutch coast was the last weak link in the Second High Water Protection Programme (HWBP-2). This is the programme in which Rijkswaterstaat and the water authorities work together to protect the Netherlands from flooding. Parties seized the opportunity to combine work on the coastal defences with investment in the area's spatial quality. A marina, climate-proof dunes and a tidal nature area are the main achievements.

'Boosting the advantages for us all.' This is how Roeland Hillen, HWBP-2's programme director, describes the approach taken by many of the projects in the Second High Water Protection Programme. 'HWBP-2 has in fact a single mission – to bring up to standard the primary flood defences that did not meet the safety requirements in 2006. But at the same time, many projects provided golden opportunities for spatial development. Work on the coast of West Zeeland Flanders is an excellent example of combined efforts by ourselves and other parties.'

#### In dialogue with local residents

'Combining spatial development with work on the coastal defences calls for a very open mind,' says Toine Poppelaars, the chair of the Scheldestromen water authority. 'It means taking a very good look around you.

Before making any plans, we talk to a whole range of parties in the area – from the municipal and provincial authorities, to the owners of beachside cafés and campsites, and nature and landscape conservation organisations. Or with developers who come along with their own plans. What are their wishes and views? Do they have projects in mind which we could combine with work on the coast? And are they prepared to make a financial commitment?'

#### Split into subprojects

The work on the West Zeeland Flanders coast spans an area of around 15 kilometres. 'Prior to the start, we agreed with Rijkswaterstaat to split this up into five subprojects, each around 3 kilometres,' says Poppelaars. 'That is reasonably manageable. It makes it easier to seek direct contact with people with an interest in a particular stretch of coast. And

some places like Waterdunen tidal nature area and Cadzand marina had their own specific dynamic. That also justified splitting the work into separate subprojects. When you combine a flood safety project with investment in spatial quality it becomes much more complex from the viewpoint of governance. The advantage of subprojects is that in each case you can identify the most important driver. At Waterdunen it was the province of Zeeland, whereas we took the lead at Cadzand.'

### Waterdunen – unique tidal nature

Two of the subprojects are particularly interesting: Waterdunen and Cadzand-Bad marina. Waterdunen is located between Breskens and Groede. The coast couldn't be strengthened here on the seaward side, so we chose to strengthen the existing dunes on the landward side. Behind these new climate-proof dunes we dug inlets, connected to open water through a tidal culvert. This will lead to the formation of a unique nature and recreation area in these brackish tidal waters. The plans also include a campsite in the dunes and a holiday park, along with new roads, paths and car parks.

### Cadzand-Bad marina

The municipality of Sluis seized the opportunity presented by the coastal defence project to upgrade the seaside resort of Cadzand. This resulted in the construction of a new coastal path, carparks, and various resting places and viewpoints in the dunes. When a water sports club came up with a plan for a marina, two piers were constructed between which space was created for a harbour with around 125 berths. 'That was quite a complicated project,' says Poppelaars, 'because there were several parties involved. But we did an excellent job together. And I'm very enthusiastic about the result. Besides strengthening the coast, we have given tourism and the quality of the beaches here a huge boost.'

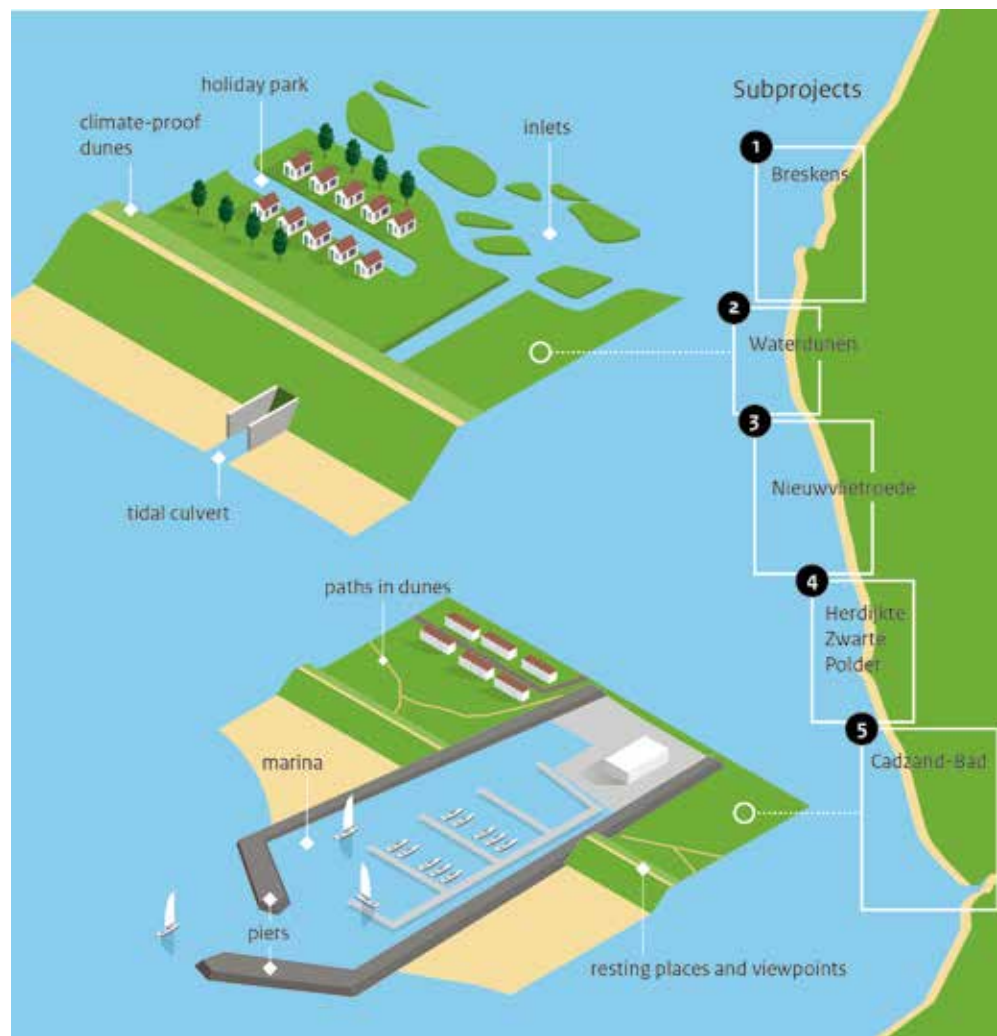
### An open mind

Hillen fully agrees. 'Not only have we made the coast safe again,' he points out, 'but we've also given the region – with its declining population – a much-needed economic boost. The best thing is that it all started with talking to each other at a very early stage and keeping an open mind. That's what I find really exciting. By taking each other seriously you can come up with excellent solutions, from which everyone ultimately benefits. We're getting better and better at doing that. And we need to, because society requires that of us.'



*'An open mind is essential to achieving results.'*

**Toine Poppelaars**  
chair Scheldestromen water authority







## 5 Sufficient clean water

We take it for granted that everyone in the Netherlands has sufficient clean water at their disposal. Households are not the only users of water. Shipping, industry and agriculture also depend on it, and so do plants and animals.

One of Rijkswaterstaat's day-to-day responsibilities is to ensure that there is sufficient clean water for every user. In meeting this challenge, we work with our water management partners – the water authorities, for example. Surface water must be clean enough to be processed for drinking and bathing. And it must also be healthy enough to provide a good habitat for plants and animals.

That is why Rijkswaterstaat works on ecological management of the water systems. Our aim is for surface water in the Netherlands to satisfy the requirements of the EU Water Framework Directive by 2027.



*Dead wood in the secondary channel of the River Lek near Everdingen*

## Clean and healthy water

**Water policy has significantly improved the status of Dutch surface and ground water in recent decades. Most Dutch waters are clean enough to be turned into drinking water and for growing crops, watering livestock and bathing. But in some places, the water still doesn't meet the requirements.**

### Drinking water

Public drinking water suppliers extract water at seven national water locations and process it for drinking. The ecological status of the water at these locations meets the requirements for most substances, though pesticides still occasionally cause problems. In 2016, Rijkswaterstaat and RIWA-Rhine signed a declaration of intent on sharing measurement data. By sharing data on residues of substances such as medicines and personal care products found in the water, problems can be identified in time.

### Bathing water

In 2016, Rijkswaterstaat managed 228 open bathing water locations. During the season, we monitor the quality of the water for compliance with the Bathing Water Directive. The bathing water quality was found to be excellent, good or sufficient at over 99 per cent of the locations. The quality was poor at only one location, where birds proved to be the

chief source of pollution. Rijkswaterstaat has taken the initiative to work with other stakeholders to improve the quality of the bathing water.

### Salinisation

Through climate change and the rising sea-level, more and more sea water is seeping into the west and north of the Netherlands. In 2016, studies showed that the River Lek will become saline unless water management measures are taken. Rijkswaterstaat and drinking water suppliers Vewin, Oasen and Dunea are now studying this part of the main water system in order to develop a new water management strategy.

## Ecology

**Surface water must not only be clean enough to be processed for drinking and bathing. It must also be ecologically healthy enough to provide a good habitat for plants and animals.**

### Ecological measures

The ecological status of the waters has risen in the past five years from 'poor' and 'sufficient' through 'moderate' to 'good'. But in 2016, the spatial planning of the national waters did not fully comply with EU requirements on healthy habitats for all plants and animals. It will take time



for ecological measures to have an impact. Concentrations of chemical substances in the environment are still too high. Rijkswaterstaat is seeking new ways of improving habitats for birds and fish. For example, we are investigating whether large-scale ecotone habitats between water and land will lead to an ecologically sound water system.

### Marker Wadden

The ecological quality of the Markermeer has declined considerably since it was closed off from the IJsselmeer in 1976. For this reason, Rijkswaterstaat is developing a new wetland reserve in this inland lake. In March 2016 we started work on the first island in the Marker Wadden, with an underwater landscape of some 300 hectares. This will considerably improve the quality of both the bed and the water in the Markermeer, leading to a healthy habitat for birds, fish and aquatic plants. By the end of 2016, the contours of the first island were beginning to emerge, and a colony of common and black tern had already settled there. In the coming years, four more islands will be constructed in the Markermeer. Ultimately, an archipelago will form, with lagoons, reed marshes and mud flats. The first island

will open to the public in 2018. For the construction of the Marker Wadden, Rijkswaterstaat entered into an alliance with nature conservation organisation Natuurmonumenten.

