The Sigma Plan

How do you want to live along the river Scheldt?

Sigmaplan

INTRODUCTION

For centuries, the river Scheldt and its tributaries have contributed to making the Belgian region of Flanders a good place to live. Our region has plenty of industry, which we owe to the Scheldt. But there is also a downside. At times, (bad) flooding can cause a lot of misery in Flanders. The Sigma Plan aims to change this. By creating more space for the tidal rivers, the Sigma Plan helps everyone keep their feet dry.

At the same time, the plan also creates stunning nature areas that are always a pleasure to behold. In this brochure, you will find out what the Sigma Plan has in store!

BERGENMEERSEN

THE LITTLE BITTERN

MASTHEAD

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WATER SAFETY

NATURE

DISCOVER

ZENNEGAT

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1
The origin of the Sigma Plan

Take an exceptionally strong northwesterly storm and add a spectacular spring tide to the mix. The water will rise to unprecedented levels, creating a downright dangerous situation. This is what happened in 1953 and 1976, culminating in terrible floods. To prevent such disasters from happening in the future, the government launched the Sigma Plan in 1977.

Storm on the Western Scheldt.

1953: a calamity in the Netherlands

The storm surge of 1953 is a grim chapter in the history of the Low Countries. The Dutch Delta region was hardest hit, with 1,836 deadly casualties as a result of flooding. In Flanders, 18 people died. The Dutch government devised the Delta Plan, a programme of construction projects that included raising and reinforcing levees as well as building dams and flood barriers to protect the Netherlands against the rising water.

The Dutch flood barriers are currently able to withstand water levels that only occur once in 10,000 years. Belgium enacted the Polder Act, to assure the future maintenance of the levees. The Civil Defence was also established to offer fast and targeted assistance in case of flooding.

1976: Flanders flooded again

In 1976, another merciless storm tide struck the Scheldt again. In addition to two fatalities, the material damage in the Scheldt basis was substantial. In Antwerp, the water levels surged to close to 8 metres, or 3.5 metres above the average high water level. The polders to the north of Antwerp and the Land of Waas region were also affected by the rising water. In Oorderen, the turbulent water broke through the Scheldt Levee, creating a 12 metre wide breach. Lillo and Hingene suffered the same fate. Three quarters of the municipality of Zandvliet was under water. In Ruisbroek, along the Rupel River, the Vliet Levee burst, completely flooding the village and leaving the inhabitants with no option than to flee to their roofs. The disastrous flood of 1976 accelerated matters.

The government understood that it had to provide better flood protection. And so it launched the Sigma Plan, an ambitious and large-scale project to guarantee people's safety.

Three measures

The original Sigma Plan was devised in 1977 and comprised three measures: 1) stronger and higher levees, 2) flood control areas to absorb excess water, and 3) a storm surge barrier in Oosterweel. The plan was Belgium's answer to the threat of future storm tides and excessive precipitation in the higher areas. Today, the levee construction projects and flood control areas of the first plan have been completed. No storm surge barrier was built because the cost outweighed the benefits. A chain of flood control areas, however, is a more secure option.

At the time, the government's vision on water management was already considered quite progressive. While the neighbouring countries focused on raising levees and building flood barriers, Flanders opted for a more natural approach to water management, creating more space for the river.

Development Outline 2010

The Sigma Plan is part of the Scheldt Estuary Development Outline 2010. This combined package of measures and projects in Flanders will create a safer, more accessible, and natural Scheldt River. The Development Outline mainly strives for a sustainable and balanced development of the river, with attention to all its functions.

www.vnsc.eu

The flooded town of Ruisbroek (1976).

Hikers and birdwatchers really appreciate the boardwalk in Bergenmeersen.

The blue-headed wagtail. Nature development is one of the four cornerstones of the Sigma Plan.

2
The Sigma Plan today

The Sigma Plan originally started out as a water management plan. Since then, it has come to encompass much more. The objective was to create a safe Scheldt region, with attention to nature while also developing assets for leisure and economy.

Update needed

Scientific insights have evolved. We now know that sea levels will rise even more because of climate change, thereby increasing the likelihood of a storm tide. Flanders, one of the three Belgian regions, will also experience more frequent and extreme weather conditions. In addition to this, more and more people moved to natural valleys, building houses in places that are vulnerable to flooding. That is why the floods take their toll. The measures of the original Sigma Plan therefore are not sufficient to guarantee our safety.

Our views on water management have also evolved over time. We now know that a river needs space to flow and overflow. And that rivers don't take well to being realigned or contained by levees. We also know that safety and nature development are inextricably linked. Since 2005, the Government of Flanders has perfected the Sigma Plan, by taking all these insights into account.

A multi-faceted river

The updated Sigma Plan aims to create a sustainable and robust Scheldt. Under this plan, all the river's functions can be harmoniously developed, now and in the future. These functions are founded on four cornerstones, namely safety, nature, leisure, and economy. Protecting against flooding is the first priority of the Sigma Plan. At the same time, the Government of Flanders will restore and further develop nature along the river banks. This is vital to meet the conservation objectives of Natura 2000 sites imposed by Europe. The Sigma Plan also improves the potential for recreation on and along the river Scheldt and its tributaries. It also focuses on the economic functions of the Scheldt Region, including shipping and agriculture. A flanking agricultural policy helps and compensates farmers who are adversely affected by the interventions of the Sigma Plan.

In brief, the updated Sigma Plan is designed to create a Scheldt with multiple functions. Open space is scarce in Flanders. So we need to use it parsimoniously and in various ways.

Proven use

During the many severe storms of recent years, the first Sigma Plan areas have already amply proven their use. Works are ongoing in several other regions and new flood control areas will be completed in the short term. The Sigma Plan should be completed by 2030. We launch new projects every five years.

Wetlands in the Kalkense Meersen Cluster.

Who?

The Sigma Plan is a project of the Government of Flanders. Waterway manager De Vlaamse Waterweg nv coordinates the Sigma Plan and is tasked with water management. De Vlaamse Waterweg nv works with the Agentschap voor Natuur en Bos (Agency for Nature and Forest) to achieve the conservation objectives. We also have joined forces with local governments, farmers' organisations, nature associations, the local population, hunters, anglers, the tourism industry, the hospitality industry, and several other partners to implement the Sigma Plan.

Bergenmeersen effortlessly playing its water absorbing role during the December storm of 2013.

The overflow levee in Paardeweide (Kalkense Meersen Cluster) doing its job.

