

Way to Go

FLANDERS, EXPERTS IN MOTION

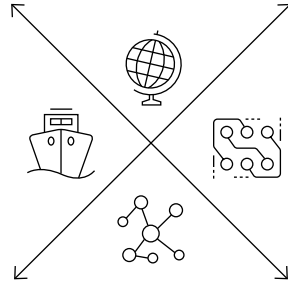


Flanders
State of
the Art

Way to Go

FLANDERS, EXPERTS IN MOTION





Expertise on the road to tomorrow

Flanders is situated right in the middle of the beating heart of Western Europe. It is a crossroads of people, trade and culture that is home to a dense network of roads, waterways and railways, fine-meshed public transport and world-renowned ports. Brussels, cradle of the European institutions, is also the capital of Belgium and of Flanders itself. London, Amsterdam, the Ruhr Area and Paris are all situated within a mere 350 km.

To assume its role as the gateway to Europe, Flanders has a broad range of cast-iron strong suits: hypermodern seaports, cutting-edge logistics and fast links by road, rail and inland waterway, plus one national and three regional airports. Infrastructure and mobility are in the reliable hands of the experts at Mobility and Public Works. This Policy Area of the Government of Flanders has well over 3,000 expert and dynamic members of staff who prepare the ground for new policies, administer and oversee the major investment projects and deliver cutting-edge technical support. We ensure smooth-paced hinterland connections and work day and night to advance intelligent multimodal mobility. Safety, climate and sustainable prosperity for the entire region are paramount in everything we do. The exchange of know-how and economic networking put Flanders' seaports prominently on the world map. Technical expertise and scientific research in highway and hydraulic engineering underpin a wide number of international cooperation projects.

Flanders applies its strengths on the widest possible front. Our experts respond quickly to the constantly changing challenges in society. Innovation, know-how and openness rank high among our core values. After all, mobility and transport do not stop at borders. Integration is key. This is why we are always on the lookout for partners that share our drive and professional expertise, with a keen eye on fast-growing markets, as well as historical partnerships. Where possible, we work with our neighbouring countries and their regions, with our European and overseas partners as well as with the other Belgian regions and the federal Government, to disseminate our expertise, broaden our know-how and exchange experiences.

What do you reckon: can we count you in as part of our network?

www.flanders-waytogo.be



Chapter 1:
Flanders, where people and goods meet

- Central location.....**6**
- Logistical top-tier player.....**8**
- Working on mobility and infrastructure.....**12**
- The Flanders traffic system.....**13**
- Basic accessibility.....**14**
- Sustainable freight transport.....**18**
- Public-private partnerships as a lever for quality.....**19**



Chapter 3:
Smooth-paced hinterland connections

- New arteries for enhanced traffic.....**29**
- Investing in public transport.....**32**
- The Albert Canal expands**34**
- Connecting Europe.....**35**



Chapter 5:
Sustainable symbiosis between ecology and economy

- Economical with energy.....**46**
- Restricting environmentally harmful substances**48**



Chapter 2:
Open gateway to Europe and the world at large

- Fully refurbished locks.....**22**
- Quality basic infrastructure.....**23**
- Ports with depth.....**23**
- Safe traffic.....**24**
- Fast transit times.....**25**



Chapter 4:
Safely on your way with bits & bytes

- Dynamic traffic management.....**38**
- Improved safety.....**39**
- Smoother-paced circulation.....**41**
- More efficient inland waterway transport with RIS.....**42**
- Safer maritime shipping with SafeSeaNet.....**43**
- Automation and remote control.....**43**



Chapter 6:
Integrated water management

- A new approach to floods.....**53**
- Water shortages and desiccation.....**53**
- Policy and management in the Scheldt-estuary.....**54**
- The Joint Meuse: an integrated approach.....**56**
- Coastal Safety Master Plan.....**58**
- Flanders' Coastal Vision.....**59**



Chapter 7:
Know-how and expertise

- Technical expertise and research.....**62**
- Maintenance and management.....**64**
- FITA, 25 years of international engineering services.....**66**



THE HUB OF EUROPE

**Flanders,
where people
and goods
meet**





THE HUB OF EUROPE

Flanders, where people and goods meet

Flanders is a federated state within Belgium and is situated at the intersection of European roads, railways and waterways. 60% of the European consumer market lies within a 500-kilometre radius. Mobility and logistics have always been of great importance for the region.

Central location

Flanders is a small, densely populated and prosperous region. Because of its distinctly mercantile spirit, it has always thrived. The region's spatial planning is compact in the cities and scattered in rural areas, with plenty of ribbon developments and dotted with natural beauty spots. Consequently, it is hardly surprising that Flanders is sometimes referred to as one big urban region. Innovative solutions and proper planning are thus required in order to reconcile swift mobility and a good quality of life. This is where the Government of Flanders comes in.

Flanders has a number of major seaports and airports and is a crossroads of European roads, railways and waterways. Large metropolitan cities and regions such as London, Amsterdam, Paris and the Ruhr Area are all within easy reach. Brussels, the capital of Europe, also serves as the capital city of Belgium and Flanders.

Even though in general the mobility infrastructure is part of Flanders' competences, some infrastructures are exceptionally administered by the federal state of Belgium. These exceptions are the national railways and the country's national airport in Zaventem (Brussels Airport). ■





Flanders in figures

Flanders



Surface area:
13,522 km²
(total for Belgium: 30,528 km²)

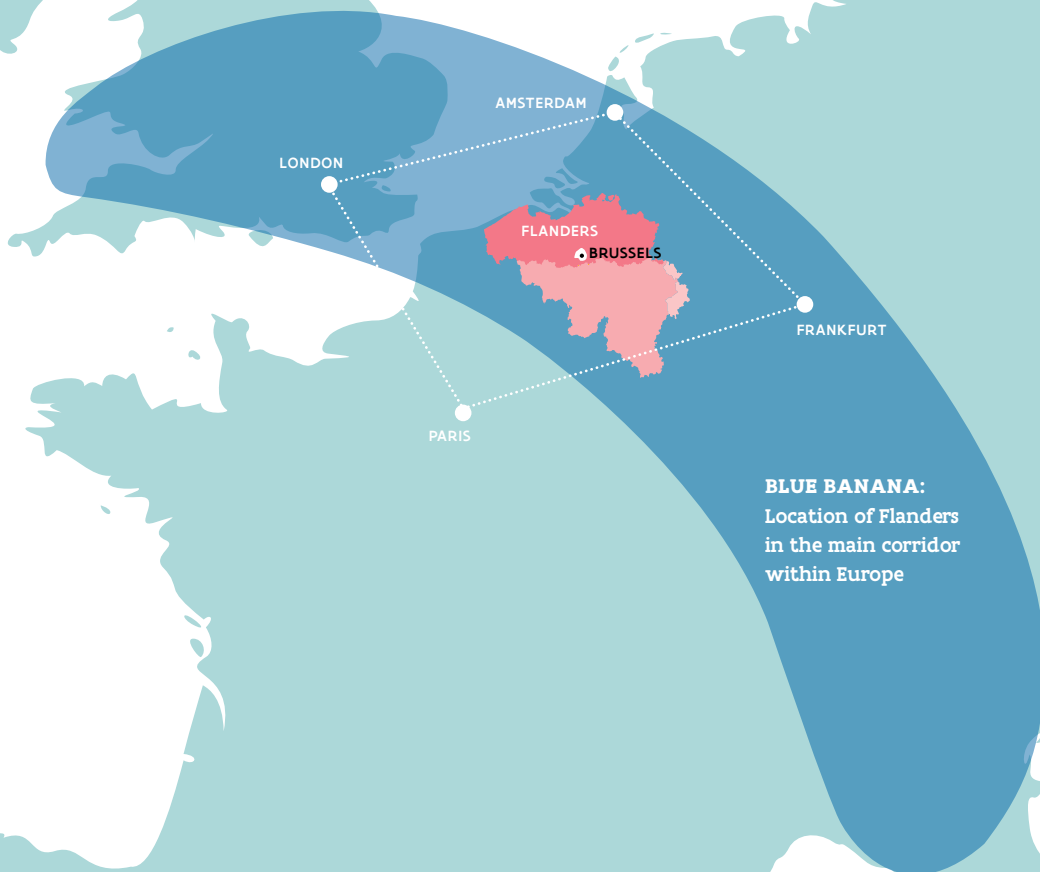


Number of residents (2017):
6,516,011 residents
(total for Belgium: 11,322,088)



Population density (2017):
481 residents/km²

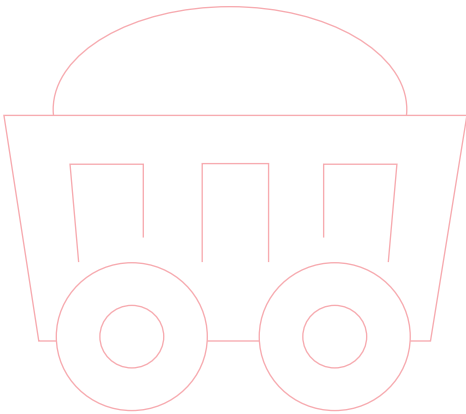
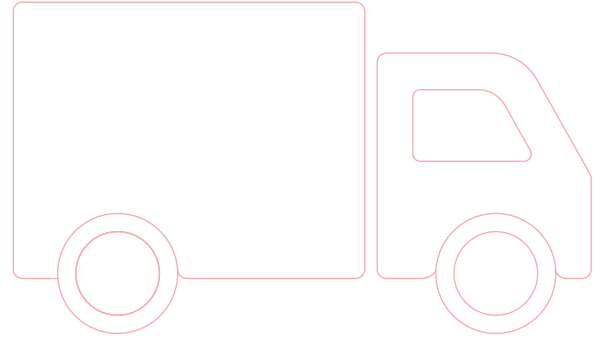
GDP per resident in purchasing power parities (2017):
35,800 euros





Logistical top-tier player

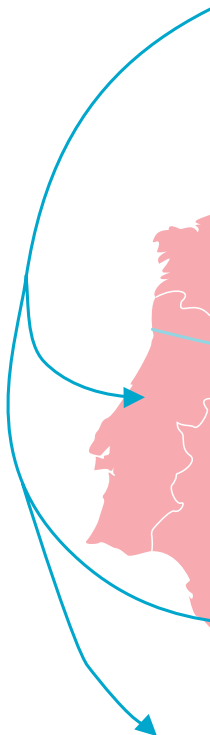
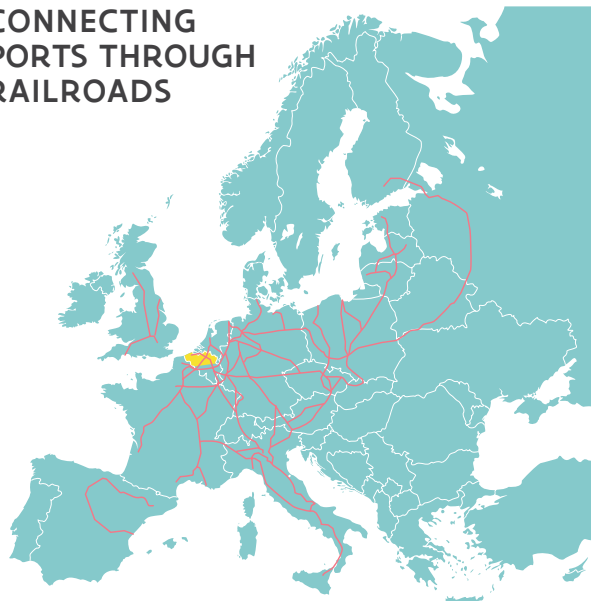
The added value of the logistical sector in Flanders is approximately 4% of the total added value (GDP). If we also include the logistical activities outside of the freight transport industry, this added value is even higher. In Flanders, the logistics industry in the broader sense accounts for an added value of over 9% of GDP.