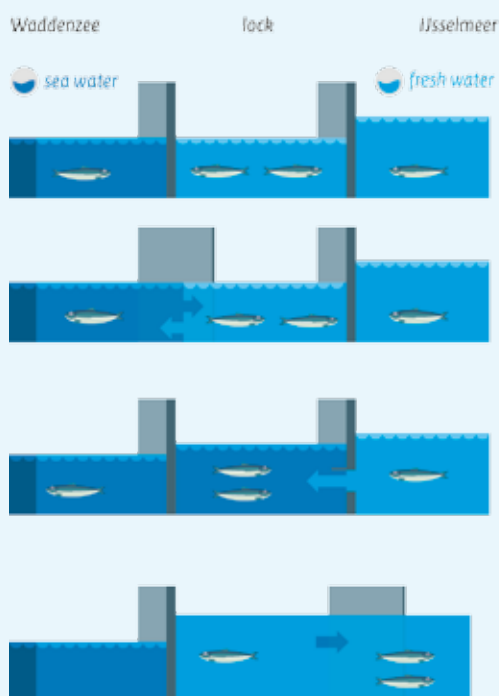
### Hiding place for young fish

The number and variety of fish in Dutch waters is declining. In 2016, Rijkswaterstaat therefore sunk 45 concrete containers, each weighing 800 kilogrammes and measuring a metre in height, near fish ladders and various harbours in the North Sea Canal. These containers look like bell-shaped bee-hives, with dozens of holes the size of a fist to enable fish to swim in and out, giving young and smaller fish protection against fish-eating birds and other fish. Studies show that elver, in particular, benefit from these containers, particularly in areas that have no natural banks, like reed banks, where they can hide. The concrete hives will also be sunk in a number of Amsterdam's harbours, and near the fish ladder in the Oranje locks.

## Fish migration through the Afsluitdijk

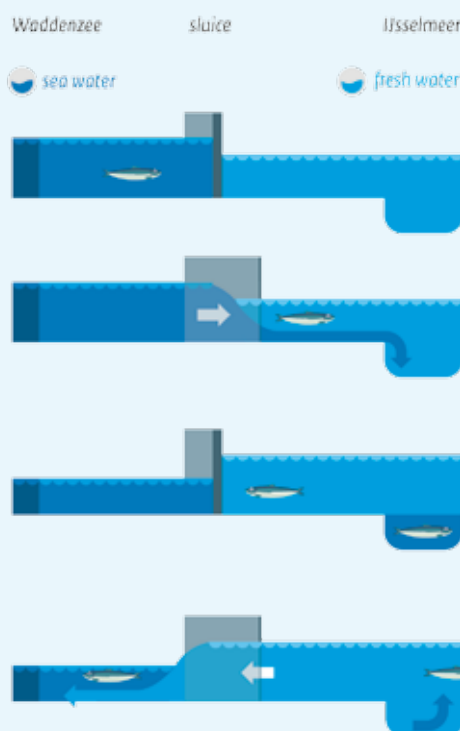
### Fish-friendly lock management

Locks bridge the difference in water level between the IJsselmeer and the Waddenzee for ships. Rijkswaterstaat now opens the locks at night for fish. In this way we provide free passage into the Netherlands for 160 million additional fish each year.



### Fish-friendly sluice management

The sluices drain surplus water into the sea. Fish cannot swim against the very strong current. 10 of the 25 sluices are now opened 15 minutes earlier each day, enabling 185 million fish to pass through each year.





### Fish migration

Many species of fish from the Waddenzee need the IJsselmeer as a spawning ground and nursery. But the Afsluitdijk (Barrier Dam) forms an obstacle. There are 25 sluices in the dike draining surplus water out of the IJsselmeer, and fish cannot swim against the very strong current. Since 2016, Rijkswaterstaat and the Hollands Noorderkwartier water authority have been making intelligent, fish-friendly use of the openings in the Afsluitdijk. Keeping the Den Oever locks open at night enables 160 million fish to enter the IJsselmeer each year. And by opening the sluices 15 minutes earlier each day, we can allow an additional 185 million to enter.

### Passage through the Afsluitdijk

At the Den Oever lock complex, many migrating fish are now able to swim effortlessly through the Afsluitdijk from the sea water in the Waddenzee to the fresh water in the IJsselmeer and vice versa. A new fish passage came into service in the Afsluitdijk in May 2016. This passage is equipped with a special tank and pump. The pump creates a freshwater current to lure fish from the Waddenzee. On several nights in April 2016, between 30,000 and 50,000 elvers used the passage. The tank in the IJsselmeer enables them to get used to the freshwater after their long journey at sea. The majority of the elvers have been carried 4,000 kilometres on ocean currents from the Sargasso sea near the Bermuda islands.

### Breeding ground for the common tern

Rijkswaterstaat has constructed an island on a caisson in the bay of the Schelphoek nature area in the Eastern Scheldt. It will provide a breeding ground for sea birds, where they can lay their eggs and raise their chicks. The island was officially opened in July 2016. Rijkswaterstaat has transferred responsibility for its management to Staatsbosbeheer (the state forest service).

### Dead trees for more biodiversity

Since the last century, all kinds of measures have been taken to make the water in our rivers more healthy. Yet life is still difficult for fish and other animals. Little remains of the original biodiversity. Natural rivers and riverbanks are often lined with dead trees in which fish and other animals can hide. But dead trees are usually cleared from Dutch rivers to prevent flooding and damage to bridges and ships.

By way of experiment, Rijkswaterstaat fixed fifteen dead trees in the Lower Rhine and Lek in the past few years. Twelve were also fixed in the secondary channel of the Maas in the Hemelrijkse Waard, eight in a former branch of the river, and another four across the river in the Maasbommel channel.

The results of these tests are hopeful and surprising. The trees not only attract more fish, but also insects like buzzer midges and sedge flies. Some species are making a comeback, including invertebrates that filter the water.

Rijkswaterstaat now wants to apply the measure in free-flowing waters in sections of the Rivers Waal and IJssel. Dead wood will probably have an even more beneficial effect on underwater life at these locations.

### Restoration of the River Maas

In the last century, the River Maas was made navigable. The channel was straightened, the river was equipped with dams and locks, and its banks were strengthened with stone cladding. Many indigenous plants, fish and other wildlife disappeared due to lack of calm, shallow water. Rijkswaterstaat is now working on the ecological restoration of the river – for example by restoring its branches and excavating new channels. The banks at many places along the river are being made more ecologically-friendly, and the mouths of streams more fish-friendly. A total of 80 kilometres of nature-friendly banks have been created by moving all or part of the stone cladding.

#### *Hemelrijkse Waard*

The Hemelrijkse Waard is a good example of a nature project along the River Maas. Between the villages of Oijen and Lithoijen in the municipality of Oss, 225 hectares of land in the River Maas's flood plain have been redeveloped. In an area the size of 300 football pitches, the original contours, with shallow waters and dry ridges, have been restored, creating an attractive habitat for river fauna and flora. Rijkswaterstaat implemented this project in partnership with co-landowner and land manager Natuurmonumenten (for more information see page 32).

### Groote Zaag

With the closure of the major sea inlets, many river estuaries no longer experience high and low tides. Since water is no longer exchanged between the sea and the rivers, the wildlife typical of a delta has become rare. The ports, dikes and hard banks of the Nieuwe Maas leave little space for nature. The river bed was also polluted in many places. The situation improved in 2016 with the construction of the Groote Zaag – an island minutes away from the city of Rotterdam. By constructing a dam, raising the soil and digging streams with soft banks, we created an intertidal zone of 10 hectares. The shore slopes gently, with a gradual transition from water to dry land, making it suitable as a spawning ground and habitat for fish. Pike, for example, lie in wait there when hunting for prey.



## More scenic areas, healthier water, greater flood safety and enhanced quality of life

### Hemelrijkse Waard

With the redevelopment of the Hemelrijkse Waard and the construction of a secondary channel over a length of 3 kilometres, we have created an attractive habitat for river flora and fauna. At the same time, the water in the River Maas now has more room.

### For more information

[www.rijkswaterstaat.nl/jaarbericht](http://www.rijkswaterstaat.nl/jaarbericht)



*'By working in partnership we were able to adopt an integrated approach.'*

**Roland Gesthuizen**  
environmental manager Rijkswaterstaat

In November 2016, work on the Hemelrijkse Waard was completed. Between the villages of Oijen and Lithoijen in the municipality of Oss, 225 hectares of land in the River Maas flood plain have been redeveloped. A new secondary channel, 3 kilometres in length, has been constructed with sandy islands. Rijkswaterstaat worked closely with Natuurmonumenten in developing the project. Local residents were invited in various ways to contribute to the final design.

The partnership between Rijkswaterstaat and Natuurmonumenten made it possible to combine various goals and adopt an integrated approach. 'Improving the ecological quality of the water – with a view to the Water Framework Directive – was Rijkswaterstaat's main priority,' says Roland Gesthuizen, environmental manager at Rijkswaterstaat. 'Natuurmonumenten owns and manages most of the land here. They wanted to use the project as part of their Meer Maas Programme for nature development and to encourage recreational activities in the area.'

### Best value procurement

The project was put out to tender using best value procurement (BVP). This means that the lowest price is not the only decisive factor. Market parties' expertise and the quality of their work are equally important.

'The tendering procedure was successful,' says Gesthuizen. 'The construction firm, Wetering, raised the quality of the design by adding extra elements, notably by employing a specialist in the ecology of the River Maas. The work was carried out in harmony, on schedule and within the budget, partly because local residents were closely involved, for instance by taking part in design workshops at the preparatory stage.'

### Giving nature more room again

Engineering works like canalisation, stone cladding to prevent river bank erosion, and the construction of dams and locks have forced the River Maas into an increasingly tight straitjacket. River wildlife has declined through lack of shallow water. But thanks to projects like this one in the flood plains, and the removal of the stone cladding from the river banks, the plants, fish, insects and

other species native to the River Maas now have the opportunity to return.

### A 'coral reef' of trees

In the new 3-kilometre long secondary channel with its sandy islands, plants can take root and fish can spawn and rest. 'The striking feature is that we used some of the tall poplars that were felled to redevelop the Hemelrijkse Waard,' says Gesthuizen. 'These trees also used to serve as beacons for shipping. We've now fixed them in the secondary channel. The great thing is that the dead wood works like a coral reef; very soon it will be teeming with life.' The River Maas now has a greater discharge capacity, so at high water, the levels are at least 4 centimetres lower than before. The Hemelrijkse Waard project was originally part of the River Basin Nature Development Programme. 'The aim of the River Basin Nature Development Programme is to improve high water protection and promote nature development in the flood plains,' says Gesthuizen.

### Listened carefully

By taking part in various workshops, local residents were able to contribute to the final design. And at the planning stage, Rijkswaterstaat listened carefully to their objections. Frans Clarijs is one of the local residents. His house is outside the dike – on the flood plain. 'At first I wasn't very interested in the project,' he says. 'But that changed when I saw a drawing showing a car park near my home. That was quite a surprise. And I suspected that the planned footpath could also be a source of nuisance. Fortunately, they listened carefully to my objections. The car park is now somewhere else, and the footpath has been rerouted to protect our privacy. A stretch of water between the path and our house solved the problem. I'm very pleased with the result. In that regard, I certainly think they listened to local residents.'