3
Good protection against flooding

Tidal rivers such as the river Scheldt are not without risk. Extra high water levels may result in flooding, during a storm tide or when there is a lot of precipitation. The Sigma Plan is based on a smart concept to increase safety.

The Sigma Plan protects Flanders against flooding. It does this by:

- raising and reinforcing the river levees;
- giving the river more space in flood control areas;
- reducing the pressure in extreme situations by giving back certain areas to the river. This is called depoldering.

Sturdy levees

The Sigma Plan comprises about 645 kilometres of levee projects. How did we decide where to build these levees? We mapped the entire basin of the Scheldt and its tributaries. Experts calculated the water pressure on the levees. We simulated storm tides with computer models. That is how we calculated the required thickness and height of the Scheldt levees. We raise the levees to 8 metres TAW* in those areas that are more upstream along the River Scheldt. The tides are stronger in the section between Antwerp and the Western Scheldt. There the levee height has been raised to 11 metres TAW.

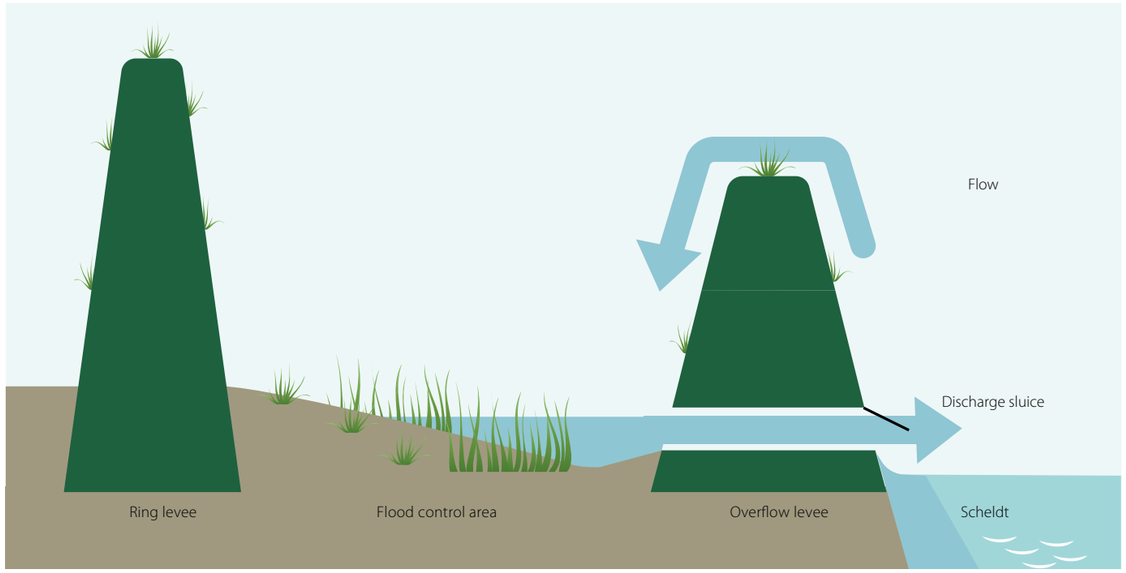
Robust water collection

When a powerful tidal wave rolls up the Scheldt, the river must be able to absorb a huge amount of water in a very short time. That is why we have developed flood control areas. These are low-lying areas of land along the river, which we encircle with a high (ring) levee. The water enters the flood plain via a lowered overflow levee. It can only flow back to the river once the water level has sufficiently decreased there. There is less pressure on the levees because a quantity of water enters the flood control area and is stopped by the ring levee. This also significantly reduces the chances of breaches in the levees.

Relieving the pressure

The polder is literally given back to the river with the process of depoldering. How do we do this? We build a new levee further inland. Then we create breaches in the old levee, allowing the tides to flow in and out of the area. Tidal nature, with mudflats and marshes, develops in the depoldered area (see page 11). At the same time, the water's pressure on the levees is relieved, reducing the likelihood of floods inland.

** Tweede Algemene Waterpassing (TAW): the reference height for measuring water levels in Belgium. A TAW height of 0 metres equals the average sea level at low tide in Ostend.*



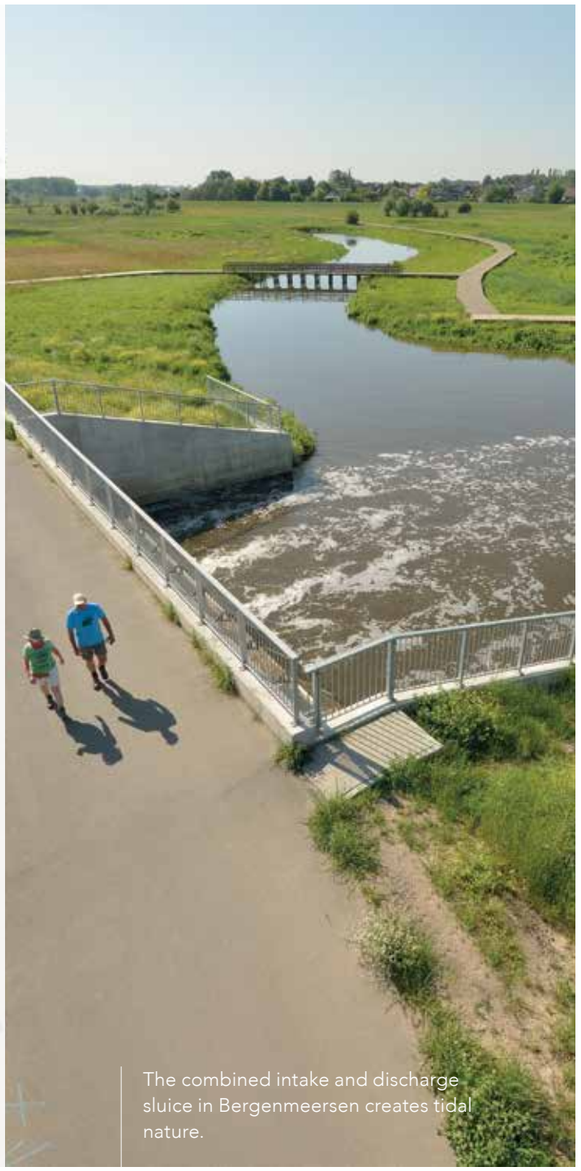
How does a flood control area work?