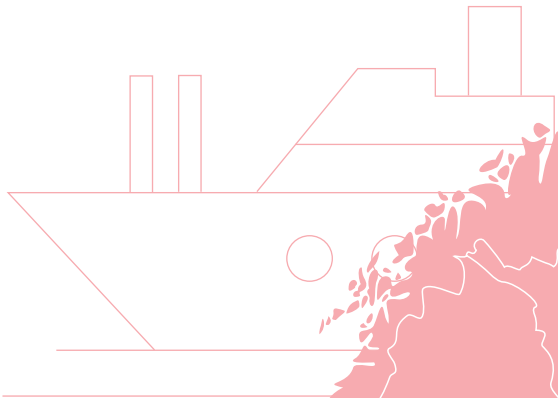


● CONNECTING PORTS THROUGH HIGHWAYS

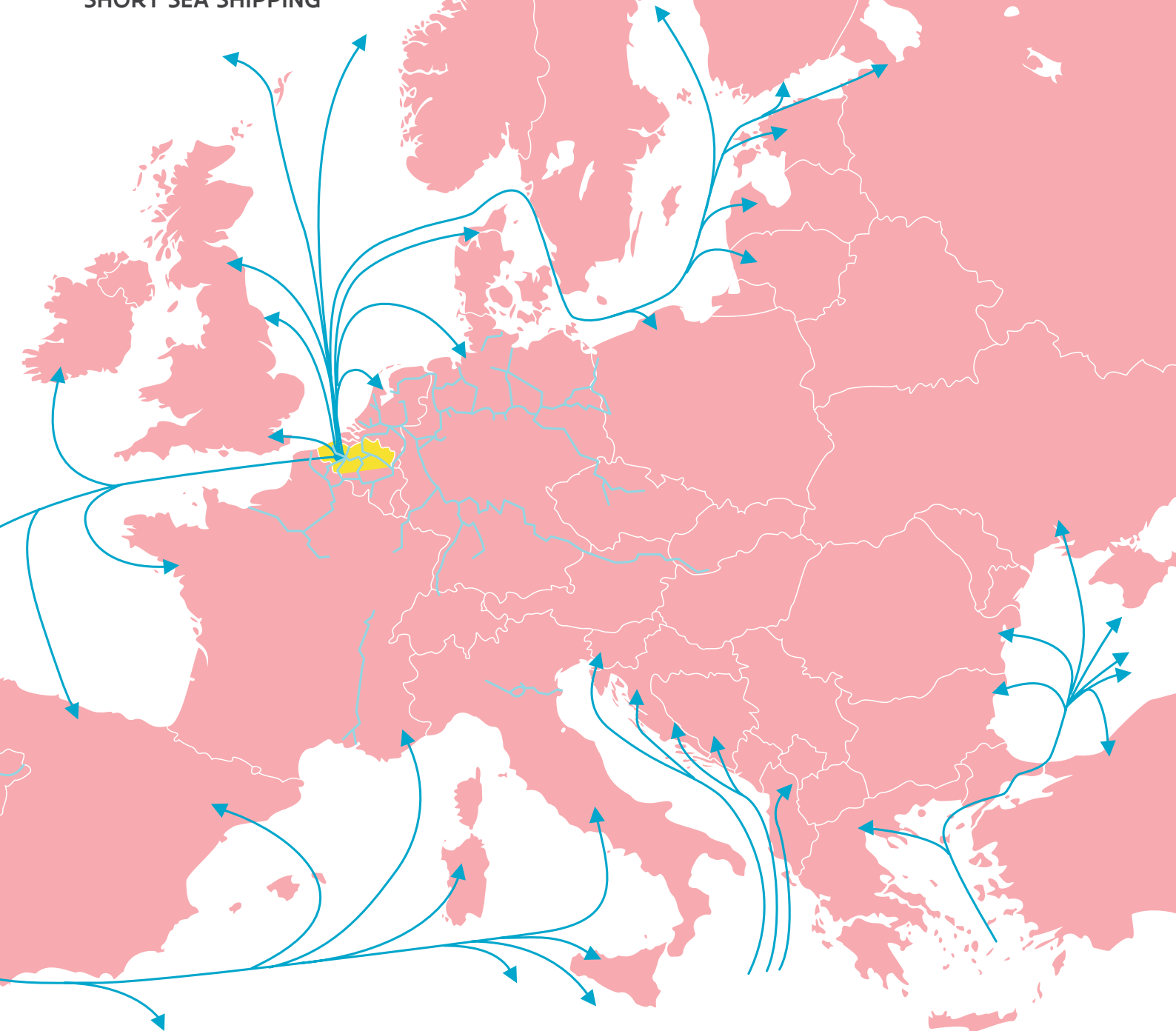


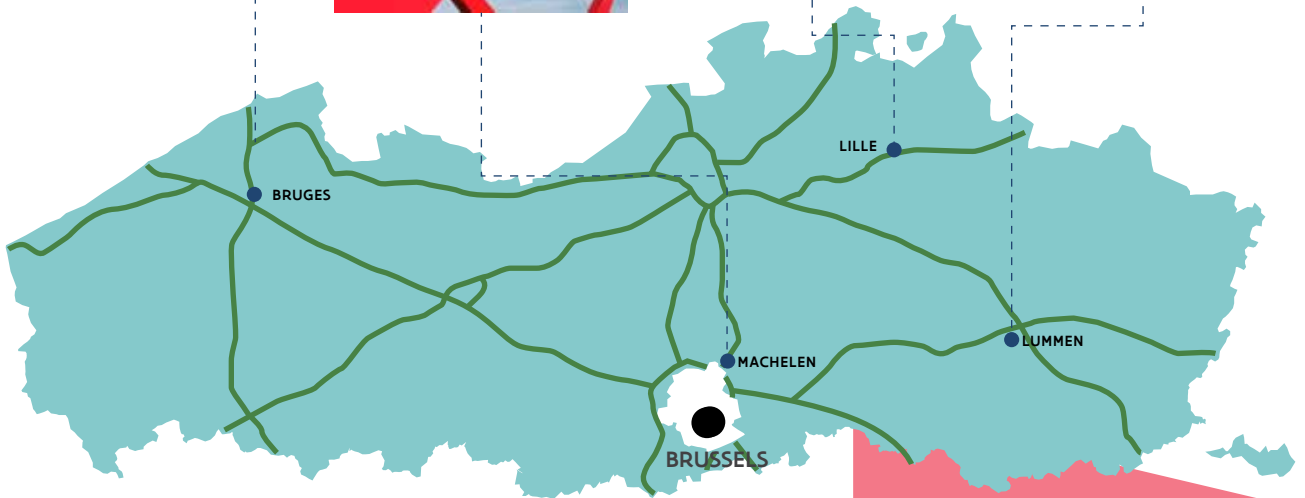
● CONNECTING PORTS THROUGH RAILROADS





- CONNECTING PORTS THROUGH INLAND WATERWAYS
- CONNECTING PORTS THROUGH SHORT SEA SHIPPING





ROADS

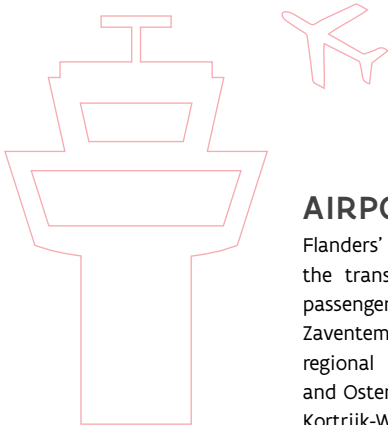
Second most dense motorway network in Europe
65,7 km roads per 1,000 km²

EU28 average:
17 km per 1,000 km²

Flanders



EU



AIRPORTS

Flanders' main traffic by air, both in terms of the transport of goods and the transport of passengers, goes through the national airport in Zaventem (Brussels Airport). Flanders has three regional airports: Antwerp, Kortrijk-Wevelgem and Ostend-Bruges. The airports of Antwerp and Kortrijk-Wevelgem are largely aimed at business travel, whereas Ostend-Bruges airport focuses on cargo and chartered flights.



Key figures national airport Zaventem (Brussels Airport)

21.818.418
passengers (2016)

494.637
cargo in tonnes (2016)

RAILWAYS

Second most dense railway network in Europe

118.9 km rail track per 1,000 km²

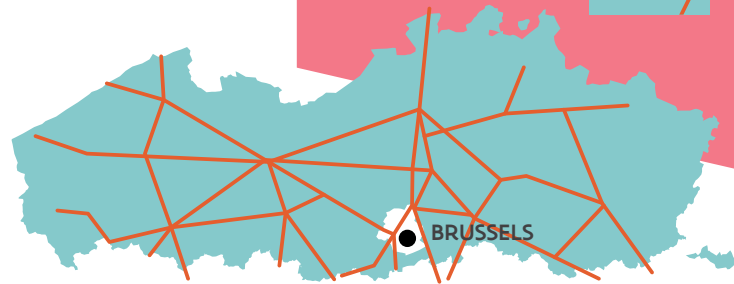
Flanders



EU28 average:

50.4 km per 1,000 km²

EU



WATERWAYS

Second most dense inland navigation network in Europe

79.6 km navigable watercourses per 1,000 km²

Flanders



EU



EU28 average:

9.6 km per 1,000 km²



SEAPORTS

Port of Antwerp

214 million tonnes in freight (2016) | 11 billion euros in direct added value (2015) | Second port in Europe | Largest petrochemical cluster in Europe | Accessible to the latest generation container ships

Port of Zeebrugge

38 million tonnes in freight (2016) | 977 million euros in direct added value (2015) | Number 1 car handling port in the world | Liquefied Natural Gas terminal which handles 15% of all Northwestern European gas distribution | Accessible to the latest generation container ships

Port of Ghent

29 million tonnes in freight (2016) | 3.8 billion euros in direct added value (2015) | The world's largest port for fruit juice imports | The largest storage capacity in Europe for agricultural bulk goods | The largest cluster in Europe for R&D and the production of biofuels

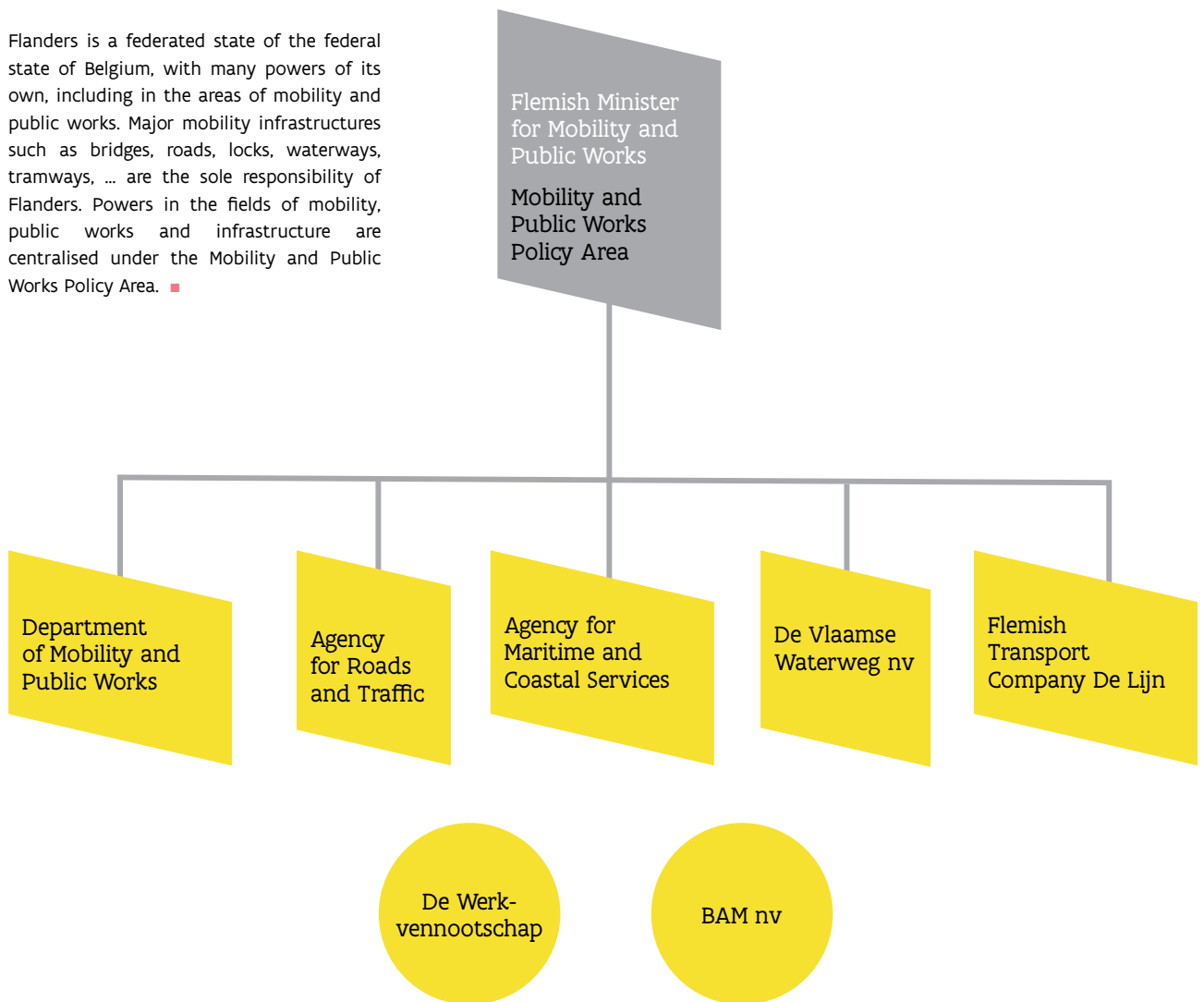
Port of Ostend

1.5 million tonnes in freight (2016) | 512 million euros in direct added value (2015) | Innovative energy port and centre of expertise for offshore wind power | Various offshore energy generating projects



Working on mobility and infrastructure

Flanders is a federated state of the federal state of Belgium, with many powers of its own, including in the areas of mobility and public works. Major mobility infrastructures such as bridges, roads, locks, waterways, tramways, ... are the sole responsibility of Flanders. Powers in the fields of mobility, public works and infrastructure are centralised under the Mobility and Public Works Policy Area. ■



The Flanders traffic system

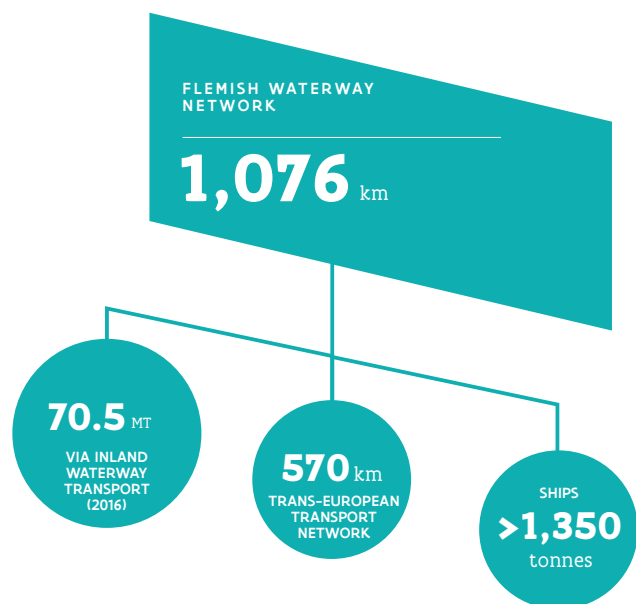
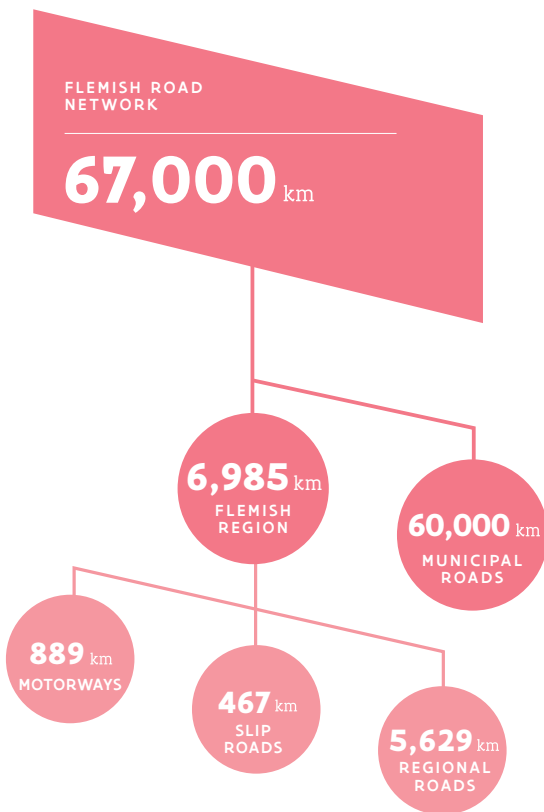
KEY FIGURES - ROADS & WATERWAYS

The road network in Flanders covers over 67,000 km. Of this number, some 6,985 km are managed by the Agency for Roads and Traffic. The remaining 60,000 km are municipal roads. Of the 6,985 km regional roads, 889 km are motorways, 467 km are slip roads, and 5,629 km are regional roads. Of this 5,629 km, around 1,000 km is situated in built-up areas.

The waterway network in Flanders is 1,076 km long and well connected to the road network and the nearby waterways and seaports. Over 570 km of this network is part of the Trans-European Transport Network (TEN-T), accessible for vessels with a carrying capacity of at least 1,350 tonnes (CEMT class IV and above). Many cities, towns and industrial centres of any meaningful size are linked to this network. In Flanders, 80% of all businesses are located no further than 10 km from a navigable waterway. In 2016, no less than 70.5 million tonnes in goods were carried via inland waterway transport.

These figures show how very finely meshed the road and waterway network in Flanders are. The traffic system in Flanders gives people and society in general the mobility and socioeconomic and sociocultural space for the development they need.

The traffic system occupies a fair portion of the space that needs to be organised. Nowhere else in the world do so many people and goods converge at the same time. Even though the system users have different reasons for engaging in traffic, they all share the same goal: getting around and seeing traded goods delivered to their destination in the best way possible. It is clear that in this respect aligning the demand for transport and the supply side can pose challenges. Consequently, supply and demand need to be continuously coordinated, which is exactly the purpose served by any traffic system. The Mobility and Public Works Policy Area assumes this coordinating task on a day-to-day basis. ■





Basic accessibility

The Government of Flanders goes all out for basic accessibility for the sustainable transport of people. Basic accessibility means reaching important social locations based on a demand-led system and with an optimal use of resources.

Integrated transport model

To this end, we are engineering an integrated transport model that consists of four components:

- The railway network;
- The core network of tram and bus transport, which ensures public transport on major routes;
- The complementary network, which contributes to the core network;
- The tailored transport, which ensures efficient solutions for all local transport demands. ▶



” Flanders is working on a multi-layered transport system in which passengers’ demands guide decision-making and various means of transport are combined efficiently. ”



Each of the four transport layers fulfils a specific role in this model, and the different layers are optimally aligned with one another. In addition, public transport in this transport model is no longer an isolated cause, but it is part of the entire mobility network. This is why the connection with other modes of transport is also portrayed. Consequently, nodes and interchanges in the network are essential in this model. These focal points have to be accessible in the most optimal way, so that collective transport modes can easily be combined with other modes such as a bicycle (sharing system) or a car (pooling system). In this way, Flanders will establish an efficient transport system in which the passenger, the demand for transport and the combination of different means of transport all play a key role.

To implement basic accessibility, Flanders will be divided into 15 transport regions. These transport regions will shape the public transport supply in their region, based on actual and potential traffic flows. The cities and municipalities that are part of a specific transport region will participate in a regional transport council, that will follow,

direct and evaluate the realisation of basic accessibility. The regional transport council is an innovative form of intergovernmental dialogue. Local authorities participate in the decision-making process about what basic accessibility will mean for their own transport region. The council will discuss and give advice on the core network, make decisions about the complementary network and the tailored transport, and draw up a transport plan that examines mobility in a broader context. In doing so, the supply in mobility will be organised from the bottom up. This will be achieved in cooperation with, among others, public transport operators, the Agency for Roads and Traffic and the Department of Mobility and Public Works. The intention is for the regional transport council to permanently keep a finger on the pulse about what matters in its working area and that all residents are correctly informed about possible changes in the mobility landscape.

The concept of basic accessibility will first be tested and evaluated in a pilot project in four pilot regions. Afterwards, it will be introduced in the whole of Flanders. ▶





ASPIRING TO SUSTAINABLE MOBILITY

The Government of Flanders' mobility policy thus places great emphasis on co-modality. In a densely branched transport network, this acts to support the commitment to sustainable mobility which, in doing so, is also made cost-efficient. The challenges we face are to use every mode of transport to optimum effect, while intelligently combining the various modes of transport. Furthermore, Flanders will equip its motorway network with electric vehicle charging infrastructure.