### Delight

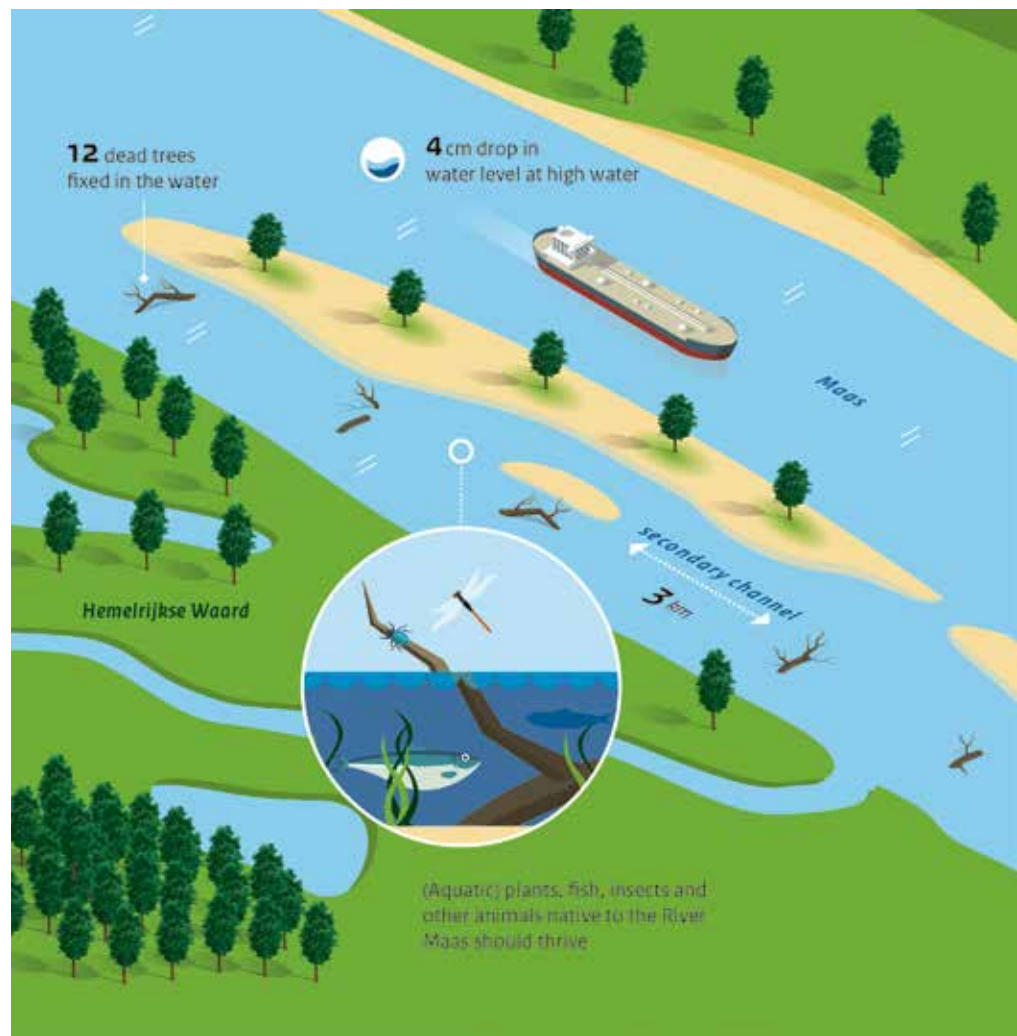
Clarijs is also very impressed at the way in which the contractors carried out the work. 'Two years ago they actually started excavating the land in the flood plain,' he says. 'But because transport was mainly by boat, we hardly noticed what they were doing. And at the implementation stage, the builder was always prepared to talk to us.'

The work was completed some time ago, and for Clarijs the Hemelrijkse Waard is now a source of great delight. 'The winter was beautiful – all that open, silent, grey land. I didn't actually go skating myself. But when you see all those skaters passing by, it's like looking at a painting by an old Dutch master. And when spring comes, everything will be green again. We're really looking forward to that.'



*'They certainly listened carefully to the local residents.'*

**Frans Clarijs**  
local resident







## 6 A sustainable living environment

A liveable country in which the economy, ecology, quality of life and social relations are in balance – that is Rijkswaterstaat’s ambition for the Netherlands. We seek to achieve it through a wide range of sustainability measures, with innovative solutions and in close partnership with many stakeholders.

A circular economy, a better environment and sustainable use of energy – these are Rijkswaterstaat’s key aims in ensuring the Netherlands is sustainable. To achieve these aims we are working on sustainable accessibility, sustainable water management and sustainable area development.

We consider the ‘quality of life’ concerns of the general public, local residents and other users. And we work in increasingly closer partnership with other government authorities, businesses and knowledge institutions towards practical, affordable solutions to sustainability problems.

### Sustainable area development

**Infrastructure projects in the Netherlands are increasingly becoming area development projects. In developing infrastructure, Rijkswaterstaat wants to contribute to a better living environment. And the public want to be more closely involved in shaping their living environment.**

#### Area-based approach

Work on roads, dikes, bridges and tunnels has a direct impact on quality of life and spatial planning. There are





The Honey Highway near the A4 Delft-Schiedam motorway

often many interests at stake. Before starting work, Rijkswaterstaat charts the solutions that will yield the highest dividend in terms of quality of life for residents and other users. And we also look at how we can best work with provinces, municipalities, water authorities, private parties and the public to achieve common goals – both before and during the project.

### Room for the River

The Room for the River projects are striking examples of the area-based approach to infrastructure projects. While protecting the areas along the major rivers from flooding, they have also created new opportunities for nature and recreation in the past few years. In the Noordwaard and Overdiepse polders we have even built houses and farms on artificial mounds so that residents can continue to live and work in areas at risk of flooding.

### Healthy cities

Rijkswaterstaat is also working on a healthy living environment in and around towns and cities. A good example is the tunnel carrying the A2 motorway under Maastricht, which was opened in 2016. The city will no longer be split in two, and through traffic will no longer pollute the air. Urban parks, sports fields and houses are being built on top of the tunnel, which is 2.3 kilometres long (for more information see page 14).

### Long park

In 2016, Rijkswaterstaat also worked on a 3-kilometre-long tunnel as part of the A9 Gaasperdammerweg project. A park twice the size of Amsterdam's Vondelpark will be built on top of the tunnel to link the various districts of Southeast Amsterdam. In carrying out construction projects, we work closely with municipal and provincial authorities, knowledge institutions and the public.

### Sustainable underground bicycle parking lot

Rijkswaterstaat contributes to the sustainable development of the major cities. At Gustav Mahlerplein in Amsterdam we have built an underground parking lot for 3,000 bicycles. The parking lot, which was opened in July 2016, is also interesting from the viewpoint of safe and healthy urbanisation. Water storage was included in its design and construction. An underground cement reservoir prevents the square from flooding during heavy rainfall. A park is planned on top of the underground parking lot, with plenty of green areas and edged with natural stone. This project is being implemented by the Zuidasdok project organisation, a collaborative venture involving the municipality of Amsterdam, ProRail, Rijkswaterstaat and BAM.

## Circular economy through sustainable use of materials

**Rijkswaterstaat is strongly committed to the circular economy. The challenge is to make all the material from the land and waters we manage part of the sustainable cycle and to reuse it.**

In moving towards a fully circular economy, the government wants central government agencies to cut their use of primary resources by at least 50 per cent by 2030. Rijkswaterstaat can make the difference. We are the country's major client for civil and hydraulic engineering projects, and purchase around 50 per cent of the asphalt and nearly 2 per cent of the cement used in the Netherlands. Rijkswaterstaat encourages its contractors to work with sustainable materials and to develop sustainable new materials and working methods.

### Sustainable asphalt

Road surfacing and maintenance account for nearly a quarter (23 per cent) of Rijkswaterstaat's carbon footprint. In 2016, we surfaced the roads at several locations using sustainable asphalt. This asphalt comprises 60 per cent recycled material. It is produced at a relatively low temperature and emits 25 per cent less CO<sub>2</sub> than traditional asphalt. On an increasing number of roads, the life of existing asphalt is being extended using smart methods. The Heijmans construction company has developed an asphalt rejuvenator. It means that roads need to be resurfaced less often, radically cutting the costs of maintenance and reducing the impact on the environment.

### Trial with plastic harvester

Plastic threatens marine life and human health. In June 2016 a trial was launched with Boyan Slat's Ocean Cleanup system – an innovative Dutch plan to clean up the plastic soup in the world's seas and to recycle the harvested material. Rijkswaterstaat is supporting the trial with a financial contribution of 200,000 euros and by providing a test site in the North Sea. The floating prototype measures 100 metres and is located 23 kilometres off the coast of Scheveningen. The trial will last a year, with sensors measuring how the floating barriers operate, and whether they can withstand extreme weather conditions.

### Bio-based crash barrier

The Westkop on the Grevelingen dam near Bruinisse is the site of a Rijkswaterstaat trial with a bio-based crash barrier. Unlike the standard galvanised steel crash barriers, this barrier does not leak hazardous substances into the grass verge. The product is made of bioplastic combined with various fibres, including grass from roadside verges.

Since September 2016, Rijkswaterstaat has been considering options for using the grass mowings from roadside verges and the banks of canals and rivers in the production of cardboard. This would transform the grass from waste into a raw material.

## Saving and generating energy

**By 2020 14 per cent of the energy consumed in the Netherlands must be from renewable sources. Rijkswaterstaat is encouraging and facilitating companies to generate energy in the land and water areas it manages.**

Rijkswaterstaat plans to use roads, waterways and the areas in their immediate vicinity for generating energy. We are also aiming for the Dutch main road network to be energy-neutral by 2030.

### Hydroelectric, solar and wind energy

Rijkswaterstaat is enabling an increasing number of wind turbines to be installed along roads and waterways, on dikes and in the North Sea. For some time now, hydroelectric power has been generated in the Maas at Linne and at Lith. And the new lock in the Wilhelmina Canal in Tilburg is being used to generate energy for around 250 households. The five turbines installed in the gates of the Eastern Scheldt storm surge barrier now generate enough electricity for 1,000 households.

### Energy self-sufficient

All the new bridges and locks built by Rijkswaterstaat are energy self-sufficient. The Ramspol bridge near Kampen is the first energy self-sufficient moveable bridge in the world. Following this example, the Beatrix lock at Nieuwegein and the lock at Terneuzen will also be made energy self-sufficient. Here, energy will be generated by the movement of the lock gates.

In 2018, a new type of noise barrier that not only restrains traffic noise but also generates energy will be installed along the A50 motorway near Uden. Solar panels will be installed on either side of the barrier.

### Energy savings

Rijkswaterstaat also wants to consume less energy. Our aim for 2020 is to reduce our energy consumption by 20 per cent relative to 2009.



### Led lighting

Led lighting has gradually been introduced along the motorways in recent years. In 2016, it was installed on the Holendrecht-Maarssen section of the A2. This is the first multi-lane motorway in the world to use led lighting. We expect to save around 241,600 kWh a year on this section of road. Led lighting cuts CO<sub>2</sub> emissions by 62 per cent compared to traditional lighting.

Rijkswaterstaat is also replacing the lights in light buoys and lighthouses and tunnels. Led lights not only save energy. As they last 10 to 15 times longer than conventional lights, they will also save about 1 million euros a year in maintenance costs.

Led lighting is also safer, especially on the roads. It produces better colour contrast and less glare, thus improving traffic flow. We expect our investment in led lighting to have paid for itself within seven years.