We build a high ring levee inland, along the river. This protects the residential areas behind it. We lower and reinforce the existing river levee, transforming it into an overflow levee. The water can then flow over this overflow levee in case of high water levels on the river.

This creates a flood control area, that can absorb large amounts of water, along the river. The river's water level is reduced, which in turn relieves the pressure on the levees. The tidal wave loses a lot of its power. And the risk of floods or breaches is also much reduced. As soon as the water level in the river has sufficiently reduced, the water in the flood control area is drained through discharge sluices.

A flood control area floods when a storm tide occurs in combination with an extreme northwesterly storm. The rest of the time the area has another function. Farmers let their livestock graze in some flood control areas. Valuable nature develops in others.

Do you want to see how a flood control area works? Then view the animated clip at www.sigmaplan.be.



The combined intake and discharge sluice in Bergenmeersen creates tidal nature.

4
Nature that is both beneficial and breathtaking

The Sigma Plan helps develop vital nature areas, and achieve the European conservation objectives. In many areas, the tides are given free rein again. But the typical river landscapes, with wet nature that is not influenced by the tides, are also given plenty of opportunities for development.

Natura 2000

Over the years, a lot of valuable nature was lost on the banks of the Scheldt and its tributaries. Europe established directives to ensure the survival of typical European flora and fauna, namely the Birds Directive and the Habitats Directive. All the Member States must designate special protection zones. Together these areas form a network of protected areas, called Natura 2000. Europe has also formulated conservation objectives for the entire Scheldt region, both for species and habitats. In the Sigma Plan project areas, we will take measures to give these special habitats and species every opportunity to develop. Large sections of the Scheldt, its tributaries, and the valley are now areas where the Habitats and Birds Directives apply.

From saltwater to freshwater

Tidal nature is created when water flows in and out of an area twice a day. Under the influence of ebb and flow, the unique transition from freshwater to saltwater comes into play, giving rise to an interaction between water, sand, and silt. Here, the river carves out a network of mud flats and shoals, marshes, channels, and brooks. Each of these biotopes has its own inhabitants. The water downstream from Antwerp and in the Netherlands is largely saltwater. Upstream, there is a 60 kilometre long freshwater tidal area along the Scheldt. The nature that develops here is unique in Europe.

Tidal nature develops in a flood control area with reduced tides (see insert page 12) or in a depoldered area.

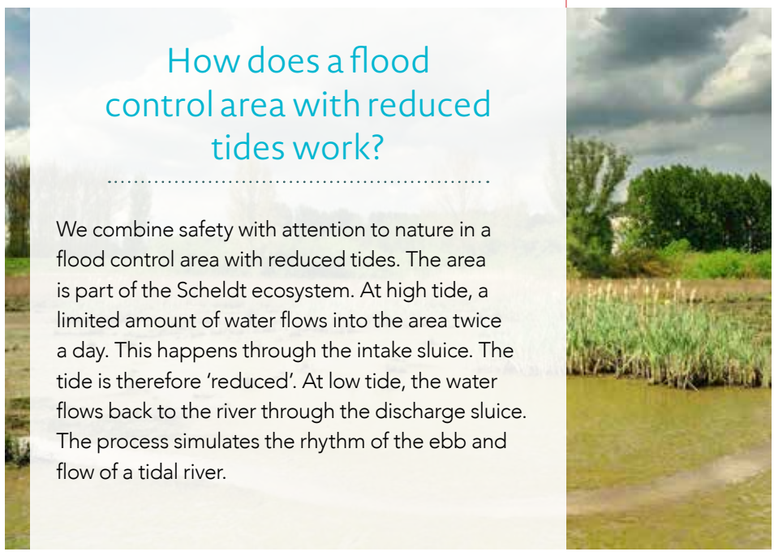
The development of freshwater tidal nature in Bergenmeersen.

Mud flats and marshes, the showpieces of Scheldt nature

Mud flats are the lower-lying sections of the bank that always flood when the tide comes in. They are teeming with small creatures such as worms, crabs, and lobsters. Water birds and fish love them. The mud flats are very popular with geese, ducks, and waders, who enjoy resting and foraging for food there.

When the water retreats after each tide, a layer of silt is deposited in the mud flats. These mud flats start to accumulate at certain places. When they protrude above the average water level, they are called marshes. Low marshes flood a few times a month. High marshes only flood at spring tide, about twice a month. Here, you will find vegetation that thrives in saltwater, including marsh samphire and sea lavender. The brackish marshes, with a mixture of salt and freshwater, are populated with reeds and sea aster. Freshwater marshes develop further upstream, creating a variable landscape with brushwood, reed beds, and tidal willow forests. In early spring, marsh marigolds flower in these tidal forests. Reed birds and marsh birds love to shelter and breed here. The willow forests along the Scheldt resemble tropical mangroves. They are dense, impenetrable forests in the water.

The fish stocks in Lippenbroek are recovering very quickly.



How does a flood control area with reduced tides work?

We combine safety with attention to nature in a flood control area with reduced tides. The area is part of the Scheldt ecosystem. At high tide, a limited amount of water flows into the area twice a day. This happens through the intake sluice. The tide is therefore 'reduced'. At low tide, the water flows back to the river through the discharge sluice. The process simulates the rhythm of the ebb and flow of a tidal river.

Wetlands

Valuable nature can also develop in areas without the influence of the tides. Rare flora and fauna can thrive in these swampy wetlands. In winter, the groundwater is high, whereas the level drops in summer. Wetlands are also extremely diverse, from open water to reed beds which turn into alder alluvial forests. These forests are a very rare type of nature. The roots of these trees are submerged for much of the year. Birds love to shelter and breed there.

Flowery hay meadows and grasslands develop where cows graze and people mow the grass. Meadow birds especially feel at home in these expansive pastures. Fish, amphibians, and dragonflies inhabit the ditches, brooks, and pools.

The black-tailed godwit is a meadow bird that will really enjoy life in the wetlands of the Kalkense Meersen.

Flowery meadows in the Durme Valley.

Nature does a lot of good

Mud flats and marshes are very beneficial for humans. They form a natural buffer, protecting us against flooding. They collect sand and sludge, reducing the need for dredging. They purify the water and restore the balance of the natural food chain. Wetlands are also beneficial. They are like a large sponge, retaining rainwater for a longer period of time. They act like a natural water buffer. Scheldt nature is not just a delightful habitat for many different bird species. It is also a great place for us all to walk, bike, and enjoy the beauty of nature.