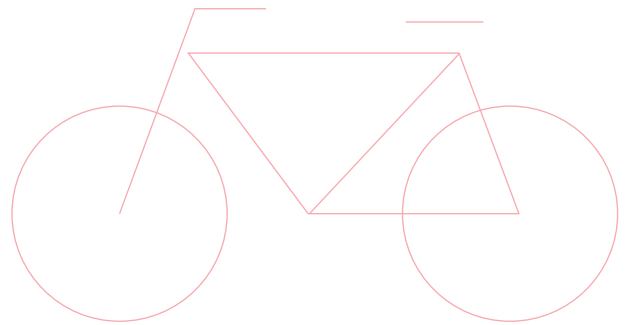


CYCLE HIGHWAY NETWORK

Flanders has a rich cycling culture. The world's most beautiful bicycle races are held in Flanders, the best bikes are made in Flanders, and the bicycle has become increasingly successful as a tourist product. This strong social anchoring ensures that functional cycling in Flanders also has much potential and a huge growth margin. In addition, new technological developments offer new opportunities for cyclists. For example, the electric bike makes it easier for people to bridge larger distances.

Therefore, the Government of Flanders wants to pursue an ambitious cycling policy. This ambition is being implemented in a Flemish Cycling Policy Plan (2016), in which the construction of high-quality bicycle infrastructure is a priority, while a structural quality improvement of the infrastructure is an important condition to stimulate cycling. Increased investments in new infrastructure also make the bicycle a fully-fledged transport mode during the working week.

A strong cycling policy takes shape through good interaction between all the parties involved. To this end, the Government of Flanders is taking the lead and guarantees



an integrated approach. For example, in collaboration with the provinces and local authorities, a network of (bi)cycle highways has been drawn up, for which a uniform signposting is currently being rolled out. These cycle highways are routes between cities that are 15 to 20 km apart. They form the backbone of the Supralocal Functional Bicycle Route Network, which connects the most important local centres to poles of attraction and relates to so-called 'functional' trips (work, education, shopping, ...).

The further development of the (bi)cycle highway network and the underlying strategic bicycle connections in congestion-sensitive areas is a priority. Special attention must be paid to eliminating missing links and enhancing circulation. Various cycle highway projects will be implemented in the coming years, partly by funding from the European Regional Development Fund (ERDF). These targeted investments are aimed at adapting towpaths located on the route of a bicycle highway, the construction of bicycle tunnels and bridges and the upgrade of cycle lanes to fully-fledged (bi)cycle highways.

ROAD SAFETY FLANDERS

In order to align with the best performing European countries, Flanders' aim is to decrease the number of traffic victims on the Flemish roads to 200 by 2020. Compared to the numbers in 2016, this is a decrease of 37,5%. Consequently, there is still a lot of work to be done. As such, road safety is a major priority on the political agenda. The Government of Flanders has set up Road Safety Flanders (*Vlaams Huis voor de Verkeersveiligheid* – VHV) to better align and coordinate all actions concerning road safety. After all, cooperation is of the essence to land results.

The 6th Belgian State reform gave Flanders more jurisdiction in the area of road safety. To wield these powers as widely as possible, and to counter fragmentation, the VHV coordinates and manages the various initiatives currently in place, all of which comes with a clear communication policy.

To fulfill its responsibilities to the best, VHV unites all partners that work on road safety. They have been assigned to four chambers in consideration of their expertise:

- Education and awareness
- Infrastructure, vehicle technology and innovation
- Enforcement
- Evaluation, monitoring and research

Each chamber gathers expertise and organises consultations, both with the partners and among the various chambers.

In doing so, the first and most significant touchstone was devised together with the stakeholders: the Road Safety Plan Flanders. In joint consultation and cooperation with all partners, the measures set out in the Road Safety Plan Flanders are to be put into practice. Directed by a steering committee, VHV handles the overall coordination. The steering committee is chaired by the Minister. ■



Sustainable freight transport

The Government of Flanders encourages the use of sustainable transport modes for the transport of goods. This reduces the pressure on the road network and limits the impact of the haulage and logistics sector on the natural and social environment.

The government invests both in infrastructure for alternative transport modes as well as in transshipment facilities between road, water and rail. In addition to the realisation of transshipment locations, a land policy is being pursued that aims to facilitate the development of regional transshipment centres, to create establishment opportunities for water-linked businesses and to utilise the potential of water-linked industrial estates.

Businesses are informed, sensitized and guided in an independent and mode-neutral manner via the multimodal advice point 'Multimodal Flanders', so that a 'mental shift' will lead to an optimal choice of mode for each flow of goods. By using integrated, flexible and sustainable transport by road, water, rail, air and through pipelines, the existing and future infrastructure and capacity will be used more efficiently. Better planning makes it possible

to switch to railways and waterways, but also to make these modes of transport as cost-effective as possible. The result? Less empty and better filled trucks, trains and ships.

In order to support the switch to safer and more ecological transport, the Government of Flanders also provides a grant system for investments that can be applied for online. In addition, a far-reaching relaxation and simplification of the reimbursement scheme in road tax for combined transport has been achieved, with part of the route going via rail- or waterways and another part via road. The maximum percentage of the reimbursement was increased from 80% to 100%. Furthermore, the reimbursement is also granted in proportion to the number of journeys made by railways, inland waterways or via a seaport in Belgium within the framework of combined transport.

ROAD PRICING FOR LORRIES

On 1 April 2016, road pricing was launched in all three regions. It applies to all vehicles with a Maximum Permissible Total Weight (MPTW) greater than 3.5 tonnes 'intended or used for the transport of goods'. In Flanders it is a tax established by the Flemish Parliament. The charge goes by the 'the user/polluter pays' principle, in which the rate applied also depends on the weight and the emissions of the vehicle concerned.

Road pricing replaces the Eurovignette (which applied to vehicles with a MPTW > 12 tonnes), and is concomitant with a maximum reduction of the annual road tax for the vehicles that fall within the policy. For vehicles up to 12 tonnes, the road tax has even been reduced to nil. The applicable tax regulations have also been amended, to the effect that, from now on, the charge can be entered as a tax deductible in people's personal income tax as well as businesses' corporation tax.

Road pricing applies to all vehicles (MPTW > 3.5 tonnes) that use the Flemish road network, which means that, from now on, all users – including those registered abroad – are expected to contribute to the maintenance and improvement of our road infrastructure in equal measure. As the charge is based on the distance travelled, road pricing also acts as an impetus to get people thinking about the need of a given journey, and especially about the need to load the vehicle as efficiently as possible. Road pricing applies to all roads. Only the motorways and the main N-roads have a charge that is greater than nil. In other words, the other roads currently have a zero rate. ■



Public-private partnerships as a lever for quality

A number of major infrastructure projects in Flanders are brought to fruition via public-private partnerships (PPP). To the government, PPP means it is able to spread costs over time. The private partner is assured that he will be getting a set amount that covers his risks. PPP is a good way to get private industry on board and to shoulder part of the responsibility for the infrastructure from which they benefit. It can also serve as a way of ensuring the accelerated implementation of priority projects.

QUAY WALLS

Businesses can enter into a public-private partnership with the Government of Flanders to build loading and unloading installations. The government defrays a maximum of 80% of the infrastructure expenses, with the company paying the remaining 20%. However,

the government pays a maximum of 50% of the total project cost and the private partner commits to effectively switching a percentage of its transport to inland waterway transport over a 10-year period. This arrangement significantly contributes to driving down road haulage to the benefit of inland waterway transport.

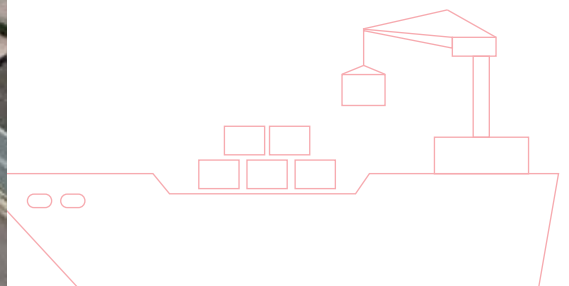
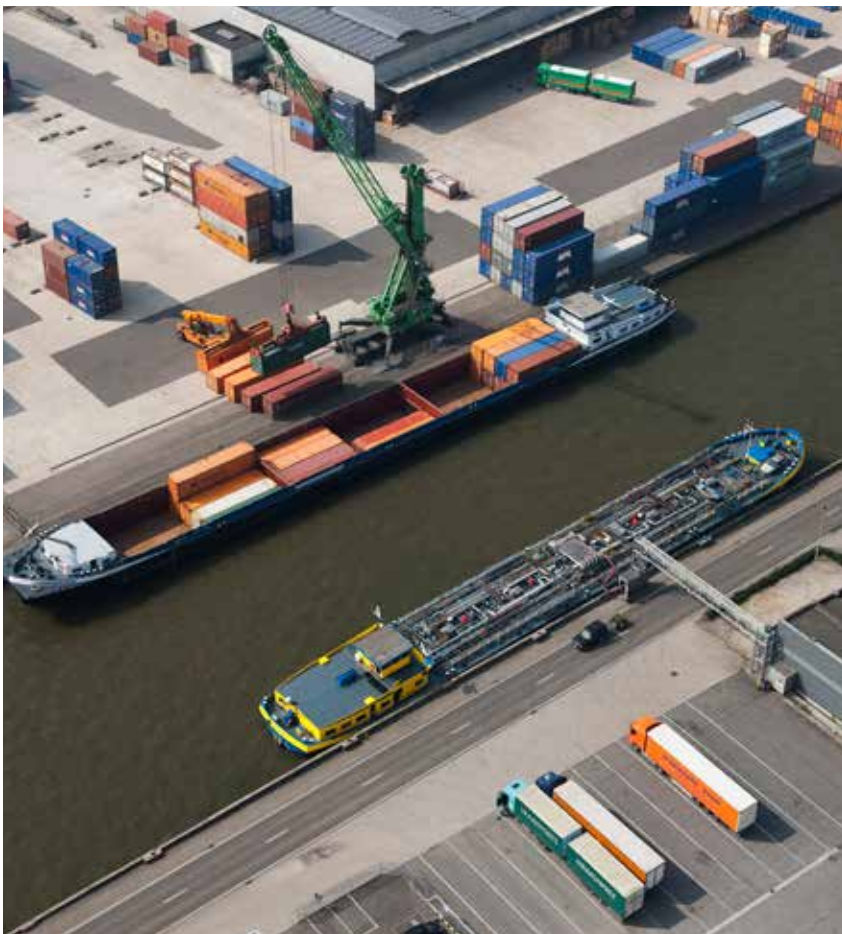
ROADS

The Government of Flanders uses PPP constructions to eliminate a number of missing links in the main road network at an accelerated pace. The A11, which ensures enhanced access to the Port of Zeebrugge, is just one example of this kind of PPP project. With the private partner responsible for planning and building the road, the government is able to confine the project and maintenance risks.



NEW PILOTAGE RESOURCES

The Government of Flanders has opted for alternative funding for the new pilotage fleet. The SWATH vessels (Small Waterplane Area Twin Hull) are leased under a bare boat contract. By opting for a system that allows for the financial burden to be spread, it was possible to replace the old pilotage fleet and the associated architecture all at once. Since the new vessels were commissioned, the pilots have been able to spend 817 hours longer on the job in very bad weather conditions (reference period: May 2012 – May 2016). This quality improvement has a substantial positive impact on the smooth-paced handling of shipping traffic to and from the seaports of Flanders. ■





ACCESSIBLE PORTS

Open gateway to Europe and the world at large



ACCESSIBLE PORTS

Open gateway to Europe and the world at large

The Government of Flanders ensures that the ports are properly equipped and maximally accessible. The ports in Flanders are among the busiest in Europe.

Fully refurbished locks



NEW LOCK ZEEBRUGGE

Today, the Vandamme lock is the sole access point to the inner port for seagoing vessels. Due to increasing maritime traffic to the inner port, the Vandamme lock has reached its operational and technical limits, which renders the Port of Zeebrugge vulnerable. To cope with these issues, the port needs a second lock for seagoing vessels.

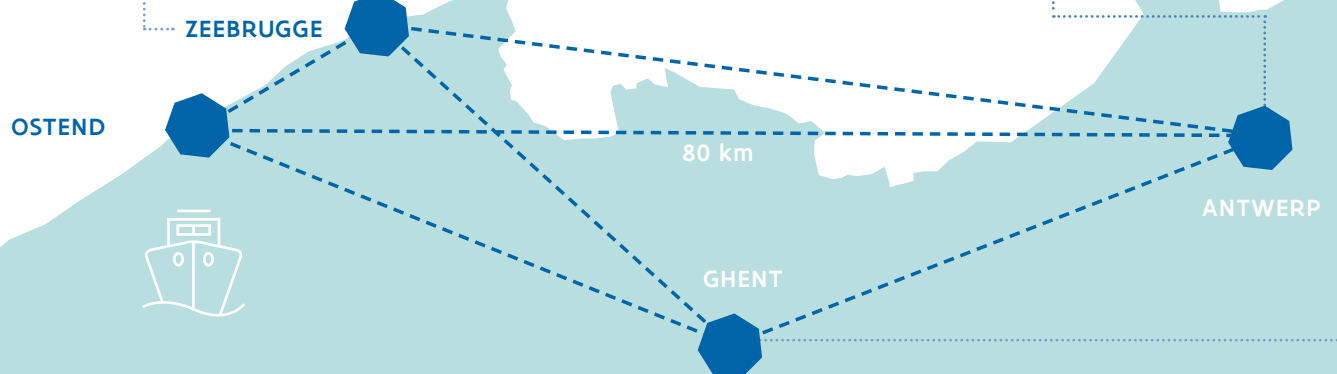
The construction of a new lock is embedded in the process approach for so-called 'complex projects', in which the existing options as well as new options are examined in joint coordination with the stakeholders.



ROYERS LOCK

The Royers lock is situated in the Port of Antwerp and was first used in 1908. The existing lock is 182.5 metres long and 22 metres wide and is used for the lockage of inland waterway vessels and, to a limited extent, seagoing vessels. The current dimensions do not allow the lockage of 4-barge push boat convoys.

The Royers lock is therefore outdated and not in good condition. It will be converted into an efficient inland navigation lock that is able to swiftly lock through modern inland waterway vessels, push-tow convoys and smaller seagoing ships.



Quality basic infrastructure

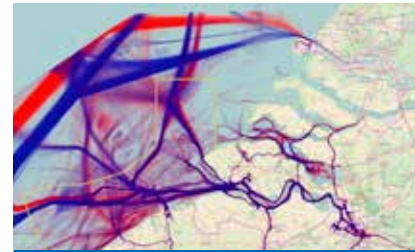
Flanders is home to four seaports: Antwerp, Ghent, Ostend and Zeebrugge. They are all part of the TEN-T Core Network, which links the main transport nodes in Europe on a multimodal basis. A merger between the port of Ghent and Zeeland Seaports (NL) is under preparation.

The Government of Flanders not only ensures proper access to the seaports, but it is also responsible for the construction and maintenance of the basic infrastructure in the ports, such as sea locks, pipework strips that are of regional interest, buffer zones, access roads and non-commercial quay walls. ■



KIELDRECHT LOCK

The Port of Antwerp has been given a new lock: the Kieldrecht lock. This also happens to be the largest operational lock in the world, along with the Berendrecht lock in the northern section of the port. Together with the existing Kallo lock, the new lock provides access to the left bank of the river Scheldt. Measuring 68 metres in width and 500 metres in length, Kieldrecht lock was inaugurated in June 2016. The bottom of the new lock is at -17.80 metres TAW, to the effect that the draught of the docks of the inner port can be used to full capacity.



Lively nodes

The seaports and inland waterways in Flanders are among the busiest nodes in the world. The Vlissingen node, at the mouth of the Western Scheldt, counts over 50,000 vessel movements each year. This is a multiple of vessel movements compared to other port regions.

Ports with depth

The fairways need to be maintained. Failure to do so causes the access routes to the seaports of Flanders to start silting up, which is why dredging operations need to be undertaken on a regular basis. In Antwerp, the port can be accessed by ships with draughts down to 15.5 metres, in Zeebrugge by ships with draughts down to 16 metres, depending on the tide. Both ports are accessible to Ultra Large Container Ships (ULCS).