### Carbon footprint

By 2020 Rijkswaterstaat aims to cut CO<sub>2</sub> emissions and energy consumption by 20 per cent relative to 2010. Every year since 2009, we have analysed our carbon footprint to

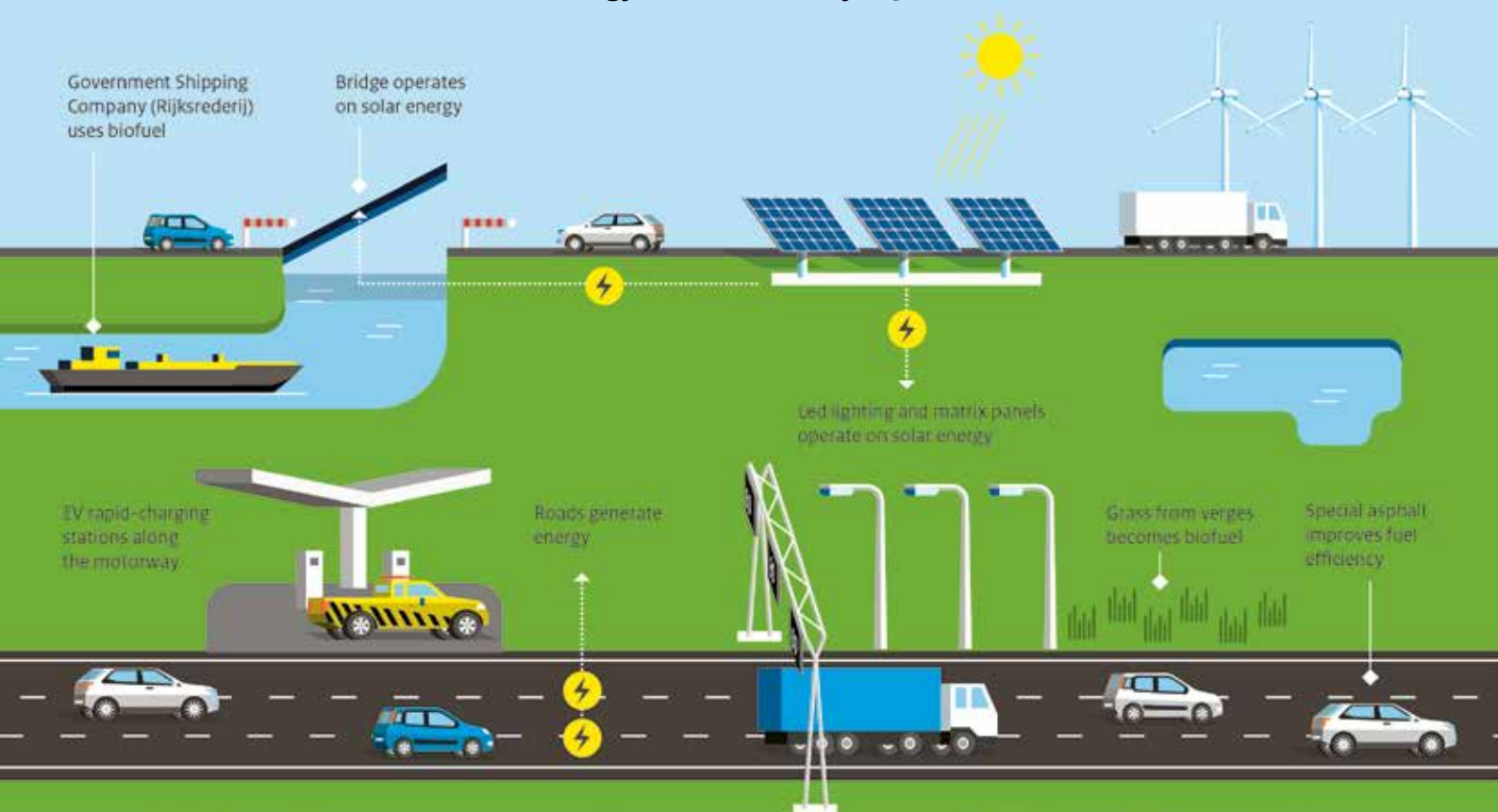
measure the CO<sub>2</sub> emissions of our activities and have been taking a wide range of targeted measures to reduce them.

### Government Shipping Company

Rijkswaterstaat's ships can play a major role in cutting CO<sub>2</sub> emissions. Deployment of the 110 Government Shipping Company (Rijksrederij) vessels is responsible for 44 per cent of the Ministry of Infrastructure and the Environment's total emissions.

The twelve largest seagoing vessels now run partly (30 per cent) on biodiesel. This hydrotreated vegetable oil (HVO) meets the strictest environmental norms, and does not compete with the food chain or lead to extra deforestation, since it is made from recycled cooking oil. In 2016, Rijkswaterstaat worked with engine manufacturers and the Netherlands Organisation for Applied Scientific Research (TNO) to investigate whether mixing HVO with diesel fuel would affect vessels' technical performance. That proved not to be the case, so the Government Shipping Company is very happy to use it. The result has been an 18.2 per cent reduction in CO<sub>2</sub> emissions relative to 2011, thus helping to reduce Rijkswaterstaat's carbon footprint.

## Infrastructure in the Netherlands energy self-sufficient by 2030





# First energy self-sufficient motorway in the Netherlands

## A6 Almere

The section of the A6 motorway between Almere Havendreef and Almere Buiten-Oost is being widened. Each carriageway will have four lanes, with main and parallel lanes. The road is being constructed to allow for the municipality of Almere's future area development plans.

### For more information

[www.rijkswaterstaat.nl/jaarbericht](http://www.rijkswaterstaat.nl/jaarbericht)



*'This will be the first energy self-sufficient section of motorway.'*

**Martin Anneeze**  
contract manager Rijkswaterstaat

On 16 February 2017, infrastructure minister Schultz van Haegen gave the official go-ahead for work on the A6 motorway at Almere. The section between Almere Havendreef and Almere Buiten-Oost will be widened from 2x2 to 2x4 lanes. The project is part of the Schiphol-Amsterdam-Almere Programme, Rijkswaterstaat's largest road construction programme in the next ten years. The 13-kilometre stretch of motorway will be the first of its kind in the Netherlands. Rijkswaterstaat put the work out to tender as an energy self-sufficient motorway. The project received the Procura+ European sustainable procurement network award for Tender Procedure of the Year.

A solar panel field at the Almere intersection will generate the energy needed for this stretch of the A6. The field will supply the energy needed for the equipment on the road – lighting, matrix panels and pumps, for example. 'That's what makes the road so special,' says Martin Anneeze, contract manager at Rijkswaterstaat. 'Our objective is energy self-sufficient management of our entire network by 2030. In that light, we need to take steps like these and explore all the possible options.'

### Seeking solutions

The project was the result of close cooperation between parties like Rijkswaterstaat and the municipality of Almere in seeking sustainable solutions. In the search for ways to make roads sustainable, various options were

explored – not only solar energy but also wind energy and energy from biomass, for example. Solar panels ultimately proved to be the best solution, and they also harmonise with the local environment.

### Freedom

'The contractor was then given a considerable degree of freedom to flesh out the solar panel option,' says Erik Stoelinga, project director for Parkway6, the consortium that was awarded the contract. 'We were not told exactly how much energy would be needed or how much we'd have to generate. But we were told that all the energy used for the road would have to be generated by solar panels. Because we designed both the solar panel park and the installations and lighting, we were able to make sure that everything

worked together seamlessly. That gave us the freedom to choose led lighting instead of old-fashioned lights. Led lights are more energy-efficient. We'll be responsible for management and maintenance for twenty years after the project is completed, and the maintenance costs of led lights will be much lower. The freedom we were given as the market party really encouraged us to come up with the very best solutions.'

### Below ground level

But the road isn't only energy self-sufficient. 'The way in which the project is taking shape will also benefit the living environment,' says Anneeze. 'We are constructing the road below ground level, so that it will pose less of a barrier. We're creating scope to develop the area between Almere Centre and the Weerwater. That will strengthen Almere's urban structure.'

'The tender required the road to be not only energy self-sufficient, but also constructed below ground level. And we awarded the contract on the basis of MEAT criteria, one of which was sustainable construction methods. The more sustainable the contractor's work,

the larger the fictional sum we subtracted from the tender price. That's an incentive to take sustainability seriously.'

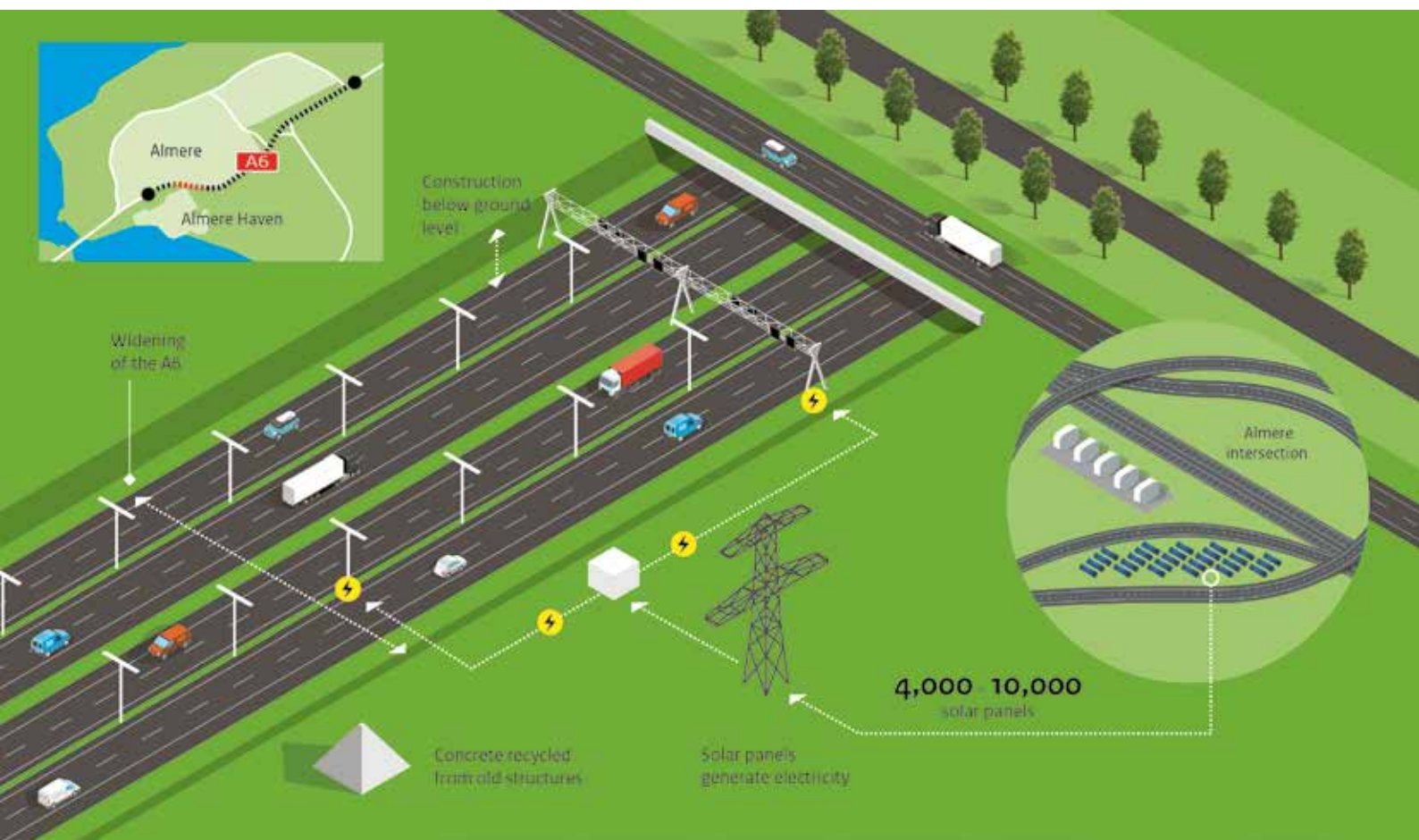
### Sustainable construction

'Right from the start,' says Stoelinga, 'we asked ourselves what materials were the least likely to impact on the environment, and whether they could be recycled. Where possible we recycle concrete from the structures we demolish. That saves not only on raw materials but also on transport. And we buy the sand left over from a nearby project, which would have to be removed anyway. That means far fewer truck movements, with lower CO<sub>2</sub> emissions and greater savings on fuel. That has a beneficial effect on the environmental cost indicators. We've also optimised construction of the paving under the asphalt so that far fewer materials are needed. That saves around 3,000 loaded trucks and as many truck movements.'