5

Enjoying the water

We are building new cycling and hiking trails along the Scheldt. As well as bird observation huts, boardwalks, forests where children can play, and bodies of water for water sports and fishing. Because life on and along the river is beautiful.

People of all ages can enjoy nature in the completed Polders of Kruibeke.

The majestic landscape of the Scheldt and its tributaries is a source of relaxation for many people. The river valleys and the many towpaths along the water are a great place to unwind. You can do this in several ways, by hiking, cycling, fishing, longboarding ... Thousands of Belgians have already experienced this first-hand.

Polders of Kruibeke

This vast area is a hotspot for nature and recreation. Cyclists, joggers, and hikers discover the typical Scheldt nature in their own way.

Original nature artworks and information boards make the tour even more special. A wooden giant called the Cosmogolem welcomes you at Scheldelei, one of the gateways to the area. You will find time capsules that highlight the past, present, and future of the landscape along the hiking and bike trails, and the towpath on the Scheldt levee. The concrete columns, bridges, stairs, bird observation huts, and rest areas designed by the famous Belgian designer Stefan Schöning give you a taste of what this lovely area has to offer. Check out the many frogs in the newly-built amphibian pool in Kortbroek.

The learning path in Wijmeers (Kalkense Meersen Cluster) informs visitors about the Sigma Plan.

Since 2016, The Voyager by Will Beckers graces the new public square in Aard (Kalkense Meersen Cluster).

We were assisted by associations, the local hospitality industry, fishermen, and the locals when we redeveloped the Polders of Kruibeke. They all were given the opportunity to share their ideas. Until September 2018, the LIFE+ Scalluvia project will also be implemented here, with European support. Thanks to this project, 90 hectares of alluvial forest and creeks will be developed in the most ideal manner. Scalluvia moreover increases social support for the Polders of Kruibeke in several ways, including guided walks and art projects.

Kalkense Meersen Cluster

The Kalkense Meersen Cluster in East Flanders is very popular with hikers and cyclists alike. Here, you will find an ecological artwork of woven wicker, Galloway cows, and birds such as the black-tailed godwit and the great bittern. The ideal place to start when exploring all this loveliness is the renovated public square in Aard, a hamlet in the municipality of Wichelen. The public square has transformed into a pretty junction, with several opportunities for experiencing the Scheldt.

The Scheldt is never far away here. A ferry will take you to the other side in no time at all. The new towpath on the right Scheldt bank assures an efficient and safe connection between Wetteren and Wichelen. Boats can now moor here thanks to the new bollards.

6

The Scheldt, life vein for the economy

The Sigma Plan takes into account the Scheldt's economic role as one of the busiest rivers in Europe that is vital for Belgium. New forms of activity also develop around the Scheldt.

The charming café Zennegat 13 is located right at Zennegat (Dyle Estuary).

Shipping and ports

The Scheldt plays an important economic role. Every year, tons of goods are transported along this major shipping route, to and from the ports of Antwerp, Zeeland, Terneuzen, Ghent, and even Brussels. The Scheldt connects Flanders and the Netherlands with France via the Lys and the Upper-Seascheldt. Ships can sail eastwards up the Albert Canal, to the Meuse basin and further, via Antwerp. Several companies are located in the port and on the river banks of the Scheldt. They employ tens of thousands of people and are crucial for Flanders' economy. The Scheldt is part of the TEN-T, the Trans-European Transport Network, which constitutes Europe's economic artery. So it is easy to see why access to the Scheldt is such an important aspect of the Sigma Plan. The Port of Antwerp emphasises the importance of the Scheldt for our economy.

The Port of Antwerp emphasises the importance of the Scheldt for our economy.

Reviving the local economy

Terraces and restaurants along the towpath, rental companies for bikes and boats, etc. The hospitality industry and service companies throughout the Scheldt Valley also benefit from the assets of the Flemish tidal rivers. Local associations and town councils help develop a wide range of leisure facilities. Farmers also contribute to tourist projects, with a farm shop that sells regional artisan products, guided farm visits, a bed and breakfast, and more.

7

An eye for agriculture

The Sigma Plan takes into account the consequences for local farmers as much as possible. Agriculture is still possible in some Sigma areas. In others, the local farmers are involved in conserving the area. We search for viable solutions for every area, in consultation with the local farmers and farmers' organisations.

Consequences for agriculture

We preserve intensive farmland where possible. We mapped these lands together with the Flemish Land Agency (VLM). We took their existence into account when defining the Sigma areas. Some project areas can still be used as farmland.

Together with the VLM, we also analysed the effects of the Sigma Plan on farms and discussed farmers' expectations. We collated this information in an agricultural impact study. This gives rise to measures for compensating farmers.

Mitigating measures

We devised measures to mitigate the consequences for the affected farmers. They are very diverse. Sigma works can for example be staggered in time. This also gives farmers more time to convert their farms. Or we help farmers move their farm or take part in land exchange projects, through the Flemish Land Bank. We also pay compensation to offset the loss of revenue.

Farmers lending a helping hand

Local farmers help with the conversion of the areas in various Sigma Projects. The wetlands of the Polders of Kruibeke and the Kalkense Meersen along the Scheldt, and in Weymeerbroek and Bulbierbroek along the river Durme, are examples of such successful partnerships. The farmers sign a conversion contract. In exchange for compensation, they conserve the land according to strict rules. A five-year conversion contract gives them the time to reorganise their farm or find alternatives for the land they lost. The land becomes wetland only after five years. Farmers can then use the land for free, under certain conditions. Farmers mow or graze the land in exchange.

8
The projects

Hedwige
Prosper Project
Doel Polder
North and Center
Lillo Polder
Netherlands
E19
E34
Scheldt
Antwerp
Burchtse Weel
Scheldt quays
Nete and Kleine Nete
Polders of
Kruibeke
Nete Canal
Kleine Nete
Herentals
E313
Albert Canal
Schouselbroek
Temse
Lier
Durme Valley
Lokeren
Durme
Lippenbroek
Bornem Cluster
Bornem
Rupel
E19
Nete
Westerlo
Grote Nete
Scheldt Meander
Ghent
Ghent Wetteren
E17
Vlassenbroek
Wal-Zwijn
Dyle Estuary
Grote Nete Valley
Kalkense Meersen Cluster
Scheldebroek
Mechelen
A12
Ham
Dendermonde
Wetteren
Bastenakkers
Scheldt
Dyle
Upper Dyle
Demer
Demer Valley
Aarschot
Diest
Dender
Dorent
Zenne
Brussels–Scheldt
Maritime Canal
Vilvoorde
Louvain-Dyle
Canal
E314

Start-up year of the Sigma areas

- before 2005
- 2010
- 2015
- 2020
- 2025
- 2030

The Sigma Plan should be completed by 2030. We launch new projects every five years. We are already implementing a first series of projects, others are being prepared step by step in the meantime. On the following pages, you will get a better idea of what will happen in the various areas.