The dredging works are monitored by the Dredging Information System (*Baggerinformatiesysteem – BIS*). The system pinpoints the dredging areas on an ECDIS map, the maritime version of a GPS map. The dredger that performs the operations continuously transmits its position, whilst keeping records of how deep the ship is dredging and where the spoil is offloaded. This all means the works can be perfectly monitored from a distance. ■



NEW LOCK TERNEUZEN

The Ghent-Terneuzen Canal links the Port of Ghent with the Western Scheldt and, as such, with the North Sea. Each year, the canal is used by around 70,000 ships. What is remarkable is the fact that the mouth of the canal and the pertaining lock are situated in Terneuzen, on Dutch territory. To provide the Port of Ghent with extra opportunities for growth, one of the locks in Terneuzen will be replaced and enlarged. The new lock (427 metres long, 55 metres wide and 16 metres in depth) will enhance access to the Port of Ghent, and deliver a smooth-paced passage for seagoing and inland waterway vessels.



Safe traffic

Vessel Traffic Services (VTS) is similar to air traffic control at airports. The VTS centres in Flanders inform and regulate all commercial shipping on the access routes to the sea-ports. Traffic is monitored by inter alia the Scheldt Radar Chain and the Automatic Identification System.

SCHELDT RADAR CHAIN

In Flanders, the Scheldt Radar Chain is the main VTS tool. The system is jointly managed with The Netherlands and consists of 5 manned traffic centres and 22 unmanned radar towers. Geographically, the Scheldt Radar Chain covers an area of approximately 150 kilometres: starting from the North Sea from the French border as far as Domburg, and on to the river Scheldt from Vlissingen to the Kallo lock.

The traffic controllers identify all vessels entering the VTS area, which automatically provides all partners with a detailed estimate of the expected traffic. In case of calamities at sea, the Maritime Rescue and Coordination Centre in Ostend is called in.

CONTINUED GROWTH

VTS has made shipping traffic much safer, and also enables the possibility to facilitate maritime and inland waterway transport. With the entire traffic flow mapped out, the moveable bridges on the Flemish watercourses can be better geared to the expected traffic volume. The system also allows for a more proactive lock planning. ■



One river delta, two countries

The Scheldt, the most important river for the economy in Flanders, flows into the North Sea via our neighbouring country The Netherlands. The Netherlands and Flanders have a longstanding tradition of working together in managing the river Scheldt. Both governments work closely on the organisation of the pilots, applicable regulations and vessel traffic services. In 2005, this collaboration was enshrined in the Treaty on Joint Nautical Management (*Verdrag inzake het Gemeenschappelijk Nautisch Beheer – GNB*).

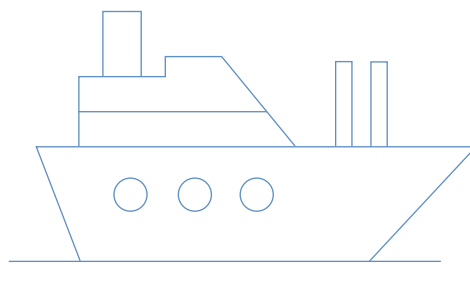
The GNB's nerve centre is the Joint Nautical Authority (*Gemeenschappelijke Nautische Autoriteit – GNA*). The GNA ensures smooth-paced and safe shipping on the river Scheldt and its approach areas at sea, inter alia via the Scheldt Radar Chain.

Fast transit times

The chain approach is implemented at various Flemish seaports and their supply routes. The goal is to reduce the time a seagoing ship spends in between approaching and leaving the port to the bare minimum. To this end, all service providers in the nautical chain align their activities. Pilots are at the ready, locks are available, tugboats are operational and berths are free.

This approach demands a particularly close collaboration between all the links in the chain. As a lot of Flanders' waterways link up with Dutch waterways, cross-border cooperation is also crucial. For the Scheldt Ports of Antwerp and Ghent, this is the responsibility of the Joint Nautical Management of Scheldt navigation.

The chain approach has proven to be a success. With all links minutely aligned, the seagoing ships save a significant amount of time, with the ports of Flanders now accessible to increasingly larger ships. ■







TOWARDS EXCELLENT
MOBILITY

Smooth-paced hinterland connections

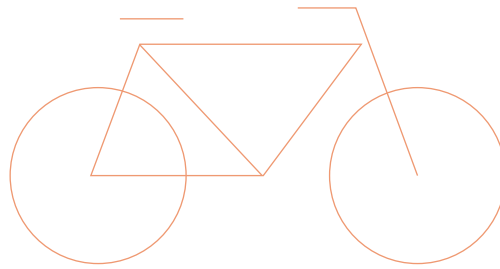


TOWARDS EXCELLENT MOBILITY

Smooth-paced hinterland connections

Flanders is a very densely populated area where huge flows of people and goods meet. To strengthen smooth-paced links where necessary, our road and inland waterway networks are being optimised.





” A new cycle lane network creates a safe cycling route to and from the port and the polder villages. ”



New arteries for enhanced traffic

The Government of Flanders has launched an ambitious road infrastructure optimisation project: ring roads around major cities such as Ghent and Antwerp are linked up, new main highways are being built and some regional roads are being upgraded.

MISSING LINK A11

The A11 is the main link to the Port of Zeebrugge by road. It not only links the port with the hinterland, but also promotes opening up the East Coast for recreational purposes and routing the traffic flows in the tourist hotspot of Bruges. To ensure road safety and livability, the A11 segregates road freight and through traffic from local traffic. A new cycle lane network creates a safe cycling route to and from the port and the polder villages.

A project such as the A11 demands serious investments, which is why we have opted for a public-private partnership (PPP) which combines creative solutions and rewarding opportunities. In a public-private partnership the government partners up with a pri-

vate contractor to conclude what is often a DBFM contract. DBFM stands for Design, Build, Finance & Maintain. The parties that sign up to the procedure are free to propose either a conventional bank loan or to attract funding for the project through the financial markets. In doing so, the Government of Flanders acts in response to the rising interest shown by institutional investors.

Moreover, the A11 was singled out by the European Investment bank (EIB) to pioneer the trial phase of the EU project bonds. Through this initiative, the EU is looking to incentivise the financial markets to invest in large-scale European transport infrastructure projects. ■



Targeted communications

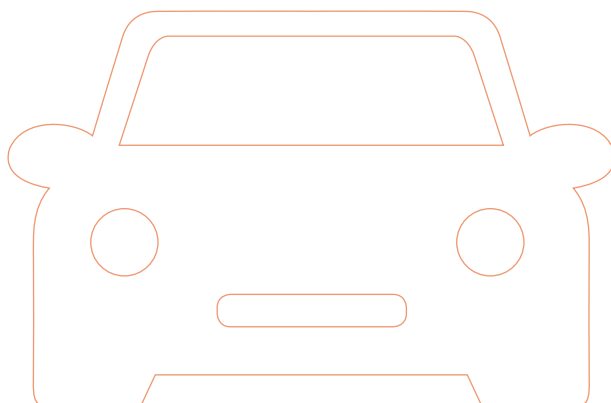
In the case of road works likely to cause considerable nuisance, local residents and businesses are involved from early on in the process. This is done by way of information meetings, information events, public consultations, et cetera. For a lot of these large-scale projects, an accessibility adviser is called in who serves as an interface between the local residents, the businesses affected and the Government of Flanders. During the project implementation phase, the government communicates about the road works using different channels.



MASTER PLAN ANTWERP

The Antwerp 2020 Master Plan provides sustainable solutions for traffic in the Antwerp region. The plan combines the accessibility to the city and the port with livability and road safety. To accomplish this aim, the plan not only provides for the construction of new roads, but also encompasses tram projects, cycle lanes and schemes to boost inland waterway transport. Moreover, routes for through traffic are being extended and strengthened. By 2020, at least half of all journeys in the wider Antwerp conurbation are to be undertaken by public transport, by bike or on foot. Stand-out projects as part of the Master Plan include:

- South Node (*Knoop Zuid*): optimisation of the connection of the A12 onto the Antwerp ring road (R1);
- North Line (*Noorderlijn*): provides for a smooth-paced tram link between the city centre and the city's northern districts;
- the Antwerp ring road, which is to be linked up (*Oosterwiel* connection);
- the second rail access line of the Port of





Antwerp, a second port access which substantially relieves the pressure on a number of nodes.

OPTIMISATION OF THE BRUSSELS RING ROAD (R0)

The northern section of the Brussels ring road (R0) is being redeveloped over a 20-km stretch. This will act to segregate through and local traffic, which will benefit road safety and the circulation on the ring road. The building of cycle lanes and improved public transport also represents significant investments in alternatives for using the car. Alongside the national interest, this project is also significant at international level, as the R0 is part of the Trans-European Transport Network (TEN-T).

NORTH-SOUTH KEMPEN

This project is an investment in smooth-paced and safe mobility for the 'Kempen', the north-eastern region of Flanders. In addition to optimising the link between the E313 motorway and Turnhout in the northern part of the Kempen, two large roundabouts are to be built, along with a fly-over across the motorway and

the Albert Canal, which links the river Scheldt to the river Meuse. Moreover, 11 junctions have been tackled. This is a thoroughgoing investment in smooth-paced and safe traffic.

R4 CONNECTS

The Ghent ring road (R4) is linked up at its southern end. Connecting the ring road onto the E17 (north-bound motorway) and the E40 (east-bound motorway) acts to ensure a more even spread of traffic flows. Heavy goods traffic and through traffic are systematically conducted along the R4. Road freight traffic, the transport of people and bicycle traffic are better segregated. All these measures increase safety and relieve nearby residential areas. Due to this new project, the new economic development in the southern part of Ghent is enabled to continue apace: a win-win situation for businesses and the region as a whole.

The redevelopment of the R4 West and East is already under way. Alongside the R4, the ground level crossings are to be replaced by grade-separated junctions. This dispenses with the need for a rail crossing. In addition, a cycle

highway is to be built along the R4 West and East. Along with the earlier projects, these interventions ensure enhanced circulation and heighten the safety of the various road users.

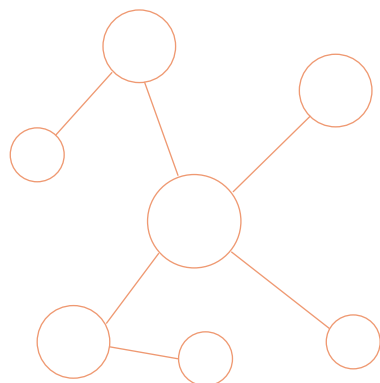
RAILWAY STATION AREA MECHELEN

In 2008, several partners including the Government of Flanders, the City of Mechelen, the NMBS and Infrabel (Belgian railways) decided to renovate the railway station of Mechelen, one of the oldest stations in Europe. In addition to building a whole new station, the project also includes an underground car park for 2,000 vehicles as well as a 722-metre tunnel at the eastern end of the railway station. This tunnel underneath the canal will divert the bulk of the north-south traffic outside the city centre. This enables the city to use the existing roads for cyclists and pedestrians. On top of the new tunnel, 2 extra rail tracks are being built to serve a high-speed rail link between Brussels and Antwerp. ■



Investing in public transport

Routes that have the biggest travel potential are being beefed up with targeted investments by De Lijn, the public transport company of Flanders. Key in this respect are smooth-paced circulation and a sufficient number of seats in new, comfortable vehicles, riding to timetables geared towards demand.



FLEET EXPANSION

De Lijn is investing in the continued expansion of its fleet. For one thing, a large number of new 'Albatross' trams have been placed on order. These extra-long trams are a third longer than the 'Hermelijn' type trams, providing more than 300 seats. Moreover, these new trams are spacious as well as comfortable, with their low floors making them accessible to all users. In all, over fifty 'Albatrosses' are already in use in Antwerp and Ghent. Like all other trams of De Lijn, these are powered 100 percent by green energy.



The coastal tram: the world's longest tramway

The longest tramway in the world follows the coastline across a 67-kilometre stretch. Dispensing with the need for a car, you alight at Ostend railway station and hop on the coastal tram for a smooth-paced ride to the seaside resort of your choice. Various studies are ongoing to expand the coastal tram to the east and to the west.

CROSS-BORDER EXPRESS TRAMWAY

A strengthened Flemish-Dutch cooperation agreement has been inked to get the express tramway between Hasselt and Maastricht back on track. The route has been adapted, and given a new terminus. Because of this express tramway, a journey between both cities will take as little as 34 minutes in times to come.

'TRAMBUS'

The 'trambus' is a form of high-quality, non-track-bound public transport. The vehicle combines the capacity and comfort of a tram with the flexibility of a bus. Wherever possible, it uses a dedicated track bed,

making it the perfect stepping-stone for the development of a new tramway. The test on the circuit of the future 'Ring Road Tram', which is part of the so-called 'Brabantnet' which is intended to ensure onward tramification in and around the Brussels conurbation, was received with enthusiasm. From 2019, this link will also be served by 'trambuses'. In the meantime, the potential of other routes is under exploration. ■





The Albert Canal expands

The Albert Canal is the principal watercourse for inland waterway transport in Belgium. The canal links the Port of Antwerp with the Port of Liège, and consequently the river Scheldt with the river Meuse: the two main rivers in Belgium. Each year, almost 40 million tonnes in goods are carried via the Albert Canal, with a significant growth in container transport in recent years.

To meet the increasing demand for transport, the Albert Canal is under further development to enhance the efficiency of inland waterway transport. The project to lift all the bridges across the Albert Canal to an under bridge clearance of 9.10 metres, is in full execution. This will make the canal accessible to four-layered container transport and three-layered high cube containers. In addition, the lifting of the bridges brings further opportunities for Short Sea Shipping and project loads. Lifting the bridges will enable ships to be loaded in an optimal way, which in turn drives down the cost of transport per unit.



The Albert Canal is a class VIb waterway with the exception of the Antwerp-Wijnegem section. This busiest stretch of the canal, close to the Port of Antwerp, is to be widened to class VIb, making the canal better suited for push-tow navigation and for inland waterway vessels in excess of 10,000 tonnes. In this respect, the widening will also contribute to increased navigability and safety.

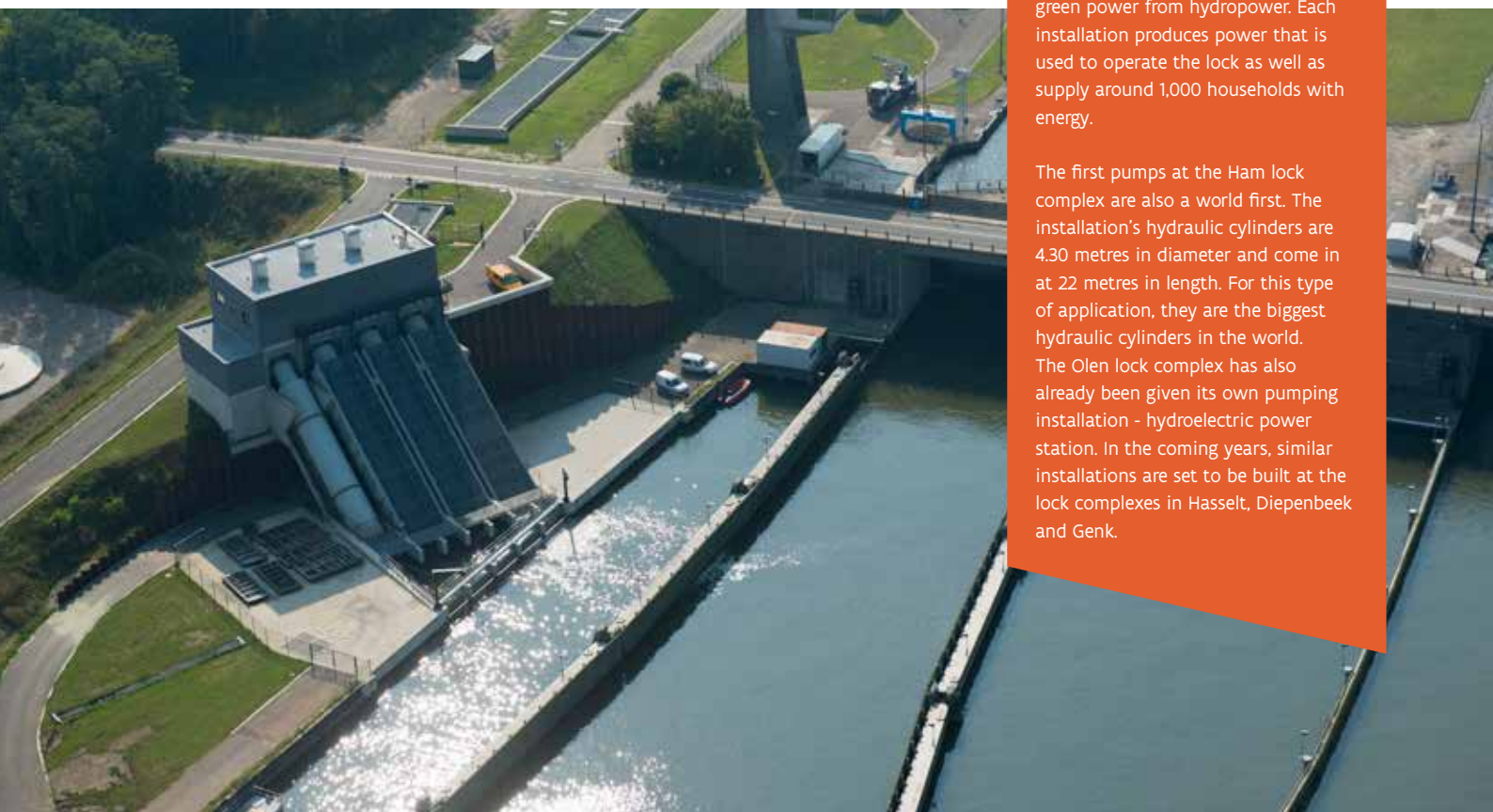
- The tonnage carried via the Albert Canal is the equivalent of 10,000 lorry journeys per working day.
- A single inland waterway vessel of more than 10,000 tonnes keeps 300 lorries off the road.