*'The tender was an incentive to seek the very best solutions.'*

**Erik Stoelinga**  
project director Parkway6







# 7 Reliable and useful information

Accurate and timely information is increasingly important for road and waterway users. They want information on traffic jams and diversions, and on water levels and the navigability of the waterways. Reliable and useful information is indispensable for user-friendly, efficient management of motorways, waterways and water systems. Rijkswaterstaat works hard to provide this.

## Main water system

**Rijkswaterstaat provides timely, reliable and useful information on both the quantity and quality of water. Our customers are all the users of the main water system: water professionals, waterway users and the public.**

## Water management centre

The Netherlands Water Management Centre (WMCN) in Lelystad is the national information hub on water quality and water quantity. The WMCN issues reports on water levels, droughts, flood threats and storms, water quality and ice formation. It is also home to the Water Help Desk, the contact point for all questions on water management and water policy.





The water in the Zuidplas polder is more than 6 metres below Amsterdam Ordnance Datum (NAP)

### Water awareness

Too few people are aware of the work that goes into keeping the country dry and habitable. They are also poorly informed about the risk of flooding and what to do in an emergency. In 2016, a second series of projects from the Room for the River Programme was completed. To make the public more aware of water issues, we decided to organise events marking the final milestones in these projects and their completion. For example, when we completed the dike relocation project at Lent, we opened the new island in the River Waal to the public. And in June events were held to celebrate completion of the IJsseldelta and Veessen-Wapenveld high-water channel projects.

### Overstroomik.nl

To make the public more risk-aware and increase their self-reliance in the event of a major flood, Rijkswaterstaat developed the Overstroom ik? website and app. Users can enter their postcode and see the maximum height the water can reach in their postcode district, the location of high buildings with a dry floor and the infrastructure that can be used as an escape route. In the event of a real crisis, the app and the website will direct the user to the local safety region and emergency broadcaster. The app and website have been used more than 700,000 times since being launched in September 2014. In 2016, Rijkswaterstaat's Overstroom ik? project won an award from the public sector network organisation Rijksbrede Benchmark Groep.

### Media campaign

In 2016, the Overstroom ik? project was also used in the successful media campaign #zohoog, in which Rijkswaterstaat drew attention to the fact that a large proportion of the Dutch population live below sea-level. The message reached seven million people through free publicity in the media and nearly three million through social media. In July, this campaign won the International Public Relations Association (IPRA) Golden World Award.

### 'Afsluitdijk Icon' designs unveiled

To protect the Netherlands from flooding in the future too, Rijkswaterstaat will be improving the Afsluitdijk in the coming years. On 2 September 2016, minister Schultz van Haegen and members of the provincial executive of Friesland and North Holland launched the Afsluitdijk Icon project. Its aim is to raise people's awareness of the Afsluitdijk importance in protecting the Netherlands from flooding. Through this project, Studio Roosegaarde will strengthen the cultural and historical value of the dike and create new links between people and landscape. Daan Roosegaarde unveiled the designs which from 2016 and 2017 will add to the iconic value of the dike as an international showcase for Dutch hydraulic engineering, innovation and design.

### World fish migration day

Dikes, dams, sluices and storm surge barriers generally form insurmountable obstacles to migratory fish. This was the focus of world fish migration day (WFMD) on 21 May 2016, with events at various locations all over the world. Around 40 activities were organised in the Netherlands by parties like the water authorities and Rijkswaterstaat. Rijkswaterstaat chose this day to launch fish-friendly management of the Afsluitdijk locks and sluices.

### National water week

How do we keep our water clean and healthy? That was the central theme of national water week, held from 1 to 8 May 2016. A total of 74 activities for both young and old were organised at 45 locations in the Netherlands. They included walks in water extraction areas and wetland reserves and visits to water purification plants. 18,000 adults and children visited the nine water museums taking part in national water week.

A second national water week was held from 12 to 19 October 2016. Rijkswaterstaat showed how it works with other partners to ensure flood safety. The national water weeks are an initiative of the Ministry of Infrastructure and the Environment, Rijkswaterstaat, drinking water suppliers Vewin, the Delta Programme, the water authorities, the provincial and municipal authorities and water companies.

### Marker Wadden

On Saturday 25 September 2016, the first visitors set foot on the newest part of the Netherlands, the Marker Wadden. Hundreds of people sailed in chartered and private boats to the new island in the Markermeer, where they were given a festive welcome. They were informed about the work and were given the opportunity to walk along the new sand dikes and around the mud flats. The event was organised by Natuurmonumenten with its partners Rijkswaterstaat, the province of Flevoland and contractor Boskalis.

### Swimming warnings

In the summer of 2016 Rijkswaterstaat repeatedly issued warnings about the dangers of swimming in rivers and canals. Despite the ban on swimming in shipping channels and at bridges, locks and harbours, injuries and deaths occur every year. The currents in rivers, canals and whirlpools can be strong enough to pull swimmers underwater. Furthermore, the navigators of large vessels have difficulty spotting people in the water.

### Bathing water app

The Bathing Water app is a handy tool for open-water swimming enthusiasts. It was developed by the Association of Provincial Authorities, the Association of Regional Water Authorities and Rijkswaterstaat to inform the public of the quality and safety of official open-water bathing locations.

With the aid of Google Maps, users can conveniently find local bathing locations, and learn how safe they are and when the water was last tested. Routes can also be plotted to lakes and swimming pools. When the temperature rises above 25 degrees Celsius, it issues a warning if there is a risk of blue-green algae. Safe bathing locations are also listed on [www.zwemwater.nl](http://www.zwemwater.nl).

## Main waterway network

**The Netherlands is Europe's water transport hub. Dutch waterways are among the busiest in the world. For smooth, safe and efficient use of the waterways, information is essential.**

### Shipping Centre

The Shipping Centre (SVC) is the contact point within Rijkswaterstaat for everything to do with shipping. It provides up-to-date information on the situation on the waterways.

### Customised waterway information

Information is essential to ensure traffic circulates smoothly and safely on the waterways. Waterway users need to know about currents, weather conditions and tides, dredging work and closures, etc. On the website [vaarweginformatie.nl](http://vaarweginformatie.nl) Rijkswaterstaat provides information that could be relevant to their journeys. Website users can set up their own free, personal account for information customised to their planned routes. The website also covers the inland waterways in countries popular with recreational boaters, like Germany and France.

### Safe Boating

Safety on the waterways is a concern during the busy summer periods. Some recreational boaters are unable to steer their craft properly, while others do not know the rules or sail in unfamiliar waters. Recreational boaters and commercial shippers are increasingly getting in each other's way. The Safe Boating campaign is therefore meeting the growing need for information about the risks on Dutch waterways.

The information is provided via social media and an app. Booklets and flyers are also handed out at trade fairs, harbours and locks and by rental companies and sailing schools. The project is an initiative by the Stichting Recreatietoervaart Nederland alliance, Rijkswaterstaat, the provincial authorities, port authorities, water sports associations and interest groups.



## Main road network

Millions of people take to the Dutch motorways every day. Reliable, up-to-date information on hold-ups, diversions and maintenance work is crucial to keep the traffic moving.

### Up-to-the-minute traffic information

Rijkswaterstaat's National Traffic Management and Information Centre (VCNL) oversees traffic flow on the road network as a whole. The five regional traffic control centres keep the traffic moving on the motorways. During busy periods diversions are announced on mobile matrix displays and dynamic route information panels (drips) above the road. The panels also display journey times and delays.

The VCNL supplies service providers such as the Royal Dutch Touring Club (ANWB) and TomTom satellite navigation with a constant stream of up-to-the-minute traffic information via the National Data Warehouse for Traffic Information. They in turn pass on the information to road users via the radio, internet, navigation systems and social media.

### Delays app

In 2016, Rijkswaterstaat developed a free app with information on traffic delays. The app Rijkswaterstaat Actueel is linked to a new Twitter account @RWS\_verkeer, which was launched at the same time. Together they provide road users with information on hold-ups on the motorways, roadworks and diversions, enabling them to plan their journeys and avoid delays. The app and the Twitter account also provide information on incident clearance on the main road network.

The app and Twitter account are additional to existing information sources, like panels above and alongside the road and traffic information services. The app has been downloadable from the App Store and Play Store since January 2017.

### Road inspectors on Twitter

Rijkswaterstaat makes systematic use of Twitter to inform users about lane closures due to maintenance work, diversions and emergency repairs. Road inspectors and mobile shipping traffic managers also use Twitter to share their experiences as they work to ensure traffic circulates safely and smoothly.

## Rijkswaterstaat's delays app





## More effective and more efficient traffic and road management

### Vehicle sensor data

The vehicle sensor data project collects anonymous sensor data – speed, position, application of brakes and weather conditions, for example – from moving vehicles. The aim is to enable better traffic and asset management, to the benefit of both road users and the road authorities.

### For more information

[www.rijkswaterstaat.nl/jaarbericht](http://www.rijkswaterstaat.nl/jaarbericht)



*‘Smarter data collection based on mobile sources.’*

**Laurens Schrijnen**  
strategic adviser Rijkswaterstaat

We have been monitoring the situation on the Dutch roads and motorways for many years – not only with cameras, but also with detection loops in the road surface that register traffic density and speed. The more information the road authority receives on circumstances on the road, the better public traffic management can be organised. With this in mind, Rijkswaterstaat launched the vehicle sensor data project in 2016. The aim is to collect more data from vehicles and use it intelligently to improve road safety and traffic circulation.