Go to www.sigmaplan.be for the latest state of affairs.

The Scheldt quays in Antwerp

We give the Scheldt quays a radical facelift, over a length of 7 kilometres, together with Antwerp's town council. This is necessary because the quay wall is in bad condition and the quays flood when there is a storm tide. The condition of the quay wall is not the same along the entire length of the quays though. That is why it has been subdivided into seven zones. A specific stabilisation technique is applied in every zone, depending on the condition of the quay wall. Besides stabilising the historic quay wall, another important element of this project is the adaptation of the flood barrier. Finally, the city will transform the quays into a fun spot by the water, as the cherry on the cake.

Surface area: 7 kilometres
Territory: Antwerp (from Rijnkaai to D'Herbouvillekaai)
Phase: in progress

Bornem Cluster

D'Ursel Castle, Groenendijk restaurant, the 'wielen' (deep water sheets), the sanctuary ... In the Bornem Cluster, history and nature are intertwined along the Scheldt. In this 200 hectare green oasis, we will build water buffers to tackle flooding. Oudbroek-Schellandpolder will become a safe flood control area with wetlands. Groot Schoor and Stort van het Buitenland will be depoldered, so the typical Scheldt marshes are expanded.

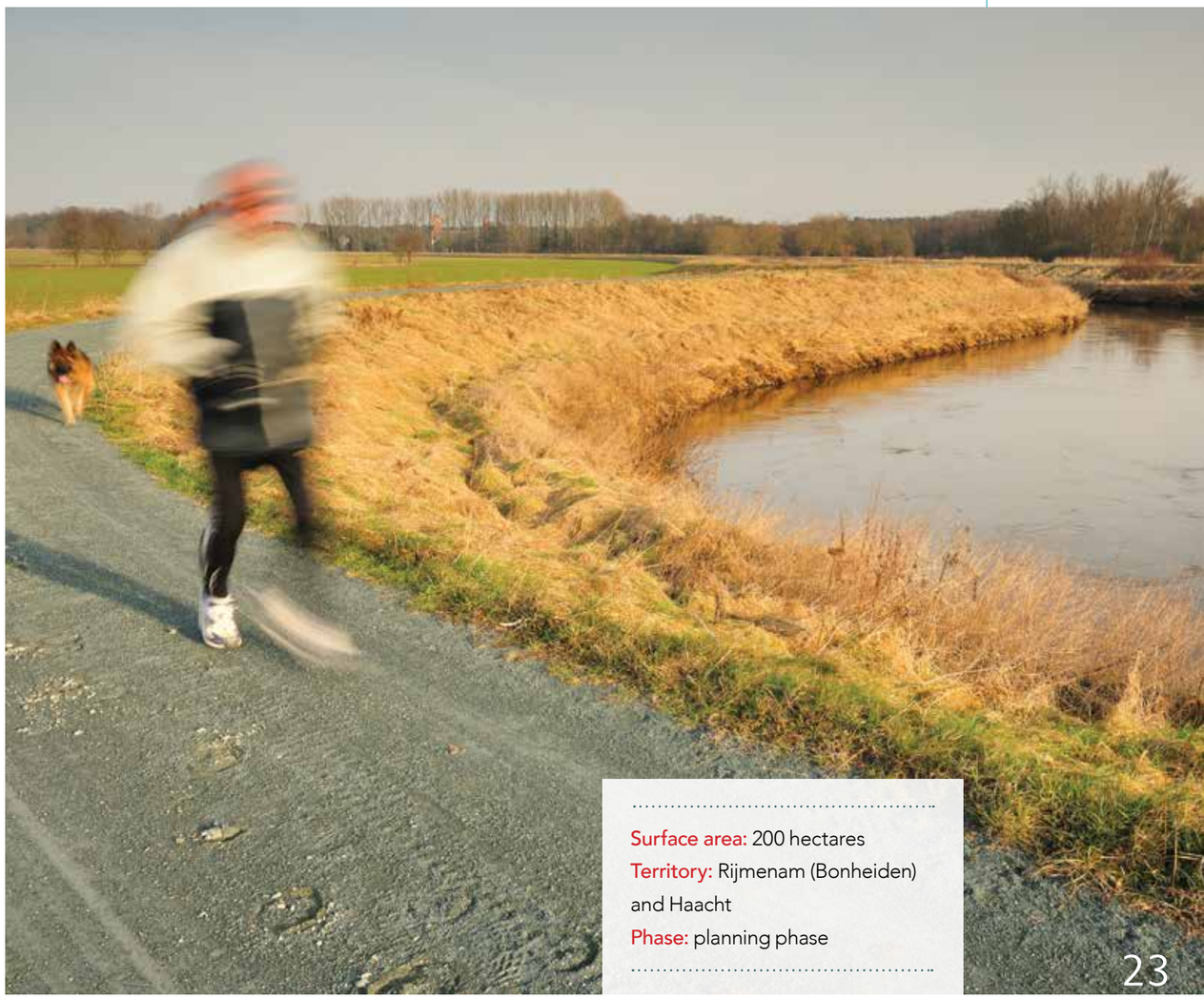
The Bornem Cluster has one of the six sanctuaries, or places in Flanders where the sound of nature has the upper hand. After the Sigma Plan works are finished, silence will be restored again.

Surface area: 216 hectares
Territory: Bornem
Phase: planning phase

Upper Dyle

A 200 hectare area in the territory of Bonheiden and Haacht will be transformed into two floodplains. The inhabitants of the wider region will have to worry less about wet feet in the future. The nature in the alluvial meadows will also be given a boost. The showpiece of this project is Pikhaken wetlands, where we will restore the habitat of the rare great crested newt and the corncrake.

The Sigma Plan improves the popular towpath along the Dyle, building new ones on the levees along the flood control areas. The trails seamlessly connect with the existing cycling and hiking networks in the region.