Pumping installation and hydroelectric power station in one

The Albert Canal is exclusively supplied with water from the river Meuse. Protracted drought, which can cause the Meuse drainage to drop substantially, may jeopardise the water supply to the Albert Canal. To maintain the canal's water levels and to continue to ensure the appropriate depth for inland waterway transport, large-scale pumping installations are being built at the 6 lock complexes which enable the water used by the locks to be pumped back.

Up to 48,000 cubic metres of water are displaced in a single lockage operation. During times of water shortage, the pumps will pump back the water from the lower canal reach of the lock back to the upper canal reach. This enables the same amount of water to be reused to enable ships to go through the lock. If there is sufficient water, the installations are used the other way round to generate green power from hydropower. Each installation produces power that is used to operate the lock as well as supply around 1,000 households with energy.

The first pumps at the Ham lock complex are also a world first. The installation's hydraulic cylinders are 4.30 metres in diameter and come in at 22 metres in length. For this type of application, they are the biggest hydraulic cylinders in the world. The Olen lock complex has also already been given its own pumping installation - hydroelectric power station. In the coming years, similar installations are set to be built at the lock complexes in Hasselt, Diepenbeek and Genk.





Win-win situation

The Seine-Scheldt project is not a standalone endeavour. Alongside improved infrastructure, a due focus of attention goes out to river conservation. Old river branches are being linked up with the river Lys again, and the riverbanks are getting eco-friendly reinforcements. Attention is also paid to the economic dimension of the waterway through the development of transshipment centres, attracting businesses, et cetera.



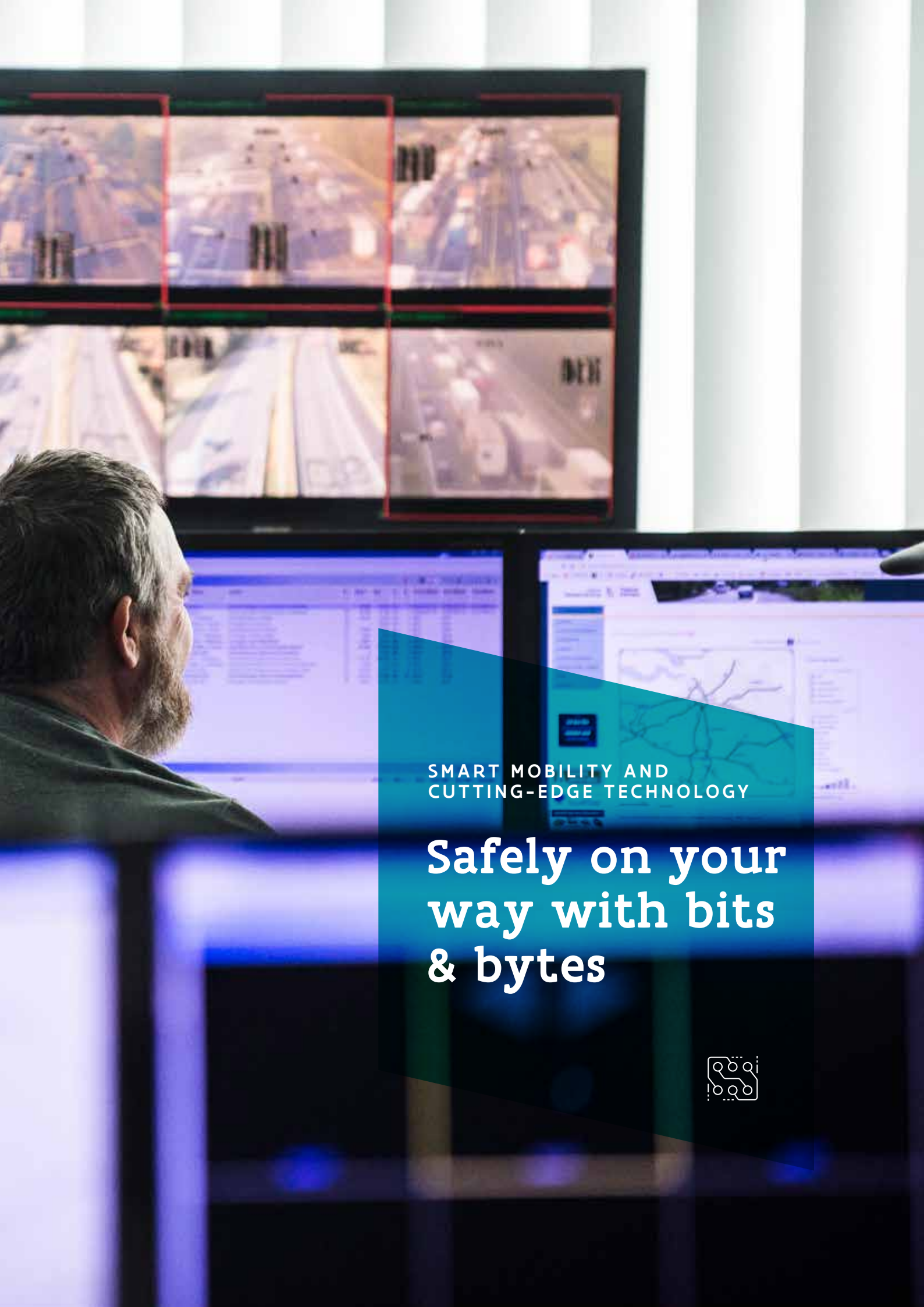
Connecting Europe

The Seine basin and the basin of the river Scheldt are two of Europe's foremost industrial regions. The Seine-Scheldt project is now linking these two growth centres. Container and push-tow vessels will be able to go from Flanders, which is the gateway to the Scheldt and Rhine delta, all the way to Le Havre, Rouen and Paris.

The main operations will be carried out in France, including the construction of a 106-kilometre canal between Compiègne and Cambrai. Flanders' main task is to deal with the river Lys, which links the basin of the Seine with the Scheldt.

The fairway and the bridges are being adapted, and new locks and overtaking lanes are being built. Due to these improvements, the route between the rivers Seine and Scheldt is made suitable for class Vb vessels (ship loads up to 4,500 tonnes).

The project will turn inland waterway transport into a fully-fledged alternative for the transport of goods by road. The result: less busy roads, greater safety and a cleaner environment. ■



SMART MOBILITY AND
CUTTING-EDGE TECHNOLOGY

Safely on your way with bits & bytes



SMART MOBILITY AND CUTTING-EDGE TECHNOLOGY

Safely on your way with bits & bytes

To ensure proper mobility, infrastructure as well as technology are important. Flanders is investing in an extensive system of cameras and measurement loops, which provide a detailed picture of traffic volumes and allow for improved traffic management. On the water, River Information Services (RIS) ensure smooth-paced and safe navigation.

Dynamic traffic management

Dynamic traffic management is a method to make the most efficient use of the available road transport capacity. Road users get earlier warnings of congested traffic and other obstacles, and advice on alternative routes. This is delivered by way of dynamic displays above and alongside the road, as well as via messages in the media, the VVC website, Twitter, RDS-TMC and open data.

The Flemish Traffic Centre (*Vlaams Verkeerscentrum* – VVC) is the nerve centre for dynamic traffic management on the highway network. Together with inter alia the road authorities, traffic police, emergency services and neighbouring traffic centres, the VVC devises traffic regulation strategies to ensure road safety and promote the swift flow of traffic.

An efficient dynamic traffic management is only possible if the VVC has a full and reliable picture of the traffic situation. This information is supplied through various channels. For instance, the highway network has a basic measurement network with measurement loops and a camera surveillance system, enabling it to gather information across the entire highway network about traffic volume, vehicle speeds and the traffic mix. ■





Peak traffic lanes drive down congestion

Dynamic traffic management allows for peak traffic lanes to be used on a temporary basis. These lanes are hard shoulders which can be opened up as extra lanes in case of high traffic intensity. On the E313 Antwerp-Liège, the E40 Brussels-Liège and the E19 Antwerp-Breda, such peak traffic lanes are already in use. In the following years, the Agency for Roads and Traffic will open additional peak traffic lanes on the E17 Kortrijk-Antwerp, the E40 Brussels-Ghent, the E313 Antwerp-Hasselt and the E314 Leuven-Genk.

Improved safety

In 2020, the Government of Flanders is keen to see road authorities, police services, emergency services and the widest possible number of road users in Flanders have services that deliver support as they travel safely and in observance of the rules and regulations. In addition, Flanders is also investing in targeted and efficient enforcement.

INFORMATION AND TRANSMISSION OF INFORMATION

At every node and every complex on the highway network, each lane is measured by way of double measurement loops which generate detailed information about speeds, occupancy rate, intensity and vehicle lengths. The information is used to steer dynamic speed limits on lane signage.

Brussels). The public broadcasting company transmits traffic information via RDS-TMC in a format which can be automatically processed by on-board car systems.

All available traffic information is posted on www.verkeerscentrum.be. On the www.wegenenverkeer.be website comprehensive roadworks information is tendered. ■

EXCHANGING INFORMATION WITH END USERS

Through the VVC, the Government of Flanders is making a free basic package of traffic information available to end users and service providers. This is done via channels such as Datex and OTAP. These are systems for Europe-wide standardised, automatic data exchanges between traffic centres (in amongst others The Netherlands, Germany, Wallonia and



DYNAMIC SIGNPOSTING

The highway network is fitted with dynamic information displays (VMS + RVMS) and over a number of road lanes also with lane signage (RSS). Dynamic displays warn traffic users of unsafe traffic situations and inform about actual travel times. Alongside fixed dynamic signposting, automatic mobile traffic queue detection and security systems are used.

INCIDENT DETECTION, AID CAMERAS

The highway network around Antwerp and Brussels is equipped with cameras for automatic incident detection, which produce real-time images of the traffic situation. Through image analysis, an image processing module is able to spot anomalies (especially traffic standstill detection). There is also direct contact with the CICs, the Customer Information Centres of emergency centres.

ANPR CAMERA NETWORK

Automatic Number Plate Recognition cameras recognise the license plates of passing vehicles and automatically record a series of data (number plate, time, nationality, et cetera). The ANPR cameras are used for the purpose of road safety, traffic analysis and law enforcement.

AVERAGE SPEED CHECKS

Alongside individual speed cameras for unmanned speed checks, Flanders uses average

speed checks to measure average vehicle speeds across longer distances. The average speed by which the vehicle covers the entire track serves as the yardstick for the traffic fines.

This kind of speed check system ensures homogeneous traffic flows and calmer traffic situations. Motorists no longer slam down hard on the brakes when they spot a speed camera before accelerating again. Moreover, the average speed check system is perceived as fairer.

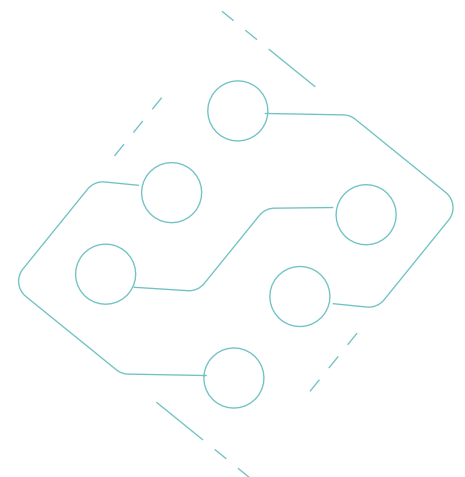
The average speed check cameras not only measure a vehicle's average speed. They are also able to detect hard shoulder drivers and vehicles for which an all-points bulletin (APB) has been issued. In addition to Belgian number plates, the software also recognises number plates of all neighbouring countries.

LORRIES ON THE SCALES

Weigh In Motion (WIM) detects overloaded lorries. The system consists of a combination of sensors placed in the road surface and cameras positioned overhead. For every vehicle that drives across the sensors, the speed, vehicle length, axle configuration, individual axle load and total weight are recorded. The cameras take a picture of every vehicle and recognise the number plate.

Through the use of WIM, inspectors get an initial indication of which lorries are overloaded. These lorries are then intercepted and taken

to the weighbridge for a second check. This is quite an improvement: previously, when they were still singled on sight, fewer than 20% of the lorries were actually overloaded. Thanks to WIM, this rate has climbed to over 80%. Which in turn means time saved for the inspectors and bona fide truckers alike. ■





Driverless shuttles at Brussels Airport

De Lijn and Brussels Airport Company are jointly working on a project in which driverless shuttle vehicles are set to carry travellers 24/7 at high frequencies using mixed modes of transport. The aim? To link the central railway and bus station at the airport with the various nearby business and car parks. In 2017, both entities sought to attract the right manufacturer by way of a European call for tenders open to competitive bidding. A pilot phase and the relevant tests are planned for 2018, with the implementation of the transport system to follow in 2019.

Smoother-paced circulation

SMART TRAFFIC LIGHTS

Smart traffic lights which act in dynamic and flexible response to the current traffic intensities increase circulation and safety at junctions. Traffic lights that are efficiently aligned ensure smooth-paced circulation on main thoroughfares whereby vulnerable road users and public transport may be given priority. On a small scale, the coordination of traffic lights is relatively simple. On a city-wide level, the challenge becomes much more complex. To deal with this, some cities are using traffic computers.

PUBLIC TRANSPORT

Infrastructural measures deliver improved punctuality for De Lijn's buses and trams, which are able to control the traffic lights as they approach a junction, allowing them to drive on without having to stop.

This application has already been in operation for a few years using measurement loops in the road surface ahead of the traffic lights. De Lijn is now also trialling wireless traffic light control. As soon as the trams and buses have been fitted with transmitters and on-board computers, wireless traffic light control can be implemented. In addition, tram and bus drivers will be automatically notified of diversions, for instance through the touchscreen on the on-board computer, with GPS information on the right route to take.

FROM SMS- AND M-TICKET TO CONTACTLESS PAYMENTS

De Lijn is making every effort to encourage its travellers to buy their ticket in advance. After all, all on-vehicle sales take time, time which the bus or tram loses whilst en route. This is why an extensive network of presale points was set up in the past. Since 2007, travellers have been able to purchase their travel tickets by text message. In 2016, De Lijn launched the m-ticket, a travel ticket that comes via an app.

In addition, De Lijn is also working on the roll-out of contactless payments via EMV (Europay, Mastercard and Visa). EMV is an international standard for chip cards. The system enables you to transact payment using a debit or credit card without having to insert the card in a card reader. Under certain conditions, De Lijn's intention is to completely phase out cash payments on its vehicles by early 2019.

REAL-TIME INFO – APPS

(Online) travel information is an integral part of De Lijn's services and the experience of its customers. Ensuring the quality of this real-time information is essential for communications with (potential) bus and tram travellers: pre-journey (designing a route on a tablet), on-journey (getting information via your smartphone on the route followed during the journey) and post-journey (for instance making enquiries about lost property items). This is why De Lijn is deploying the strategic

RISE project (*ReisInformatieSystemenExtra* or Travel Information Systems Extra) to deliver accurate and consistent (real-time) information at physical touchpoints with efficient digital platforms and CRM systems.