‘We manage around 3,000 kilometres of motorway,’ says Laurens Schrijnen, strategic adviser on Smart Mobility at Rijkswaterstaat. ‘We spend all our working hours measuring what’s happening on and around all those roads. But measuring systems are maintenance-intensive and only give local data. So we’re looking for ways of collecting data more intelligently. There are 8 million cars in the Netherlands. More than 7.5 million of them have in-car systems providing all kinds of information. The question is whether we can use these vehicles as mobile sources to collect data much more intelligently.’

### Start small

‘Of course it would be great if every car in the Netherlands could supply information,’ he continues. ‘But the vehicle sensor data project is starting small, with twenty of our own Rijkswaterstaat vehicles and a group

from three provinces. That means we don’t need to put the project out to EU tender. We first just want to explore the possibilities, and see what problems we run into. We’re working closely with the National Data Warehouse for Traffic Information.’

### Data as indicators

The project uses on-board units to collect anonymous sensor data from moving vehicles – on speed, position, application of brakes and weather conditions, for example. ‘In the first place the data are mainly interesting as indicators of fog, rain and ice, for example, or holes in and obstacles on the road. To see what we can do with the data, the project will start with three specific road management problems: fog, rain and ice. And with two asset management situations – holes in the road and an uneven road surface. When motorists switch on

their fog lights or windscreen wipers on a stretch of road, it indicates the weather conditions in that area. So if we can share this information, other road users and our traffic control centres will also benefit.'

### Public money well spent

The province of Overijssel has been involved in the project from the start. Lindy Molenkamp, head of the province's Road and Canals Unit, is enthusiastic. 'The plan is for all the vehicles driven by the province's road inspectors to take part in the project,' she says. 'We'll fit them with an on-board unit to pass on the data.' When asked why the project is so important for the province, she replies that it goes much further. 'I think a project like this goes far beyond the interests of the province. Of course, for us in Overijssel it is an opportunity to work with different information, from other sources – to learn by doing, not only about the major roads, but also about the secondary road network. So it is certainly important for the region. But, more importantly, I'm convinced that it will open up some wonderful prospects. The project will enable us to explore how new technologies can help us organise road management and road maintenance more intelligently – at national and European level. At the end of the day, what matters is to ensure that public money is well spent,

and that motorists can use the roads safely, without delays.'

### Gift

'The vehicle data will enable us as the road authority to work more effectively and more efficiently,' Molenkamp continues. 'It's the perfect opportunity to raise the functioning of the infrastructure networks to a higher level. Whether we're talking about asset management, management and maintenance of our roads, or traffic management. I regard the technology now available to us as a gift. We benefit hugely, yet it costs relatively little. I'm certainly optimistic about the future. Of course the playing field will change. For example, the relationship between the private sector and the government. But let's not be too concerned about protecting our positions. Let's adopt an open attitude and explore the future together.'

### Open data

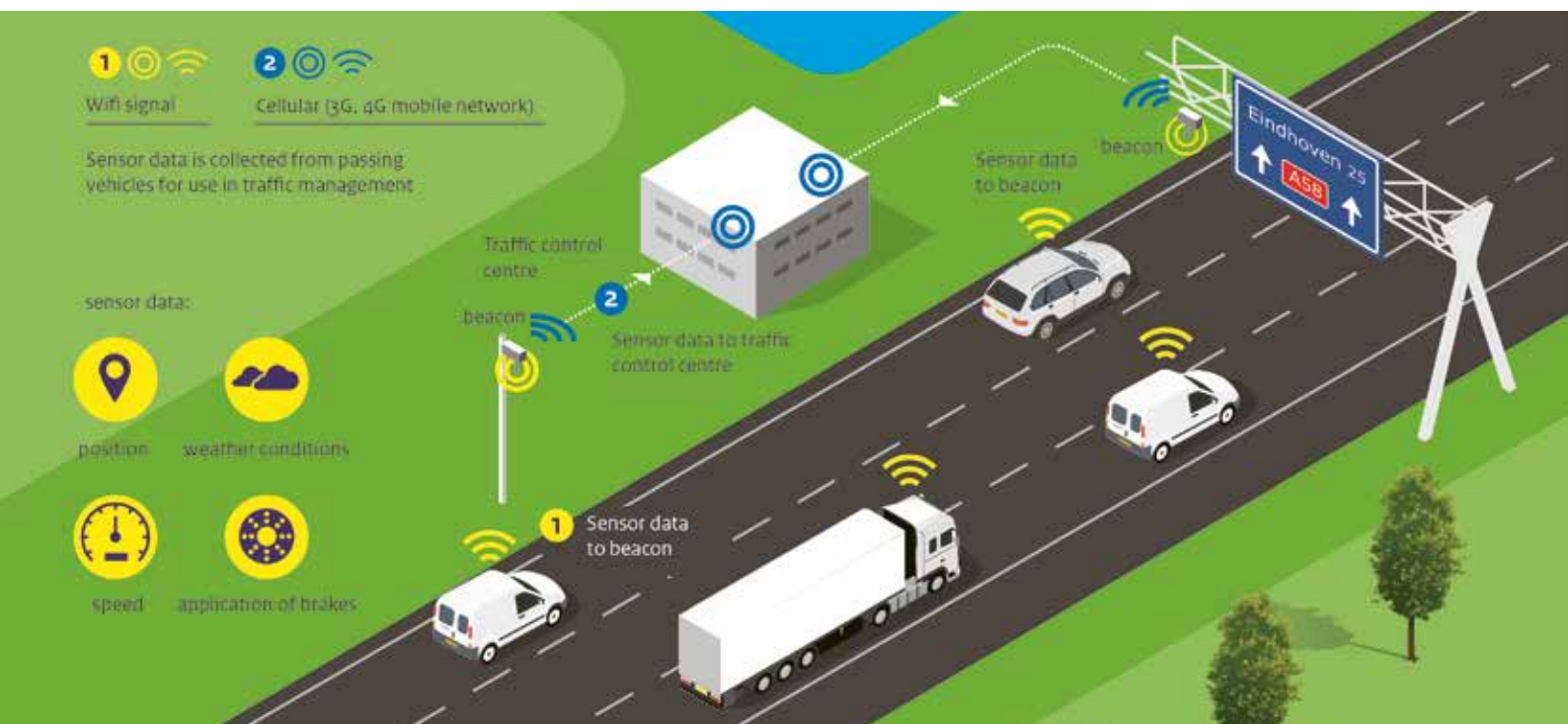
The vehicle sensor data project will start small, but its ultimate aim is to collect as much data as possible. 'I'm convinced that we'll succeed,' says Schrijnen. 'Although there are certainly a few unsettled issues – for instance in relation to privacy and ownership of data – the transport sector is really enthusiastic. Ultimately, this should lead to a wealth of open data that everyone



*'It will help us to work more effectively and more efficiently.'*

**Lindy Molenkamp**  
head Roads and Canals Unit province of Overijssel

can use as they see fit. With our partners we're taking the first steps towards creating this mass of anonymous data. Everything we do serves a higher purpose – to improve the safety of our roads and traffic circulation. The Netherlands can show that it is not only a knowledge and transport centre, but also a leader in innovation.'







## 8 Changes in the organisation

Rijkswaterstaat wants to respond flexibly to the challenges facing society today. That is the aim of Strategy 2020, our new organisational approach that seeks to be efficient, connective and customer-driven. Based on this strategy, our staff work together to achieve maximum added value for society.

People in the Netherlands need a service-minded government committed to ensuring the country is safe, accessible and liveable and that actively involves the public in spatial planning. Knowledge institutions, market parties and our government partners are keen to step up cooperation with Rijkswaterstaat. And political parties want our organisation to work more uniformly, more efficiently and more flexibly.

Strategy 2020 shows how Rijkswaterstaat will achieve those aims in the period up to 2020. The organisation wants to

respond better and more flexibly to new developments that affect the way it does its work. Sustainability and the living environment, information provision and intelligent mobility are all part of Rijkswaterstaat's new work.

### **Building for the future**

Strategy 2020, launched in September 2016, builds on the objectives and results of the 2015 Business Plan, Rijkswaterstaat's organisational strategy for the 2011-2015 period. An evaluation of this strategy in 2016 showed that



*Rijkswaterstaat's Westraven office building, on the Amsterdam-Rhine Canal*

Rijkswaterstaat has made considerable progress since 2011. The organisation has developed into an executive organisation operating nationwide for the entire Ministry of Infrastructure and the Environment. Problems relating to infrastructure, transport, spatial planning and water can now be tackled coherently. And Rijkswaterstaat now works more closely with the provincial and municipal authorities, the water authorities, market parties and the general public.

Rijkswaterstaat has also become leaner and more efficient. Internal work processes have been streamlined and consolidated. And staff members' attitude to their work has changed. They are now much more focused on continually improving work processes and preventing waste.

### **Strategy 2020 – internal**

Strategy 2020 contains many of the elements that were also at the core of the 2015 Business Plan. In the period up to 2020, too, we are committed to a unified Rijkswaterstaat that works closely with its partners and produces better results every day. However, the strategy's focus has shifted. The spotlight is no longer on the organisation itself but on the professional development of its staff. Key themes include working on trust and equilibrium in the organisation and reducing red tape. From now to 2020, as few changes as possible will be made to the organisational structure and, where possible, internal regulations will be reduced to their essentials. The aim is to enable our staff to make optimal use of their talents and skills for products that serve society.

### **New work culture**

Strategy 2020 also seeks efficient, customer-driven cooperation to achieve maximum added value for society. That calls for a new work culture. The strategy encourages staff members to be more customer-minded and externally focused, and to work more closely with our partners. Trust, consolidate and improve are the key words.

### **My RWS**

Staff members played an important role in the process leading to Strategy 2020. More than half of them contributed to its development in 2016. Strategy 2020 is a living document. Staff members will continue to focus on making a maximum contribution to the organisation's objectives up to 2020. Under the motto My RWS, they will invest in their skills and use their personal talents to the full. Each staff member must regain a sense of ownership of their work, and the freedom to shape their own input. In this way, Rijkswaterstaat will continue to be an attractive employer for current and future employees.

### **Knowledge**

Demographic ageing is also impacting on Rijkswaterstaat. In the next few years, many baby boomers will be retiring. Ensuring that the right knowledge is available at the right place in the organisation continues to be an essential task. Each year, we determine what knowledge must be developed, strengthened or obtained in each of the fields in which we operate.

Our 2016 knowledge strategy identified the knowledge and expertise that Rijkswaterstaat itself must have in-house and what it can obtain from external knowledge parties. A targeted approach to mobility enables us to coordinate the recruitment, transfer and departure of staff and their knowledge. Specialist knowledge is pooled within internal core teams or programmes that operate across organisational units – knowledge of flood defences, sustainability or smart mobility, for example.

### Cutbacks

The cutbacks required by the first and second Rutte governments present Rijkswaterstaat with a considerable challenge. The staff establishment will need to be reduced by 1,500 FTEs between 2014 and 2018. From 2018, Rijkswaterstaat's budget will be cut by another 53 million euros a year. This is on top of the 187 million euros in cuts to organisational costs required by the first Rutte government.