Surface area: 200 hectares
Territory: Rijmenam (Bonheiden) and Haacht
Phase: planning phase

Kalkense Meersen Cluster

The Scheldt is given more space in a wide area around the Kalkense Meersen Cluster, between Ghent and Dendermonde. As a result, the region around Berlare, Laarne, Wetteren, and Wichelen is better protected when a storm tide raises the water levels. Bergenmeersen, Wijmeers, Paardeweide, Paardebroek, and Kalkense Meersen: these stunning natural gems form the Kalkense Meersen Cluster.

A special sluice lets a limited amount of Scheldt water in and out of the area, to the rhythm of the tides, in Bergenmeersen. As a result, rare nature develops here, with freshwater mud flats, freshwater marshes, and tidal willow forests.

The ferry between Aard and Schellebelle.

Surface area: 950 hectares
Territory: Wichelen, Berlare, Laarne, and Wetteren
Phase: in progress

Surface area: about 2,500 hectares along the Demer (different phases)
Territory: Diest, Aarschot, Scherpenheuvel-Zichem, Begijnendijk, and Werchter (Rotselaar)
Phase: planning phase

Demer Valley

The Demer Valley between Diest and Werchter will be completely redeveloped to better protect the valley against flooding and tackle the problem of drought in summertime. This is vital for restoring the valuable Demer nature. Barriers in the river will increase the groundwater level. In some places, we will restore the winter riverbed and build safety levees. We will also restore a number of natural bends (meanders) in the river. The river's natural flexibility and buffer capacity will be restored again as a result. A resilient river can handle larger amounts of water, and offers opportunities for more, and better, nature.

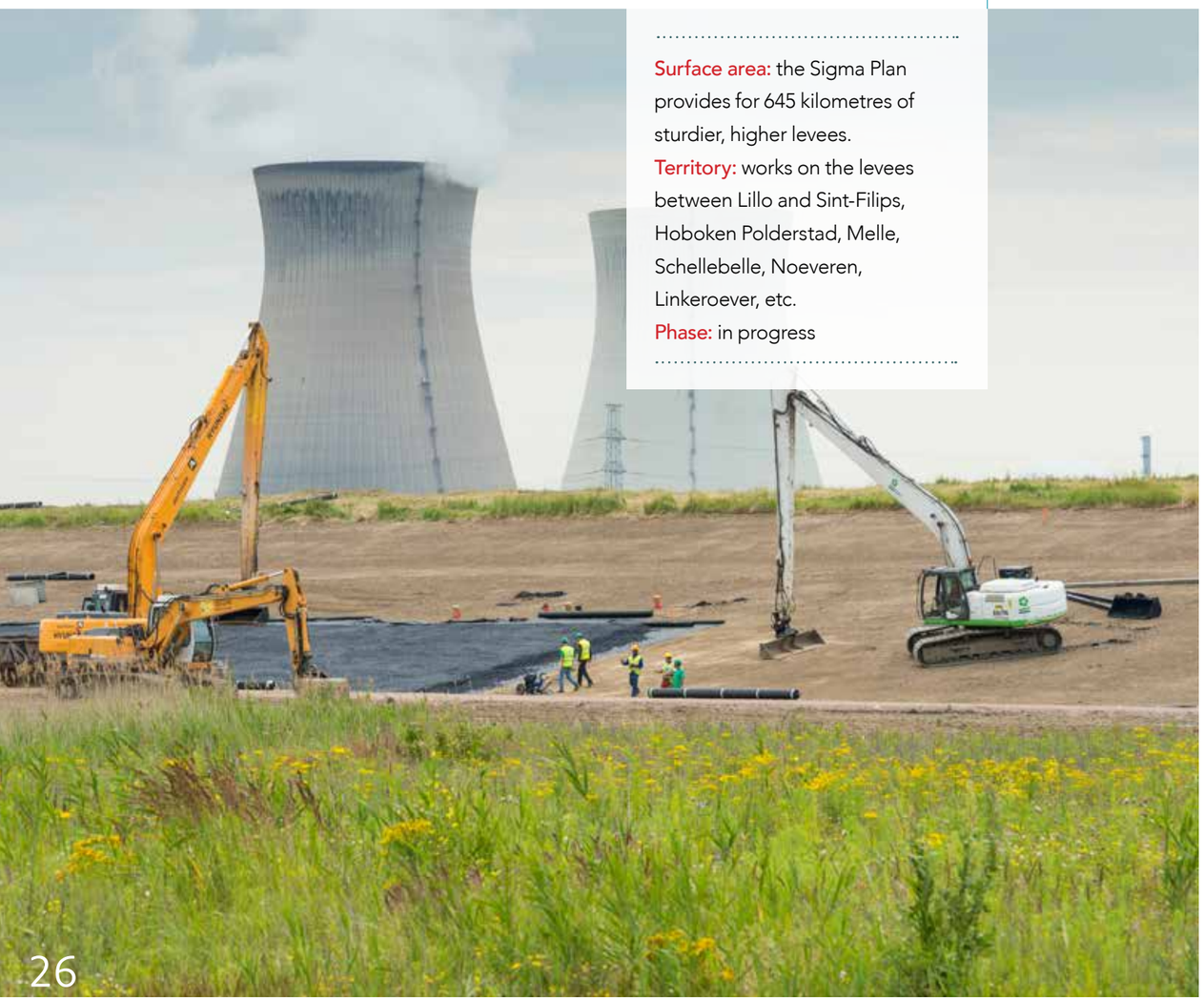
The region already has several facilities for leisure, heritage, and regional development. And these will only increase thanks to the interventions of the Sigma Plan. Kayakers, horse riders, and cyclists will be better served.

Building and maintaining levees

Where necessary for safety, we raise and reinforce the river levees. Levees have two advantages. Sand bags are officially a thing of the past for anyone living or working near the Scheldt. And the towpaths are a lovely place to walk or bike.

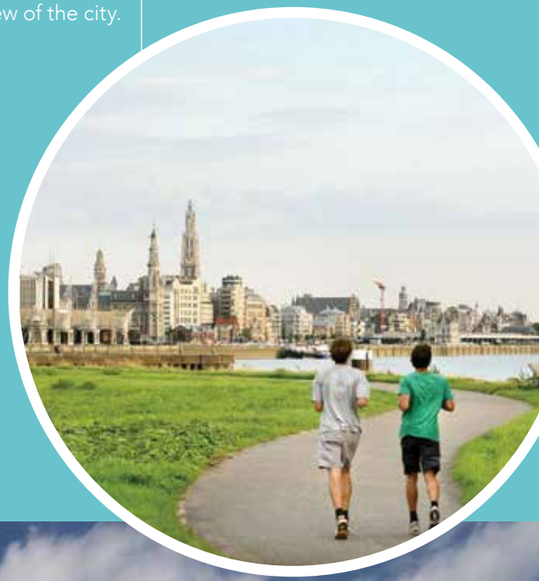
Besides flood control areas, the Sigma Plan also builds levees for securing the region, as is the case here in Prosper Polder (Hedwige Prosper Project and Doel Polder).