The roll-out of the new generation real-time information displays will take place as of 2018. From 2018 forward, the gradually increased central control of the route information that is transmitted to the website, apps, real-time boards and bus station displays will ensure the latter show even more accurate and synchronised real-time information. In addition, the public transport company is unrelentingly working on making its site and travel information apps more user-friendly. For instance, the app not only has travel information on any given route, but also timetables for specific stops and a direct link to the purchase module via text message or an m-ticket.

De Lijn is also keen to obtain the conceptual input from the market. By actively making data and web services available to third parties, De Lijn is looking to foster digital entrepreneurship in Flanders and beyond. De Lijn is working on the relevant software and is making its data available to other app developers. ■

More efficient inland waterway transport with RIS

European inland waterway transport is investing heavily in River Information Services (RIS), a global project for safe and efficient inland navigation through information technology carried on board of ships.

EUROPEAN SYSTEM

River Information Services (RIS) deliver fast electronic data transfer between ship and shore. An EU Framework Directive is in place to make sure the systems are internationally compatible.

RIS streamlines the exchange of information between the waterway operators and the waterway users. This means that traffic management on European inland waterways is highly integrated, which only benefits overall safety. By exchanging transport and logistical data, RIS increases the efficiency of transport management, which in turn means the competitive position of inland waterway transport in Flanders is strengthened.

SHIPPING MESSAGES

Through RIS, navigation notifications can be transmitted online to the inland waterway users. This enables inland shipping companies to receive all relevant information for their navigation routes on board: any obstacles, temporary unavailability of locks or bridges and emergency messages.

INLAND AIS

One of the four RIS core technologies is the Automatic Identification System for inland waterway transport (Inland AIS). Ships that carry AIS continuously transmit their identification number, name, dimensions, safety information, position, speed and direction of travel to other nearby ships and the onshore operators. This is not only important for safety, but equally for the swift flow of traffic. Bridge, lock and traffic control centres and port authorities are all automatically sent the expected time of arrival of any given vessel. In doing so, they get a clear picture of the traffic intensity and are much better able to track and handle inland waterway traffic.

INLAND ECDIS

The RIS Directive requires all competent authorities to create electronic navigational charts for all of their inland waterways ranked as part of European class IV or higher. These charts are then available to be consulted on-board using an Inland ECDIS system (Electronic Chart Display Information System), which is comparable to a GPS navigation system for cars. Inland shipping companies can use Inland ECDIS as a route planner which automatically takes the current traffic situation on the waterway into consideration.

UNMANNED NAVIGATION

Reflecting on tomorrow's mobility, we cannot omit to take into account the innovations in the area of autonomous mobility. In the world of aviation, the autopilot concept is already at a very advanced stage. For the transport of people and goods by road, various parties are increasingly experimenting with driverless cars and lorries. In the shipping industry too, a number of pilot projects on unmanned navigation have been conducted or are in the process of being engineered. Through research, Flanders' waterway manager is looking to get a reliable picture of the opportunities unmanned inland waterway transport have to offer in terms of greening of transport, efficiency gains and sustainability. ■



The Maritime Rescue and Coordination Centre

The Maritime Rescue and Coordination Centre (MRCC) in Ostend is the first reporting centre for all accidents that occur in the Belgian section of the North Sea. Since 2006, the centre has been able to conduct even more targeted searches using electronic search patterns (Search And Rescue Information System – SARIS). All accidents are also recorded in a digital log, which is useful for statistics or to set up prevention campaigns.



Safer maritime shipping with SafeSeaNet

The European maritime information network SafeSeaNet is a harmonised and standardised warning system to prevent calamities and pollution at sea. Each ship that enters a European port is required to notify its arrival ahead of time and disclose inter alia full details of hazardous cargos carried on board.

SafeSeaNet enables the authorities and rescue services to promptly respond to incidents. High risk ships are spotted early and the pre-arrival notification allows for enhanced planning of port traffic. Flanders ranks among the frontrunners in the exchange of data with SafeSeaNet. ■

Automation and remote control



In order to create added value for the waterway transport and for the logistical players, Flanders' waterway manager is investing in the automation and remote control of bridges and locks and the extensive digital exchange of information with the inland waterway users, logistical partners and port authorities.

Being able to ensure a reliable infrastructure enables us to move towards remote control centres which can be used as traffic centres, with extensive traffic assistance and greater service times for inland waterway users. This is in keeping with the principles of optimum corridor and shipping traffic management along the major inland navigation thoroughfares in Flanders, and optimum links to the international fairways to and from Flanders' seaports and our neighbouring countries.

For instance, on a number of canals in Flanders – the Dessel-Turnhout-Schoten Canal, the Brussels-Scheldt Sea Canal and the Leuven-Dijle Canal – bridges and locks are served from a central control building. To be able to remote control the bridges, all bridges have been fitted with cameras, sound installations and marine VHF radio antennae. The cameras register inland waterway traffic on either side of the bridge as well as the vehicles using the bridge. Based on the experiences gleaned from these projects, a greater number of structures will systematically be remote controlled. ■



E

ELEKTRISCHE BUS

5599

VRIJGEEL
of
LIJN

1-60B-646



GEZONDERO
A



CARE FOR THE ENVIRONMENT

**Sustainable
symbiosis
between
ecology and
economy**



CARE FOR THE ENVIRONMENT

Sustainable symbiosis between ecology and economy

Amongst other things, sustainable mobility means that the effects of traffic on the environment are kept down to the bare minimum. The development and maintenance of infrastructure should also occur in full respect of the living environment.

Economical with energy

MOTORWAY LIGHTING PLAN

Since 2011, there is less lighting on motorways in Flanders. With the Flemish Motorway Lighting Plan (2011), a clear vision has been set out on motorway lighting in Flanders. The plan is based on a series of unambiguous criteria and establishes on which roads the lighting needs to be on at all times. Amongst other locations, this applies to complexes and motorway slip roads. In addition, the plan also establishes roads where the lights are only to be switched on under certain conditions: e.g. bad weather, congested traffic, calamities or road works. On other motorways, lighting will no longer be installed. Due to the technical improvements in LED lighting, the Agency for Roads and Traffic will be introducing this technology to motorway lighting in the future.

In addition to the Motorway Lighting Plan, since 2014 a lighting plan has been in place for the regional roads managed by the Government of Flanders. The lighting vision for the regional roads sets out from the 'no lighting, unless' principle for the following road types: motorways, local ring roads, road diversions, green trunk roads, rural roads/cross-over regions. This means that the default position for these road types is to remove the lighting, unless the spatial and traffic-specific context is such that lighting is required.

BUS FLEET GREENIFICATION

Flemish public transport company De Lijn is set to greenify its bus fleet at an accelerated pace. The procurement policy in the coming years is decidedly green. From 2019 forward, De Lijn will only be purchasing buses powered by alternative fuels (hybrid, electric, hydrogen ...). De Lijn deploys its eco-friendly vehicles all across Flanders. The ambitious aim is to run only green

buses – a mixture of hybrid and battery-powered electric buses – in the major cities by 2025, using strictly electrically powered vehicles in the city centres of these major cities.

By focusing its investment policy on sustainability, De Lijn is delivering a structural and crucial contribution to the sustainability revolution in Flanders. In one fell swoop, this sees the public transport company raise the appeal of modern, sustainable, responsible and forward-looking public transport, whilst strengthening the association between De Lijn and the notion of 'quality'. The environment reaps twofold benefits: buses that are less harmful to the living environment and greater enthusiasm for public transport, which tempts more travellers to trade in car for bus travel.

MAKING INLAND WATERWAY TRANSPORT GREENER

Inland waterway transport has a number of strong suits enabling this industry to raise its profile as a sustainable transport mode. Inland waterway vessels can carry large quantities of freight, enabling economies of scale to be applied. Moreover, inland navigation is not plagued by congestion issues, ensuring a smooth-paced flow of traffic. Flanders' policy focuses firstly on the greening of inland waterway transport through the development of new logistical concepts such as Watertruck+ and unmanned navigation, secondly supporting the industry which is looking to greenify its operations, and thirdly investing in the development of alternative energy and fuels. Consequently, the policy of Flanders aligns with the European 'Clean Power for Transport' Directive, which encourages the use of eco-friendly energy and fuels through the development of infrastructure for alternative fuels. For inland navigation, the main focus of

attention goes out to the development of LNG infrastructure and onshore power.

LNG-POWERED MARITIME SHIPPING

Maritime shipping is increasingly resorting to liquefied natural gas (LNG) as the new fuel to power vessels. LNG is a cheap and eco-friendly alternative to heavy fuel. Nitrogen dioxide emissions are 65 to 90% less and the emissions of sulphur and particulates are even negligible. The latter has been a major strong suit since 2015, when the sulphur emission standard for maritime shipping along the Western European coast was tightened.



In all seaports, preparations are underway to enable vessels to be fuelled with LNG. This places Flanders at the forefront of the European pack in the development of LNG infrastructure.

ONSHORE POWER

Onshore power enables shippers to use shore side grid power which dispenses with the need to run their engines or generators whilst idle at berth. Using onshore power installations results in improved local quality of air and less greenhouse gas emissions. Doing so also raises the level of on-board comfort and drives down odour and noise nuisance.

” Flanders is at the forefront of the European pack in the development of LNG infrastructure for maritime shipping.”

Onshore power facilities have been in place at various locations in Flanders’ seaports and along the inland waterway network for quite some time. In recent years, efforts have gone into the further development of this network. In the coming years, the further development and modernisation of the onshore power network is also firmly on the agenda.

LESS NOISE

Flanders is mapping the noise nuisance of road traffic. At the worst impacted locations, noise barriers are being put up at an accelerated pace and noisy road surfaces are being replaced. For the (re)development of the roads, we are opting for silent versions of road paving technologies on the widest

possible scale, in consideration of the local buildings around, and the traffic intensity on the road.

To further deepen our understanding of noise-friendly road surfaces, trial sections were put in place on the N19 in Kasterlee, with various thin and silent wearing courses in asphalt. Alongside the acoustic properties, the study also tested the texture, water sensitivity and resistance to rutting or ravelling of the road paving. Based on the outcomes of this study, a new type of road surfacing has been included in the standard specifications for road works, enabling road authorities to demand contractors to use silent and thin-wearing courses for their roads. ■

Dewatering dredging spoil

To maintain the Port of Antwerp’s accessibility, the fairway needs to be dredged on a regular basis. However, the cleared spoil is a problem at historically contaminated areas, as it takes up a lot of space. And because it is contaminated, often it cannot just be dumped elsewhere. This is why the Government of Flanders devised the Amoras mechanical sludge dewatering installation. Amoras stands for *Antwerpse Mechanische Ontwatering, Recyclage en Applicatie van Slib* (Antwerp Mechanical Dewatering, Recycling and Application of Sludge).

Amoras dewateres the dredging spoil to the point that only dry, easily stackable filter cakes are left. The water from the spoil is treated and reused as process water or water for firefighting systems. Adopting phased and controlled salvaging allows for operating times in excess of thirty years to be reached. If opportunities for reuse are found for the filter cakes in the future, this will only add to the above length of time.





Restricting environmentally harmful substances

SPRAYING BRINE

Using brine instead of road de-icing salt allows us to substantially cut back on the amount of de-icing product being used. Due to its greater adhesive strength and faster action, brine is an eco-friendly alternative to deal with snow- and ice-covered roads, especially for preventive salt spreading.

SPREADING WITH GPS

All de-icing salt spreading routes are equipped with a system for automatic spreading. A GPS system guides the driver, so that he correctly follows the spreading route. Based on the GPS coordinate configuration, the system also automatically adjusts the spreading width according to the location. Thus all road segments are treated, even if the driver is not familiar with the route. The system also saves up to 20% salt as compared to the traditional method.

VLOOT FLIES THE GREEN FLAG

The Flemish public shipping company (VLOOT or 'fleet' in English) builds innovative, eco-friendly vessels from sustainable materials, each with their own eco-friendly characteristics (for example: heat recovery from the engines, energy-efficient engines for low-sulphur fuel, non-biocidal antifouling, et cetera). For these vessels, the shipping company also runs a green procurement and stock management policy. This approach resulted in a significant reduction in fuel consumption and in sulphur oxide emissions.

Sustainability is a deliberate strategy for VLOOT. In 2015, the shipping company was praised for its merits as the most sustainable workplace within Flanders' public administration. Through its external service delivery this acknowledgement and accomplishment is extended to the shipping industry and the seaports that operate on a regional, European and international scale. ■



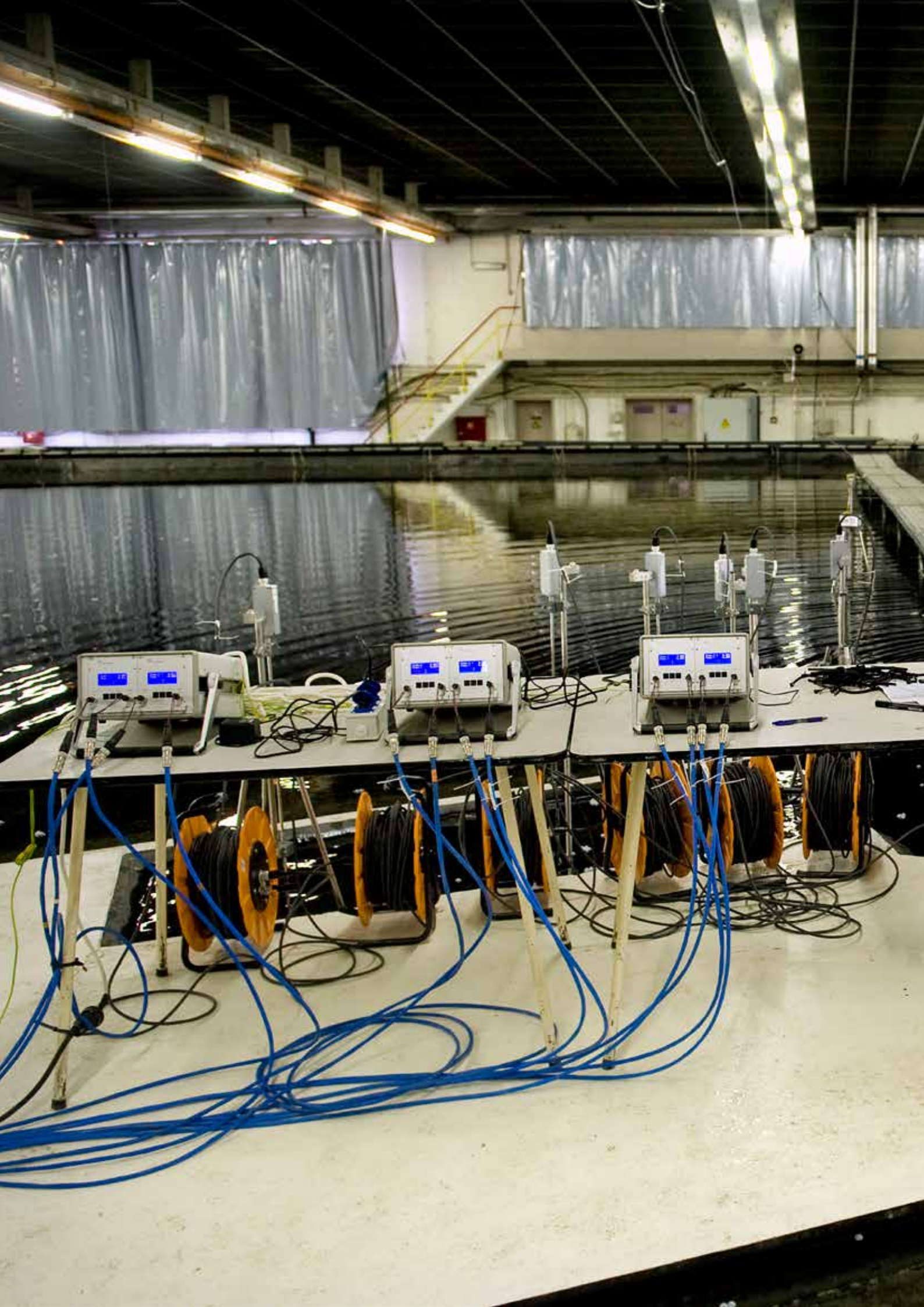
” Today, the entire fleet of VLOOT, the Flemish public shipping company, sails on low-sulphur fuel. ”