In 2016 Rijkswaterstaat set out a broad package of economy measures. In deciding where to make cuts, our aim is to ensure that we have sufficient people and knowledge to continue operating as a reliable, service-driven organisation.

### Cooperation

Partnerships are essential to provide more effective, efficient, customer-driven and environment-oriented services. Rijkswaterstaat is therefore investing intensively in cooperation with counterpart infrastructure managers and other partners. Since 2012 it has entered into alliances with ProRail, the Royal Dutch Touring Club (ANWB), the Dutch Water Authorities, Natuurmonumenten, the Road Transport Agency, the Land Registry, the National Road Signage Agency and the Army Maintenance and Logistics Command.

In December 2016, Rijkswaterstaat also entered into a partnership with Staatsbosbeheer. The fences separating the areas managed by the two organisations will disappear, so that they can manage a single, larger area together. The two organisations want to work as partners on sustainable maintenance of vegetation, flood safety, area planning and outdoor recreational activities.

### Market Vision

Building projects are becoming increasingly complex and call for closer cooperation. In January 2016, Rijkswaterstaat, in partnership with builders' organisations and building sector associations, presented a Market Vision. By 2020, builders in the Netherlands aim to excel in a vital sector that works in close partnership to ensure maximum added value for society.

### *New culture*

The Market Vision chiefly invests in a new work and partnership culture. Clients and contractors want to work as partners, learn from each other and take each other into account. They want to gain a better understanding of each other's position, help each other where necessary and share risks more fairly. While working together on a project, they want to share knowledge and information openly. New-style partnerships ultimately lead to fewer rules and less red tape in contract award procedures, so transaction costs and the costs of failure can be reduced. With fewer rules and less red tape, it will be easier to develop innovations and better working methods and apply them in practice.

### *Implementation*

The Market Vision was co-produced by Rijkswaterstaat, ProRail and the sector organisations Bouwend Nederland, MKB INFRA, NLIingenieurs, Vereniging van Waterbouwers, UNETO VNI and Astrin (Association of Traffic Industries in the Netherlands). In addition, ProRail and the Central Government Real Estate Agency, which joined in 2016, have started embedding the Market Vision within their organisations.

In 2016 the Market Vision was signed and endorsed by 1,100 people. A survey conducted by Rijkswaterstaat in 2016 showed that the majority of the respondents had already heard of the Market Vision. A third said that it was already changing communication in the sector. People were taking more account of each other's interests, and were more willing to understand each other's viewpoint.

### Bouwcampus

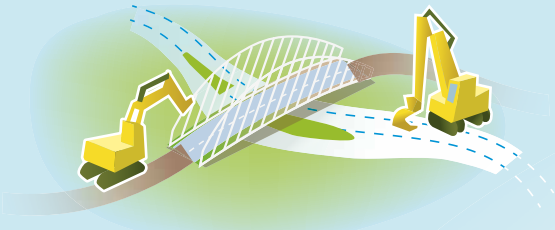
The Bouwcampus innovation centre, launched in January 2016 in Delft, is a good example of a new partnership in the building sector. The Bouwcampus is a meeting place where parties can work together to create innovative solutions for problems in the field of living and working – at a precompetitive stage, and in an open dialogue and impartial environment. More than 120 businesses, government agencies and knowledge institutions have now joined the network. They include contractor BAM and eleven organisations with offices in the same building. One of the Rijkswaterstaat projects now being developed within the Bouwcampus network is the design of new dams for the River Maas.



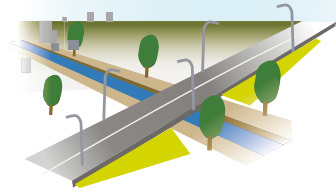
## Rijkswaterstaat's organisational units

Rijkswaterstaat's executive work is carried out by seven regional units that take a coherent approach to issues relating to infrastructure, transport, spatial planning and water. Rijkswaterstaat also has six units operating nationwide, with more specialist and support staff. The organisation is managed by Rijkswaterstaat's Executive Board.

Rijkswaterstaat  
Major Projects and Maintenance



Rijkswaterstaat  
Water, Transport and Environment



Rijkswaterstaat  
Programmes, Projects and Maintenance



Rijkswaterstaat  
Transport and Water Management



Rijkswaterstaat  
Central Information Services



Rijkswaterstaat  
Centre for Corporate Services



Rijkswaterstaat  
Executive Board





## Children advise Rijkswaterstaat

### Children's Council

The Children's Council enables children to talk about strategic and social issues with companies and organisations. Everyone benefits. Children learn more about the world around them, and decision-makers discover new, creative lines of thought.

### For more information

[www.rijkswaterstaat.nl/jaarbericht](http://www.rijkswaterstaat.nl/jaarbericht)



*'A great opportunity to talk to children.'*

**Eline Hartevelde**  
management adviser Rijkswaterstaat

Children talking on an equal footing with adults, in particular on subjects that impact on their futures. That is the idea behind the Children's Council, an initiative of the Missing Chapter Foundation, which was set up in 2009 by princess Laurentien. A Children's Council gives children a voice and teaches them to think about the world around them. Organisations benefit from children's original, creative views on adults' problems and dilemmas. Rijkswaterstaat set up a Children's Council in the autumn of 2016.

Children have the right to express their views, since decisions taken today will have a direct impact on the world in which they live. That is the main idea behind the Children's Council. 'You often hear the phrase 'children are the future', says princess Laurentien. 'But we say that children are equal stakeholders. That may be a very subtle distinction, but it makes a huge difference. Allowing children to join in and think along with adults is not only in children's interests. In fact, it's precisely because children think outside the box on the rules of the game in the adult world, that they can help adult decision-makers discover new lines of thought.'

### Enthusiastic responses

The idea of talking to children through a Children's Council – suggested through a Rijkswaterstaat forum – immediately

generated an enthusiastic response within the organisation. 'Rijkswaterstaat talks to many parties and groups in society, from sector organisations and interest groups to universities and local residents,' says Eline Hartevelde, management adviser at Rijkswaterstaat. 'Up to now, young children hardly had a say. They were simply not on our radar. But this is a great opportunity to change things. Director-general Jan Hendrik Dronkers was enthusiastic from the start. Children introduce a new, fresh way of looking at things. That has already paid dividends. Their ideas make us smarter. And the Children's Council gives us the opportunity to generate enthusiasm among young people for Rijkswaterstaat's work and technology in general. We have certainly managed to get a number of children hooked.'

### Encourage sustainable use

'Rijkswaterstaat is an organisation that works tangibly on the planning and future of the Netherlands,' says princess Laurentien, when asked why Rijkswaterstaat is such an interesting organisation for children. 'And it is committed to innovation. Children are of course thrilled to be asked for their views on the challenges facing Rijkswaterstaat.'

A Children's Council project starts with the organisation identifying a problem. 'Sustainability is a major theme of our organisational strategy, Strategy 2020,' says Harteveld. 'So we took that as our starting point. We then asked ourselves what we found most difficult. That led to a question for the Children's Council: how can we encourage the public to use our infrastructure sustainably? We can always put down environmentally-friendly asphalt, but at the end of the day people themselves need to use the road network and their cars more sustainably.'

### Make other people envious

The children – pupils in the 10 to 11 age group attending Noorderlicht primary school in 's-Hertogenbosch – made some very clear recommendations on the basis of their own research. 'If you think sustainability is important, you need to get the message across to the whole of society.' For example, Rijkswaterstaat is now making its fleet of cars sustainable. 'Turn them into mobile advertisements for electric cars,' said the children. 'Show the Netherlands that you think it's important, and pass that on to other road users.' The idea is that the cars will carry slogans designed by the Children's Council.

'The children also thought that Rijkswaterstaat could devote more attention to using recycled plastic from the sea and rivers in constructing roads, for example,' says Harteveld. 'We are now exploring ways of putting the idea into practice. Another idea Rijkswaterstaat is working on is a bag in the car for collecting roadside litter.'

'Besides giving highly practical advice, children are sometimes very wise,' says princess Laurentien. 'One of the children told Jan Hendrik Dronkers that he should

make others envious of what he does. That was a real gem.'

### Not just for the ride

How do the children experience a Children's Council project? 'It's wonderful to hear what it does for them,' says princess Laurentien. 'The children are given free rein, and that gives them the opportunity to express their ideas. They are free to do research in their own way, and to work on a problem. Anything goes. It doesn't have to fit into a particular box. But there is a very tangible problem to deal with. That is very good for the children too. They're thrilled to be giving their views on a real problem, not one that's been invented for them. They really matter; they're not just there for the ride. And we make sure that their ideas are put into practice. At the end of the project, the organisation – in this case Rijkswaterstaat – is accountable to the children for what it plans to do with their ideas.'



*'Children help you discover new lines of thought.'*

**Prinses Laurentien**  
founder Missing Chapter Foundation





# 9

## Summary annual accounts 2016

### Statement of income and expenditure 2016

<i>All amounts in thousands of euros</i>	<b>31 - 12 - 2016</b>	<b>31 - 12 - 2015</b>
<b>Income</b>		
Income from parent ministry	2,235,181	2,224,488
Income from other ministries	40,224	61,005
Income from third parties	155,069	159,464
Interest income	-	156
Provisions released	22,608	21,880
Extraordinary income	3,407	3,484
	<b>2,456,489</b>	<b>2,470,477</b>
<b>Expenditure</b>		
Management and maintenance costs	1,349,063	1,362,290
Other costs:		
Personnel costs	786,627	775,035
Equipment costs	204,661	226,783
Depreciation and amortisation	30,411	34,811
Interest expenses	4,041	4,562
Additions to provisions	7,112	64,310
Extraordinary expenses	217	1,351
	<b>2,382,132</b>	<b>2,469,142</b>
<b>Net income and expenditure</b>	<b>74,357</b>	<b>1,335</b>
Addition to Government Shipping Company reserve	10,269	10,416
<b>Unallocated deficit</b>	<b>64,088</b>	<b>- 9,081</b>

## Balance sheet as at 31 December 2016 (before allocation of deficit)

<i>All amounts in thousands of euros</i>	<b>31 - 12 - 2016</b>	<b>31 - 12 - 2015</b>
<b>Assets</b>		
<b>Fixed assets</b>		
Intangible fixed assets	5,551	2,772
Tangible fixed assets	179,471	187,744
Financial fixed assets	48,800	63,000
	233,822	253,516
<b>Current assets</b>		
Debtors	36,478	47,179
Other debtors, prepayments and accrued income	39,107	37,394
	84,573	84,573
<b>Liquid assets</b>		
	601,934	462,945
<b>MIRT projects</b>		
Projects in progress	8,190,543	8,614,189
<b>Total assets</b>	<b>9,101,884</b>	<b>9,415,223</b>
<b>Liabilities</b>		
<b>Capital and reserves</b>		
Government Shipping Company reserve	41,147	39,191
Operating reserve	48,413	57,494
Unallocated deficit	64,088	- 9,081
	153,648	87,604
<b>Provisions</b>		
	<b>44,134</b>	<b>80,246</b>
<b>Long-term liabilities</b>		
	124,502	130,335
<b>Current liabilities</b>		
Creditors	53,254	41,745
Other creditors, accruals and deferred income	187,827	208,609
Management and maintenance work still to be executed	347,976	252,495
	589,057	502,849
<b>MIRT projects</b>		
Deliverable projects	8,190,543	8,614,189
<b>Total liabilities</b>	<b>9,101,884</b>	<b>9,415,223</b>

## Notes to the summary annual accounts 2016

### General

The summary annual accounts and notes are taken from Rijkswaterstaat's annual accounts for 2016. The annual accounts are drawn up in accordance with Ministry of Finance regulations based on Title 9, Book 2 of the Civil Code.