Surface area: the Sigma Plan provides for 645 kilometres of sturdier, higher levees.
Territory: works on the levees between Lillo and Sint-Filips, Hoboken Polderstad, Melle, Schellebelle, Noeveren, Linkeroever, etc.
Phase: in progress



We will also reduce the risk of flooding on Linkeroever (the left bank of the Scheldt) by raising and reinforcing the levees. Together with the City of Antwerp, we are planning lovely, green levees and strategic observation points with a view of the city.

In Schellebelle we built a glass water barrier. We also raised the levees on both banks between Wetteren and Schellebelle. We rebuilt the safe bike link on the levees, and added an accessible ferry and boating jetty, and bollards for commercial shippers.



Dyle Estuary

The inhabitants of the watery country around Mechelen and Willebroek can sleep easy again. Four flood control areas (Zennegat, Grote Vijver North and South, and Tien Vierendelen) guarantee that everything is safe here. They also contribute to the development of valuable nature. Channels, marshes, and mud flats are the perfect habitat for rare flora and fauna. You can easily connect to the various bike junctions thanks to the new, moveable bike bridges. And the water ski club now has new, floating docks and a stylish club house.

The Grote Vijver South area, which will continue to provide water leisure facilities as well as having a protective function. The water ski club of Mechelen, the largest club of its kind in Flanders with 800 members, is fully enjoying its brand new club house, which opened in the summer of 2015.

Surface area: 207 hectares
Territory: Mechelen and Heindonk (Willebroek)
Phase: in progress

Dorent

The Flemish Agency for Nature and Forest is developing a new section of wetland nature in the Zenne Valley in Vilvoorde, and Zemst. The Sigma Project Dorent will transform 90 hectares into a patchwork of wet hay meadows, and pastures, hedgerows, reed beds, and ponds. If you enjoy hiking, biking or horseback riding, then you are more than welcome to explore the new Dorent when it is finished.

Unpaved hiking paths criss-cross through the area and along the levees of the Old Zenne. The signposted route from Dorent to Nelebroek starts in Daalweg in Zemst.

Surface area: 90 hectares
Territory: Vilvoorde and Zemst
Phase: planning phase

Durme Valley

Long ago, the Durme was a long river, with its source in West Flanders, which merged with the Scheldt near Hamme. Over time, the course of the Durme has been changed. The typical flora and fauna also changed. The river is now being given more space by transforming 205 hectares – from Hamme to Temse, Waasmunster, Zele, and Lokeren. Various interventions will be needed. Dredging will allow the river to flow more freely again. We are also studying how we can use the dredged material through the European financed USAR (Using Sediment As a Resource) project.

Three of seven project zones in the Durme Valley will be depoldered and exposed to the tides again. The other four project zones will be developed as wetland with hay meadows, swamps, and reed belts.

Interreg
2 Seas Mers Zeeën
USAR
European Regional Development Fund

Silting and flooding as a result of heavy rainfall is prevented by the new pumping station (2016). An integrated fish ladder allows fish to migrate in both directions, between the Moervaart and the Durme.

Surface area: 205 hectares
Territory: Hamme, Temse, Waasmunster, Zele, and Lokeren
Phase: in progress

Surface area: 465 hectares (170 hectares Prosper Polder, 295 hectares Hedwige Polder) and 300 hectares (Doel Polder)
Territory: Beveren and Hulst (the Netherlands)
Phase: in progress

Hedwige Prosper Project and Doel Polder

The Scheldt will be given free rein in Hedwige Prosper Project and Doel Polder. The Hedwige and Prosper Polders, on both sides of the border between Belgium and the Netherlands, will be depoldered and given back to the Scheldt. A new submerged land will be developed next to the Verdronken Land van Saeftinghe. Over time, an erratic pattern of marshes, shoals, and mud flats will develop here. Doel Polder Center will transform into a system of channels and creeks, and a high mud flat will develop in Doel Polder North, which is currently a habitat for meadow birds. The depoldering also increases safety, reducing the pressure in case of a storm tide. The tide will become less powerful, wreaking less havoc upstream.

In the future, the Hedwige Prosper Project and Doel Polder will become part of the Grenspark Groot-Saeftinghe, the largest tidal area in Western Europe, covering a surface area of 4,500 hectares.

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Lippenbroek

In the past, Lippenbroek in Hamme – covering a surface area of 10 hectares – used to be a maize field. Now it is used as a testing ground for the Sigma Plan. Lippenbroek is a world first. Here, scientists are investigating the effect of flooding during storms. They are also examining the development of tidal nature. These data provide a lot of useful information for other Sigma Projects. Flanders Hydraulics Research, the Research Institute for Nature and Forest, the University of Antwerp, and the University of Ghent are studying, advising, and where necessary, adapting the operation of the sluices. We thus refine the mathematical models for simulating and studying the behaviour of flood control areas.

The intake and discharge sluices in Lippenbroek are the prototype for other Sigma Projects. The daily ebb and flow of the tides soon helped lush nature develop here.

Surface area: 10 hectares
Territory: Hamme
Phase: completed

Nete and Kleine Nete

This Kempen Sigma Project is spread over Lier, Duffel, Nijlen, Grobbendonk, Berlaar, and Zandhoven. We have already developed flood control areas in the framework of the original Sigma Plan. Based on new insights, these flood control areas are further optimised, and levees will be locally interrupted or lowered, allowing the water to flow into the area behind it. At the same time, we are creating 265 hectares of space for plenty of unique flora and fauna.

You can spend hours biking or hiking along the Nete and Kleine Nete. Soon you will also be able to take your children to the future Pallieterland landscape park.

Surface area: 265 hectares
Territory: Lier, Duffel, Nijlen, Grobbendonk, Berlaar, and Zandhoven
Phase: planning phase

Surface area: 600 hectares
Territory: Kruibeke
Phase: completed

Polders of Kruibeke

Flanders' largest flood plain, the Polders of Kruibeke, is located in the Land of Waas. This flood control area makes Flanders five times safer. The Polders of Kruibeke have the largest water storage capacity of all Sigma Plan areas. The area will be used about twice a year, in case of extreme weather. The alluvial forests, which are teeming with marsh marigolds in spring, are a typical feature of the Polders. But the landscape is much more varied, attracting a lot of spectacular species, including the purple heron and the otter. Beavers even have made this their home since a few years.