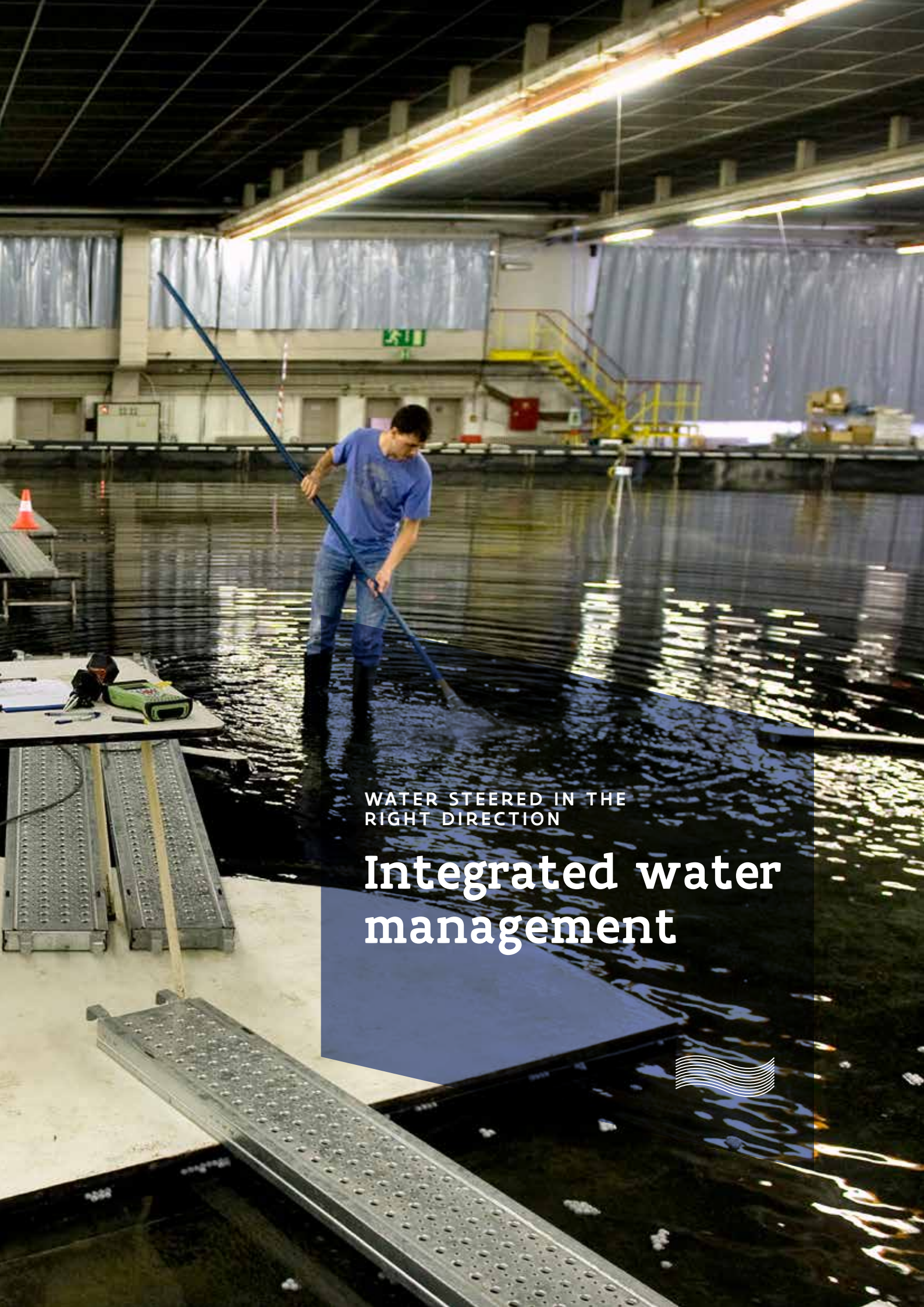


Recycling for continuously reinforced concrete

Continuously reinforced concrete (CRCP) is a road surface pavement of concrete that is poured in a single run which goes on for kilometres without contraction joints. This causes it to produce less noise than the traditional concrete slab sections with contraction joints.

In addition, the Government of Flanders is also experimenting with 2-course CRCP with a thick base course and a thin wearing course, both of which are concrete, put in place using the wet-on-wet process. For the base course, recycled concrete granulates can be used, which, inter alia derives from crushed concrete paving. This constitutes a considerable saving on primary raw materials. For the thin wearing course, fine granulates are used in all cases. This produces a finely textured road surface, which in turn results in even greater noise abatement.





WATER STEERED IN THE
RIGHT DIRECTION

Integrated water management



WATER STEERED IN THE RIGHT DIRECTION

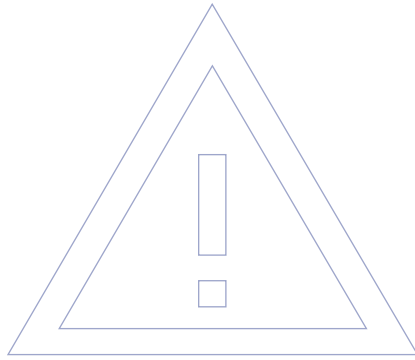
Integrated water management

In a region with a high density of paved and built areas, a high population density, an extended coastal strip and many rivers and canals, integrated water management is crucial. Alongside the important transport function served by the water, the Flemish authorities also focus on nature, tourism and sustainable economic development. Waterborne transport requires an appropriate water level at all times, but Flanders also ensures protection against flooding and water shortage by means of inter alia dike heightening, flood control areas and return pumping plants.

Forecasting system for dikes

As part of the government's Dikes Knowledge Network, the Geotechnical Engineering division and Flanders Hydraulics Research examine the geotechnical and hydraulic parameters that may cause levee breaches, dike distortions and dike erosion. One of the aims is to develop an innovative monitoring and forecasting system for dike breaches, which links the results of tests conducted at the laboratory and in situ to the actual behaviour of the levees. This system will also prove useful to partners abroad. Moreover, the system ensures efficient and effective levee management and maintenance.





A new approach to floods

Not that long ago, most authorities and citizens assumed that floods could be stopped, as long as the dikes were high enough. But floods are a natural and inevitable fact of life. Not even the highest levees will be able to contain the water in certain cases – not taking into account the very high expenditure any kind of protection against the rarest of floods would demand.

This is why the current water management model steps away from endeavours to stop floods at any cost, but instead seeks to limit the damage. This is quantified through the following formula: risk = likelihood x damage. In principle, meadows that are frequently flooded will no longer get extra protection as the economic damage of a flood is low. Densely populated areas on the other hand get extra protection, even if they are not flooded very often. After all, the damage in such areas is potentially very significant.

The new approach is an integrated way to manage coastal areas and rivers, with a due focus of attention going out to all functions: safety, as well as accessibility, nature and tourism. In addition to the more classical protection component, emphasis is also put on prevention and preparedness.

Water shortages and desiccation

In a densely populated region like Flanders the water availability per person is among the lowest in Europe. In case of protracted drought, this may cause problems. In recent drought years, for instance 2003, 2006, 2011, 2015 and 2017, restrictions were imposed on shipping and/or the supply of drinking water derived from surface water at certain water catchment centres was restricted or even shut down altogether. As a result of climate change and increasing concretion (currently

6 hectares/day), the water supply may diminish even further in times to come. This is why much research is carried out on this issue and many preventive, cost-efficient measures are put in place.

For instance, a proper river management model has been devised that maps out all major water use and water supply flows of the navigable waterways. In light of the system's complexity and the interaction with adjacent basins in The Netherlands, Wallonia and northern France, the focus of the water allocation model is not confined to Flanders, but has been expanded to cover the entire Scheldt river basin and the canals that link the Scheldt basin with the other river basins. For the unnavigable watercourses in Flanders, hydrological models are used, as a result of which the use of groundwater and surface water in these watercourses is integrated only implicitly in the water allocation model.

In devising the water allocation model for the Scheldt river basin, various sectors are aligned. The model is now in operational use in support of scenarios involving the deployment of measures. In joint consultation with the sectors, missing data is gathered and the model is further honed and improved.

The Flemish authorities anticipate the differences in the availability of surface water. To this end, bidirectional pumping plants are being built at various locks or space is being created to pump the water back up to the upper reach in case of water shortage. In case of excess water, these pumping plants are used to drain water. In the process, a substantial amount of renewable electricity is generated and transferred to the grid. One example is the cluster on the Albert Canal, which is already up and running. ■

Warning systems

To mitigate the impact of floods due to rain or storms on the North Sea, warning systems are operational. Based on measurements, models, forecasted precipitation rates and wind parameters, these systems are able to predict water levels and waterway emissions. If threshold exceedances are expected, Flanders' waterway manager can be warned before an event takes place. This makes it possible to proactively put measures in place to prevent flooding or lower the impact of floods.



Better than a storm surge barrier

Flood control areas give a river more space and greater buffering capacity. This works better than constricting the river at every turn by way of dike heightening or a storm surge barrier.

The enabling conditions under which these types of constructions were originally built no longer apply, especially given the predicted sea level rise. Countries that have sea defences at times need to use them on an almost monthly basis. Should these water control structures fail, the consequences would be catastrophic.



Policy and management in the Scheldt-estuary

In 2005, The Netherlands and Flanders signed a treaty to cooperate on policy and management of the estuary of the river Scheldt. Under this treaty, which took effect on 1 October 2008, the Flemish-Dutch Scheldt Committee (*Vlaams-Nederlandse Scheldecmissie* – VNSC) was established.

The VNSC works towards the development of the Scheldt-estuary as a multifunctional estuarine water system that is used to serve human needs in a sustainable manner.

The joint aims are to deliver protection against floods, optimise maritime accessibility to the seaports along the Scheldt, conserve a healthy and dynamic ecosystem and set up joint scientific research.

The VNSC's territorial scope moreover includes the Ghent-Terneuzen Canal and the Scheldt-Rhine Canal.

The Long-term Vision of the Scheldt-estuary was devised at the start of this century. It constituted the first step towards the concretisation of the cooperation treaty and as such it was the first result of the new, integrated vision of river management. It spelt out what the Scheldt-estuary is to look like by 2030 and how this to-be situation may be achieved.



As the Scheldt is situated on both Dutch and Flemish territory, the Long-term Vision of the Scheldt-estuary was jointly drafted by both governments. Three functions are key:

1. protection against floods;
2. improved accessibility to the ports on the river Scheldt;
3. preserving nature. The Scheldt-estuary is one of the most important estuaries in Europe with a full tidal regime and a full freshwater-saltwater gradient. The conservation and strengthening of this exceptional piece of nature is an important task.

SIGMA PLAN

The updated Sigma Plan is the practical translation of the Long-term Vision of the Scheldt-estuary. It succeeds the first Sigma



Polders of Kruiabeke

A good example is the flood control area 'Polders of Kruiabeke', which covers an area of 600 hectares. Excess Scheldt water flows into this flood control area only once or twice a year, when storms coincide with spring tide. This reduces the risk of floods in the Sea Scheldt basin from once every 70 years to once every 350 years. Any other day, the area is left to develop on its own, making it an ideal habitat for countless plants and animals in tidal nature and wetlands. The project thus stimulates the development of the authentic Scheldt nature: no less than 300 hectares of mud flats and marshes, 150 hectares of meadow bird area and more than 92 hectares of alder marsh forests will be added. This is also a peaceful and multifarious natural area for a walk or a cycle ride.

Plan, which dates back to the 1970s and mainly revolved around dike elevations. The dike elevations and reinforcements remain part of the updated Sigma Plan, albeit a chain of new flood control areas is created along the Scheldt and its tributaries. This gives the river extra space – when powerful tidal waves flow into the Scheldt, the river must absorb a huge amount of water in a short amount of time. Due to a lowered Scheldt dike, the water can flow into these flood control areas, and can only flow back into the river once the water level has decreased sufficiently. Along with the safety aspect, Flanders is committed to restoring the river's natural quality and achieving Europe's nature objectives. In some flood control areas, the tides are allowed to flow to a limited degree every day via an intake and emission construction, which gives a unique tidal nature. More information can be found on the website www.sigmaplan.be.

SCHELDT QUAYS

In densely populated areas such as the city centre of Antwerp, the Sigma Plan obviously ensures maximum protection against floods. As part of the Scheldt Quays Master Plan, the age-old quay wall was stabilised and the tidal barrier was raised by 90 centimetres. The project also envisages a comprehensive redevelopment of the Antwerp Scheldt quays. While Flanders' waterway manager is implementing the safety measures, the city of Antwerp is handling the renovation of the public space. The works are being executed in various phases. ■



The Joint Meuse: an integrated approach

Across more than 55 km, the Joint Meuse serves as the border between Flanders and The Netherlands. It is jointly managed by both partners. The Joint Meuse is all about working together on a day-to-day basis.

The Joint Meuse is a typical rain-fed river: depending on the amount of rainfall in the Ardennes and the north-eastern part of France, the water level in the Meuse can be either very low or very high. The average amount of water that flows through the Meuse is 250 m³ per second. In case of long-term drought however, this can go down to a flow rate of 25 m³ per second. Given persistent precipitation, the flow rate can go up to as much as 3,000 m³ per second and more.

Using an integrated vision as the starting point, projects have been engineered to protect the surrounding areas even better against high water levels and floods. The idea is to create as much space for water in the river's winter bed as possible. Buildings and other infrastructure in the winter bed are removed as widely as possible. The widening of the winter bed gives the river a lot more

space. Consequently, notwithstanding high water levels, the water levels and current velocities fall. In some places, this also allows for the bank protections to be removed, which gives free reign to the formation of natural banks.

MORE THAN JUST HIGH WATER PROTECTION

The Meuse has plenty of natural values and is very important for recreation. By giving the river space, expansive areas with varying flooding frequencies are produced. These are ideal locations for new nature ecotopes.

The mouths of local watercourses are being adapted, thereby dispelling fish migration bottlenecks. Valuable nature emerges on the banks of the river Meuse. Cyclists and hikers get to enjoy the scenery in full. Walking trails have been developed in the winter bed especially for this purpose. ■





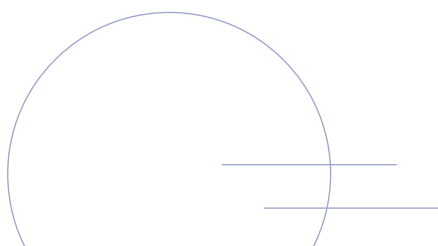


Zeeheldenplein

A particularly apt example of an integrated measure is the renovation of the *Zeeheldenplein* ('Sea Hero Square' in English) in Ostend, which has been expanded to three times its original size. The larger square and the wider seafront with wave damping constructions provide new recreational opportunities, whilst simultaneously raising coast safety.

Coastal Safety Master Plan

Flanders has a 67-kilometre coastline, with 10 coastal towns, major seaside resorts, seaports, marinas and ecologically valuable areas such as the Zwin Nature Park. Sadly, the region is also vulnerable to flooding.





Flanders' Coastal Vision

Flanders' Coastal Vision stands for a sustainable long-term vision for our coastal region with 2100 as its time horizon. We aim to be prepared for the challenges of climate change, and simultaneously reinforce the various functions of the coastal region. The fast changing climate reality prompt us to reflect on ways to further develop and integrate the existing activities, and above all on how to ensure the long-term safety and livability of our coastal region.

One of the biggest challenges coming our way over the decades ahead, is the impending rise of the sea level. To ensure that the coastal region, and by extension all of Flanders, remains safe in the long term, the Flanders' Coastal Vision examines ways to deal with this issue. With the start-up decision for a 'complex project' Coastal Vision a participatory research project has started which will examine which solutions offer the best chances in terms of inter alia safety and accessibility.

The aim of the Coastal Safety Master Plan is to protect the coast against a so-called 'thousand-year storm' until at least 2050. At the 10 coastal towns numerous works have already been carried out, are in progress or are planned to make sure the coast is able to withstand these super storms. The areas with the weakest defences are being dealt with first.