### Net income and expenditure

#### *Net income and expenditure*

The 2016 financial year was closed with a positive balance. This surplus has been added to capital and reserves..

#### *Income from other ministries*

Income from other ministries relates principally to income received in respect of the Government Shipping Company.

#### *Income from third parties*

Income from third parties of 155.1 million euros consists largely of rents and leases paid for parcels managed by Rijkswaterstaat, compensation paid for damage caused by road or waterway users, income under the Water Act and income generated by the National Road Signage Agency.

#### *Management and maintenance costs*

Management and maintenance costs relate to costs charged by third parties (chiefly contractors and engineering firms).

#### *Personnel costs*

Personnel costs consist of the cost of our own staff and of temporary staff hired in to carry out core tasks.

#### *Interest expenses*

Interest is paid on interest-bearing loans granted by the Ministry of Finance.

### Balance sheet

#### *Financial fixed assets*

Financial fixed assets comprise the debt falling due after more than one year receivable from the parent ministry. The current portion is included under 'debtors'. The non-current portion will be settled by the parent ministry over 15 years as from 2009.

#### *Debtors*

The debtor position was managed more actively in the year under review, resulting in a further decrease in the outstanding balance.

#### *MIRT projects*

'Projects in progress' includes accumulated direct production expenditure on current MIRT projects as at balance sheet date. 'Deliverable projects' are recognised as a contra entry to the same amount.

#### *Capital and reserves*

The result of 9.1 million euros for 2015 was deducted from the operating reserve; the result of 64.1 million euros for 2016 is shown separately on the balance sheet.

#### *Provisions*

The reorganisation costs and asbestos abatement costs were reviewed in 2016.

#### *Long-term liabilities*

Long-term liabilities comprise the loans agreed with the Ministry of Finance to finance capital expenditure. Loan repayments are timed to coincide with depreciation.

#### *Management and maintenance work still to be executed*

This item relates to net income and expenditure in respect of management and maintenance work still to be executed.

### Operational management

#### *Regularity*

Internal quality assurance and assessments by the Central Government Audit Service found that Rijkswaterstaat is in control of its business processes. No irregularities or uncertainties were found that exceeded the limits applicable to Rijkswaterstaat.

#### *System-oriented contract management (SCB)*

In 2016 SCB procedures and use were further improved, in particular through HRM efforts, resulting in the ambitions set being achieved.

#### *Information security*

Rijkswaterstaat continues to focus on bringing and keeping IT security under control, to support mission-critical processes. It actively monitors progress in implementing management measures and therefore has accurate information for identifying, implementing and safeguarding security measures.

#### *Organisational changes at Rijkswaterstaat*

2016 saw the conclusion of the 2015 Business Plan and the launch of Strategy 2020. The latter began with an evaluation of the results of the 2015 Business Plan. Rijkswaterstaat now operates much more as a single team, and its private sector and public administration partners acknowledge this.

#### *Rijkswaterstaat's payment conduct*

In 2016 Rijkswaterstaat paid 97 per cent of the 150,000 or so invoices it received on time, i.e. within 30 days, thus comfortably meeting the government-wide target of 95 per cent.

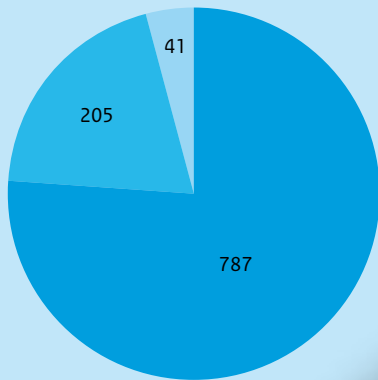
#### *Status of financial statements*

The above summary annual accounts are taken from Rijkswaterstaat's annual accounts, on which an unqualified auditor's report was issued. Rijkswaterstaat's annual accounts form part of the Ministry of Infrastructure and the Environment's annual accounts for 2016.



# Rijkswaterstaat expenditure and costs 2016 (total 4.3 billions euros)

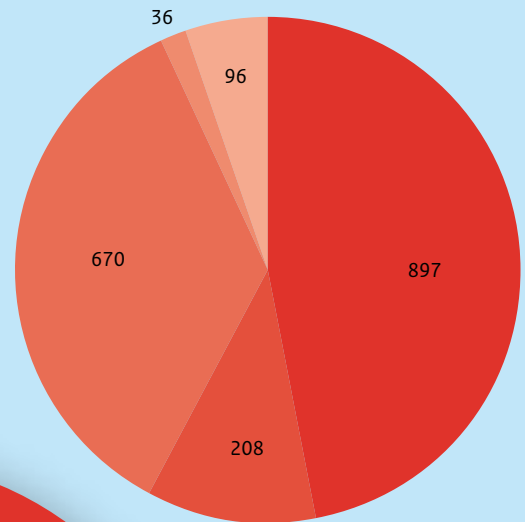
## Costs



### Direct and indirect organisational costs

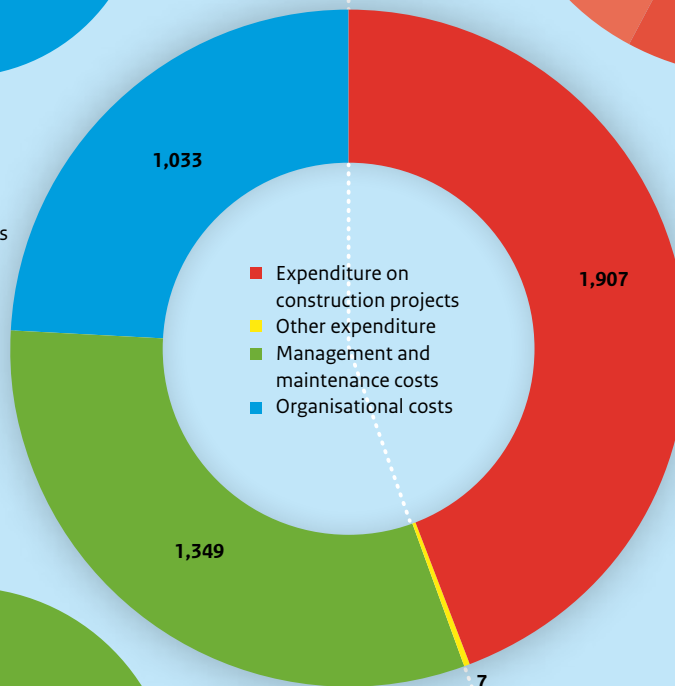
- Personnel
- Material
- Other organisational costs

## Expenditure

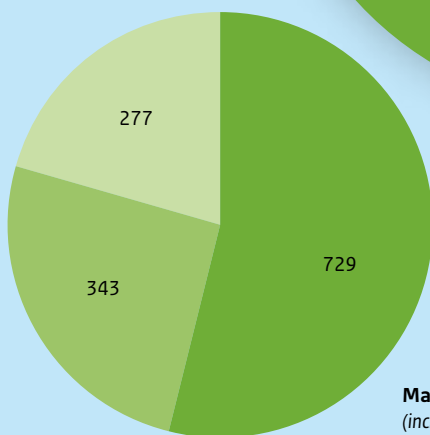


### Expenditure on construction projects (infrastructure fund)

- Main road network
- Main water system
- Main waterway network
- Mega project
- Regional and local infrastructure

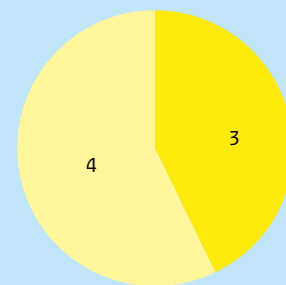


- Expenditure on construction projects
- Other expenditure
- Management and maintenance costs
- Organisational costs



### Management and maintenance costs (including traffic management)

- Main road network
- Main waterway network
- Main water system



### Other expenditure (infrastructure/environment)

- Improvement of the living environment (GIS)
- Miscellaneous

## Notes to expenditure and costs

Rijkswaterstaat is the executive arm of the Ministry of Infrastructure and the Environment. It is responsible for the management and maintenance of the main road and waterway networks and the main water system. Rijkswaterstaat has been a government agency since 2006. As an agency, it concludes management and maintenance agreements with the ministry. Rijkswaterstaat receives an 'agency fee' for the work it performs which also covers organisational costs. Rijkswaterstaat can make a profit or incur a loss on the agency fee. In addition to management and maintenance, Rijkswaterstaat is responsible for the construction and expansion of the main roads and waterways and the main water system. The ministry funds the expenditure on these construction projects directly from the Infrastructure Fund. Rijkswaterstaat cannot make a profit or incur a loss on this expenditure.

### Management and maintenance costs

The cost of area management and maintenance (1,349 million euros) and the agency's organisational costs (1,033 million euros) are accounted for in this annual report and disclosed in the statement of income and expenditure. Management and maintenance costs consist of the cost of work performed by contractors on main roads and waterways and the main water system and the cost of traffic management (main road and waterway networks) and water management (main water system). Network-wide costs are disclosed separately.

### Direct and indirect organisational costs

Organisational costs are divided into personnel costs (787 million euros), equipment costs (206 million euros) and other organisational costs (41 million euros). Direct personnel and equipment costs relate principally to traffic and water management, management and maintenance, exploratory and planning studies and the execution of construction projects. Indirect equipment costs include, for example, buildings and depreciation; indirect personnel costs include, for example, central administration and management support staff.

### Expenditure on construction projects

Construction projects relate to building work on the main roads, waterways and the main water system. As in the case of management and maintenance, this work, too, is outsourced to third parties (1,907 million euros). Other costs incurred by Rijkswaterstaat for these projects (such as project management costs) are recognised as organisational costs and are accounted for in the agency's statement of income and expenditure.

### Other expenditure

Chapter XII of the central government budget relates to the budget of the Ministry of Infrastructure and the Environment. Of particular relevance to Rijkswaterstaat is the Improvement of the Living Environment policy article (3 million euros), which includes the Noise Reduction Schiphol project (GIS). This project aims to reduce noise levels for local residents by insulating noise-sensitive buildings near to Schiphol Airport, such as schools, houses and care centres.

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with the exception of page 13 and 50: Rijkswaterstaat  
page 51: Rijksvoorlichtingsdienst

## Infographics

Jeroen van Ingen Graphic & Information design, Utrecht

# Rijkswaterstaat Annual Report 2016 on social media

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Published by

**Rijkswaterstaat**

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0800 - 8002

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May 2017 | CD0517MC12