SUSTAINABLE

One particular aim is to ensure the sustainable development of the coastal region, striking the right balance between sea defence structures, nature, tourism-

recreation and economic development. This means the protective measures are first and foremost 'soft' measures such as sand replenishment, the restoration and management of dunes that fend off the sea, the renovation and elevation/widening of seafronts and adjustments at the coastal ports. In all these ports, storm barrier walls are planned around the docks, except in Nieuwpoort where a storm surge barrier will be realised at the port entrance. ■





CUTTING-EDGE
CRAFTSMANSHIP

**Know-how
and expertise**





CUTTING-EDGE CRAFTSMANSHIP

Know-how and expertise

Flanders is home to a very dense network of higher education institutions. Several of these institutions are part of the Government of Flanders. In the field of mobility and public works, Flanders also has the kind of know-how that is recognised at international level and which is frequently called upon by foreign partners.



Technical expertise and research



FLANDERS HYDRAULICS RESEARCH: RESEARCH INTO WATER-LINKED MATTERS

Using land surveys and computer models, monitoring networks as well as physical river, coast and port models, the effects of interventions in the infrastructure, the hydrological regime, the morphological management in the coastal region and the estuaries are examined. Computer models are not always quite capable yet of fully charting the effects on detailed flows in case of adjustments to hydraulic engineering constructions. But numerical models do serve as powerful tools to run scenario analyses in, plus they also provide insight into the interactions between various physical processes. For other situations, physical scale models offer up a wealth of information. Amongst other things, they provide

indications of the effects of navigating vessels in shallow waters, flows and waves, the risk of erosion or the manoeuvrability of ships in ports and on inland waterways.

A fixed measurement network and various measurement campaigns along the inland waterways and the coast supply the data for the day-to-day management, to monitor changes over longer periods of time, to calibrate models, to manage the water levels on the waterways and to work up operational hydrological expectations in case of impending flooding or water shortages.

GEOTECHNICAL ENGINEERING KNOWLEDGE CENTRE: SUBTERRANEAN RESEARCH

High-quality geotechnical research and comprehensive expertise enable us to properly model the subsoil. For tests in situ and tests at the laboratory alike, advanced testing methods are used to gain a better understanding of the soil. This research is supplemented with the latest geotechnical monitoring technologies.

ONLINE MEASUREMENTS

Standard measuring techniques for monitoring are reliable but labour-intensive and

do not allow for continuous follow-up. This is why a methodology is being devised to monitor the subsoil of Flanders online by way of sensors. The measuring techniques which have been adopted rely inter alia on optical fibre technology and microelectromechanical systems (MEMS), supplemented with more traditional measuring techniques. The test results are transmitted to an external server, making them available to be consulted online by the engineers.

In a number of trial projects, an excavation pit was used to continually measure the vertical and horizontal wall distortions, subsidence behind the walls and forces in the anchoring, using the latest measuring techniques. The usability of these techniques was found to be overall positive, offering prospects for interactive designs, whereby the design can be redressed in accordance with the measurement results.

ADVANCED RESEARCH INTO ONLINE MONITORING

In the future, standard monitoring techniques are set to be combined with innovative online monitoring. Online monitoring will develop into a surveillance system which indicates whenever changes



Flanders Subsoil Database

The Flanders Subsoil Database (*Databank Ondergrond Vlaanderen* – DOV) is the one-stop-shop for subsoil data in Flanders. The database structures, administers and provides access to information on geotechnical, geological and hydrogeological data regarding the subsoil. The geotechnical section of the DOV database inter alia contains the results of soil sounding campaigns, boring campaigns and lab tests. These can be consulted online. The data you are looking for is displayed on your screen in just a few clicks. The maps containing basic geological and geotechnical information are of use for infrastructure projects and projects involving a spatial-functional element.

occur in the construction's behaviour. If this is the case, traditional measuring techniques can be used to yield unequivocal quantitative measurement results. This methodology is now being implemented at the Kieldrecht lock (Port of Antwerp) and the Siesegemlaan tunnel in Aalst, to name but two. Applications for the monitoring of dikes in inter alia Schellebelle, Melle and Wetteren, are also ongoing.

EXPERTISE IN CONCRETE AND STEEL CONSTRUCTIONS

Flanders has always had an in-depth understanding of concrete and steel constructions, with particular reference to fixed and moveable bridges, tunnels, weirs, retaining walls, pumping stations, quay walls, lock chambers and lock gates. As the project owner/client of important large-scale constructions, Flanders is keen to have in-house know-how for the efficient and sustainable execution and the solid management of civil engineering works. The technical support provided for the verification of the infrastructure designs is particularly extensive. The inspection of the materials and the production follow-up as part of large-scale infrastructure projects is carried out both at home and abroad.

TRAFFIC ENGINEERING RESEARCH

The development and implementation of traffic models acts to provide a quantitative foundation for policy. In addition, research into traffic indicators which are used to monitor policy is being conducted. As the characteristics of road traffic on the main highways network are collated every minute, traffic indicators may be inferred to map out the effects of traffic measures. Dynamic traffic models and mobility studies investigate the organisation of road traffic and the road design options. Research and development in respect of intelligent transport systems (ITS) is conducted in accordance with European standards.

ROAD ENGINEERING LABORATORY

The Road Engineering Laboratory (*Laboratorium Wegenbouwkunde*) conducts mechanical and chemical tests on road construction materials: asphalt mixes, binding agents, cement concrete, soil and aggregates. The laboratory carries out preliminary research as well as in situ tests.

On newly built roads, the lab performs test measurements. In doing so, the lab checks the friction, roughness and rutting of the road surface, the thickness of the courses laid,

the asphalt paving and the concrete paving. The Road Engineering Laboratory also investigates the acoustic properties of road surfaces and conducts noise measurements with a view to designing noise barriers.

TRAFFIC AND TELEMATICS EXPERTISE

As a knowledge centre, Traffic and Telematics Expertise (*Expertise Verkeer en Telematica* – EVT) provides consultancy services to in-house and external customers. In all cases, the experts seek out the best favourable solution in the areas of traffic regulation, street lighting, traffic lights, signage, protective structures, exceptional transport, tunnel policy, et cetera. ■



Maintenance and management

A Pavement Management System (PMS) is the most efficient and cost-effective way to maintain a road surface. In Flanders, a PMS is in use for the main highway network. In respect of the management of the regional airports, the Government of Flanders is responsible for the preservation of the basic infrastructure, whereas the commercial operation is handled by a private company.

PAVEMENT MANAGEMENT SYSTEM (PMS)

PMS is a computerized system that takes into account the type and age of the pavement itself, the traffic load, past interventions, et cetera. In order to correctly enter the condition of the roads, a multifunctional measuring vehicle is deployed to measure rutting, faulting, cracks, texture and longitudinal evenness of the road.

Based on all these parameters, the PMS plans the maintenance and the nature for each road section: from small, superficial repairs

to a complete structural renovation. Such maintenance is carried out in homogeneous sections as far as possible, so that the hindrance to operations is limited.

A PMS is much more efficient than a reactive maintenance system, where action is often taken when there's already visible damage to the road surface. It's also cost-effective. Preventive maintenance can extend the life of the road surface.



Photogrammetry and topography

The General Technical Support division provides expertise and in-house research in the disciplines of inter alia topography and photogrammetry. To this end, it draws on conventional as well as innovative technologies. The use of Unmanned Aerial Vehicles (UAV) and 3D technologies are explored and honed in detail to serve the development of internal expertise.

INNOVATIVE MANAGEMENT STRUCTURE FOR THE AIRPORTS OF FLANDERS

The regional airports of Flanders are economic gateways which generate a lot of prosperity. They need to be able to operate on a sufficiently autonomous and market-led basis to stake out their position on the aviation market. But it is equally important to keep the government closely involved with the airports. To reconcile both aims, a LOM-LEM structure has been set up for each airport:

- The Airport Development Company (*Lucht-havenontwikkelingsmaatschappij* – LOM) is run by the Government of Flanders. Through the LOM, the government is responsible for the preservation of the basic infrastructure.
- The Airport Operating Company (*Lucht-havenexploitatie-maatschappij* – LEM) is a private company that is in charge of the commercial operation of the airport.

The companies make sure each airport has the dynamics to gear their services to the diversified market of (international) aviation. ■

“A Pavement Management System is much more efficient than a reactive maintenance system, where action is often taken when there’s already visible damage to the road surface.”



FITA, 25 years of international engineering services

The Government of Flanders is largely competent for mobility, public works and infrastructure. Under the auspices of the Mobility and Public Works Policy Area, the Flanders International Technical Agency (FITA) promotes know-how in these areas worldwide. It does so upon request of private sector federations such as inter alia the Flemish Construction Confederation and the Organisation of Engineering Consultancy Firms.

FITA's core business is to render public expertise to the private sector. As a non-profit association it has been providing (technical) assistance to its beneficiary consulting companies through working contracts based on daily performances. As part of the expansion of the Panama Canal, FITA experts have been recruited to

conduct additional studies in preparing engineering specifications for the development of a new set of post-Panamax locks. Moreover, several task orders delivered through the Panama Canal Authority (ACP) were executed by FITA experts. Flanders Hydraulics Research also acquired several study assignments including various model studies and tank test performances for vessel manoeuvring in the locks.

Flanders' governmental agencies are recognized internationally for their highly qualified professionals. Consequently, private consulting companies request FITA on a regular basis for nautical assessments for inland navigation and port extension projects abroad. Experts in waste management have also been nominated to environmental projects in several countries in Central and Eastern Europe.

Another major responsibility of FITA is the (co-)organisation of sectoral trade missions and business events. These networking activities to the benefit of the concerned private sector can save time and expense in identifying and developing profitable relationships with compatible foreign companies and local authorities. Through its worldwide network, FITA is able to provide a platform. It allows private companies to present their knowledge and expertise directly to qualified counterparts through a series of presentations and networking events, frequently developed with partners such as FIT (Flanders Investment & Trade).

Recently, FITA celebrated its 25th anniversary in the international engineering services market.

Wave basin

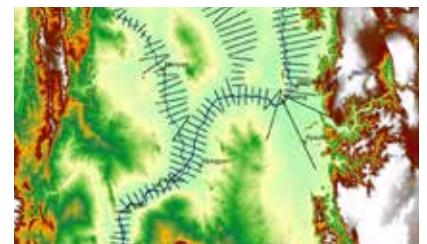
The Coastal and Ocean Basin (COB) is a large water-filled pool (dimensions +/- 30m x 30m x 1.5m in depth) where waves, currents and wind conditions are generated under controlled conditions. Realistic scale models are placed inside the COB to examine their behaviour under these conditions. These may be scale models of large offshore constructions, coastal protection constructions, floating wind turbines, wave energy converters, et cetera. The COB will be modifiable and provide unique possibilities to generate waves and currents. This kind of infrastructure is an important tool for the scientific partners (Ghent University, University of Leuven and Flanders Hydraulics Research) and industrial players from the marine sector alike.



NUMERICAL MODEL OF THE IRRAWADDY (MYANMAR)

The Irrawaddy River (or Ayeyarwady River) is over 2,000 kilometres long, with a drainage basin of around 400,000 km². This makes it the largest river in Myanmar. The Irrawaddy River is of great cultural, economic and ecological interest to the country and is intensively used for transport. During the dry season, the low drainage volumes greatly drive down the permissible draught of ships. Low dams may improve navigability and generate power, but it is important that putting such dams in place does not increase the risk of flooding, damage to cultural heritage or the loss of habitat for the rare freshwater dolphins.

With the financial support of FITA, a consortium of private consulting companies carried out various feasibility studies. Flanders Hydraulics Research built a hydrodynamic model for a 525 km





Towing tank

To ensure the accessibility of ports for increasingly larger sized ships, it is vital to arrive at an assessment of ships' manoeuvrability under such conditions. These assessments are performed on Flanders Hydraulics Research's ship manoeuvring simulators.

These simulators emulate real life conditions based on data gleaned from manoeuvring trials inside the towing tank. Towing tanks allow for the manoeuvring behaviour of ships in shallow and limited water volumes to be put to the test under controlled conditions. In addition, an increasing body of research is being conducted to benefit inland waterway transport.

The rising scale factor seen in the models of seagoing ships, and the compact dimensions of the propulsion expedients of inland navigation vessels means that very small propellers and rudders are used during the trials inside the present towing tank. The uncertainty of the results obtained using these propulsion expedients, detracts from the quality of the mathematical modelling efforts.

The new towing tank will be 174 metres in length and 20 metres in width. The tank may be filled up to a water depth of 1 metre, enough to enable manoeuvring trials with model ships of up to 8 metres in length.

stretch of the Irrawaddy River and a 175 km stretch of the Chindwin River, the largest tributary. The existing situation was calibrated to historical water level and flow rate measurements. The study also figured scenarios involving a low dam at various locations so as to chart the impact on flow rates, water levels and current velocities. Lastly, flood maps were created for the valleys.

DESIGN STUDY FOR A NEW DOCK AND CONTAINER TERMINAL AT THE PORT OF LOMÉ (TOGO)

The Autonomous Port of Lomé has built a new dock and a new wider nautical access channel to receive Ultra Large Container Ships (ULCS). Flanders Hydraulics Research (FHR) contributed to the concept design which was executed by Ghent University, executed the detailed design with real-time simulations in cooperation with the Flemish Pilotage and advised on the dimensions of the access channel at sea (width, depth and bend radius), the swinging area in the port and the dimensions of the dock (width, depth and bank slope).

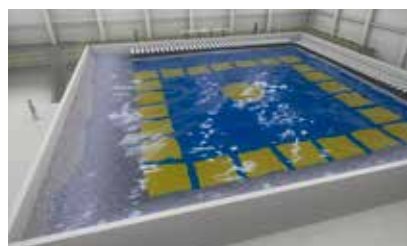
The arrivals and departures of ULCS in the design were assessed and practised on the full mission bridge manoeuvring simulators at FHR, in order to design a final lay-out

for the port, establish the requisite support by tugboats and to create optimum manoeuvring scenarios – under variable wind and current conditions.

In doing so, FHR called on the expertise and advice of Flemish pilots from the Agency for Maritime and Coastal Services. Togolese pilots travelled out to Antwerp to practise the manoeuvres on the simulators mentored by Flemish pilots, after which they took part in real-life training exercises on board of large container ships.

MARITIME RESEARCH CENTRE

The Government of Flanders has decided to develop new research infrastructure and facilities in Ostend: a basin for the study of waves (COB) and a basin for trials using scale models of ships (2nd towing tank). The plan is for the complex to be commissioned in the course of 2019. ■





A reliable and competitive infrastructure, excellent logistics and fast mobility are assets for any modern society. The experts of Mobility and Public Works take care of this. They are part of the Government of Flanders: a workforce comprising over 3,000 skilled and dynamic employees who define the policies, manage large investment projects, and provide groundbreaking technical support in a variety of areas.

www.flanders-waytogo.be



Medegefinancierd door de Europese Unie
De financieringsfaciliteit voor Europese verbindingen

The following projects are co-financed by the Connecting Europe Facility of the European Union (CEF): Albert Canal (2014-BE-TM-0054-M), New Lock Terneuzen (2014-EU-TM-0129-W), Seine-Scheldt (2014-EU-TM-0373-M), RIS (2014-BE-TM-0238-M and 2015-BE-TM-0024-W), ITS (2014-EU-TM-0597-W) and Watertruck+ (2014-BE-TM-0578-S).



FLANDERS
INVESTMENT &
TRADE

www.flandersinvestmentandtrade.com

COLOPHON

Working Group on International Cooperation

Government of Flanders - Mobility and Public Works Policy Area

Responsible publisher

Civ. Eng. Filip Boelaert,
Secretary-General of the
Department of Mobility and Public
Works
Koning Albert II-laan 20, Post Box 2,
1000 Brussels

Photos

Coverphoto ©ID/photo agency
p. 4-5 ©Peter Knoop
p. 11 ©Dirk Neyts
p. 14 ©Jerroen Willems
p. 14-15 ©Cambio
p. 33 ©CAF
p. 46-47 ©Gemeentelijk Havenbedrijf
Antwerpen
p. 50-51 ©Marco Mertens
p. 56-57 ©Wim Robberechts & Co
p. 17B, 23A, 26-27, 34B, 36-37, 60-61
©Karel Duerinckx

Other images from Agency for
Maritime and Coastal Services,
Agency for Roads and Traffic, De
Vlaamse Waterweg nv, Flemish
Transport Company De Lijn,
Department of Mobility and Public
Works

Layout & printing/realisation

RCA, www.rca.be

Registration number

D/2017/3241/193

Edition December 2017

Unless otherwise specified, the
figures in this brochure date from
June 2017.



VISIT FLANDERS



WWW.FLANDERS.BE