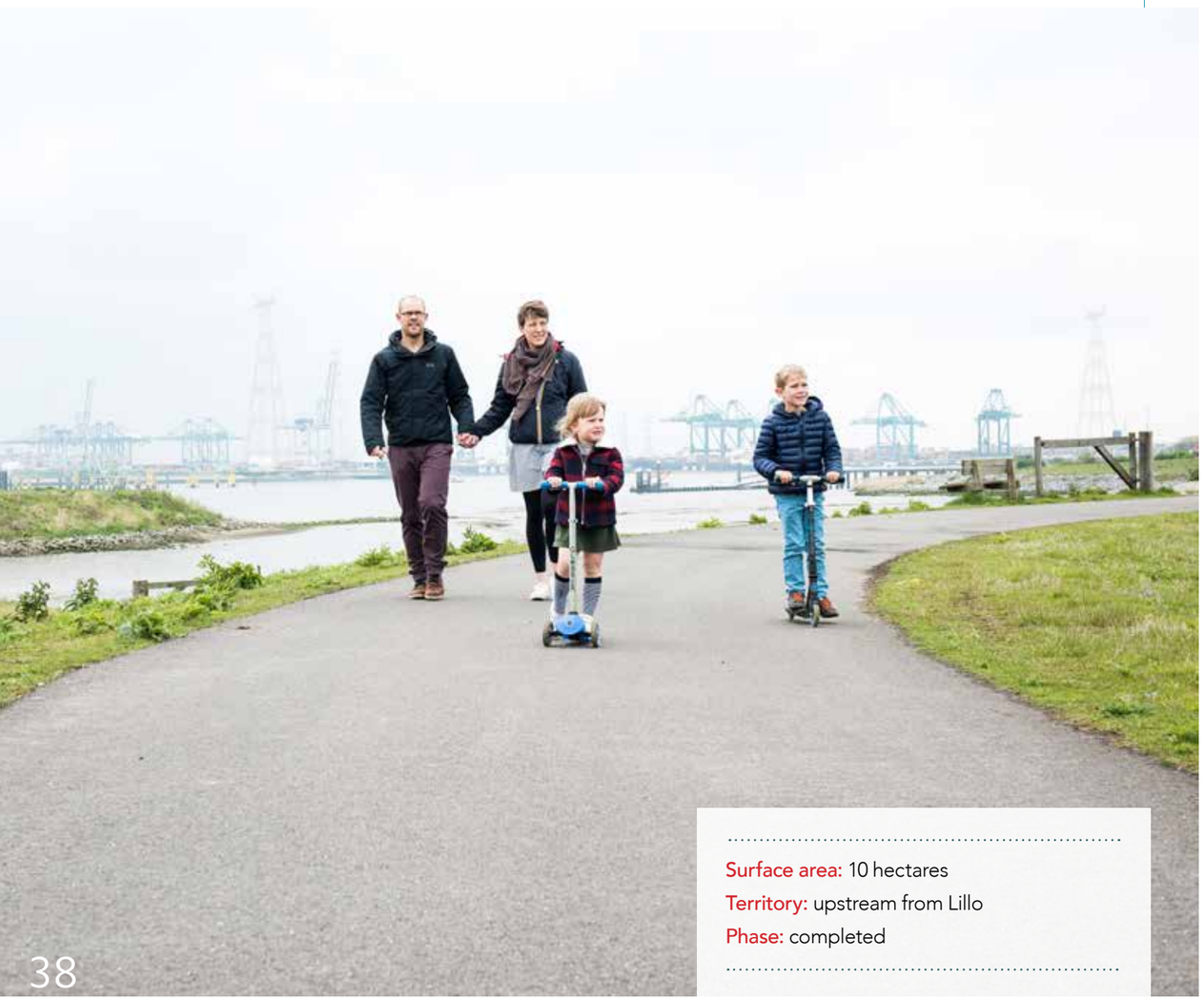
The Polders of Kruibeke are the largest and most frequented Sigma Plan area in Flanders. They are becoming a tourist attraction for leisure, with a house style that is reflected in the information columns, the bridges, stairs, bird observation huts, boardwalks, and so on.

Lillo Polder

Work was completed in the Polder in Lillo in 2012. The depoldering of this area was a first step in the process to make the Antwerp port area more secure, protecting it against floods. We built a one kilometre ring levee around the Polder. The levee is raised to the Sigma level (height of +11 metres TAW*), meaning it is sturdy and high enough to protect the land behind it against the Scheldt's waters in extreme storms.

** Tweede Algemene Waterpassing (TAW): the reference height for measuring water levels in Belgium. A TAW height of 0 metres equals the average sea level at low tide in Ostend.*

We breached the existing levee along the Scheldt, so the water can flow into the polder. The Port of Antwerp will soon be enlarged with valuable marshes and mud flats as a result. The burgeoning tidal nature area attracts a lot of breeding birds. During the breeding season, the hiking trail is closed, so as not to disturb the birds. You can get to the ring levee throughout the year though.



Surface area: 10 hectares
Territory: upstream from Lillo
Phase: completed

Scheldt Meander Ghent Wetteren

We want to make the area around the Scheldt meander between Ghent and Wetteren safer and more natural. This is vital, as the combination of storm tide and the silting of the river mean this area is prone to flooding. Without interventions, this part of the Scheldt would become land, increasing the risk of flooding even more which would cause valuable nature to disappear. The Scheldt Meander Ghent Wetteren Sigma Project must eliminate this threat altogether in the long term. The following interventions are planned: a new weir and lock in Heusden, the development of tidal nature in the sand pit in Melle and Ham, and a flood control area to absorb water in Bastenakkers with space for agriculture.

Surface area: 220 hectares
Territory: Ghent, Destelbergen, Melle, Heusden, and Wetteren
Phase: planning phase

Schouselbroek

In Schouselbroek, we are developing a vital and important landmark to protect the area against floods. But the Scheldt nature in Temse will also be able to fully develop in time. Besides the depoldered areas of Groot Broek and Klein Broek, which will give the Durme plenty of space to develop, the flood control area with reduced tides in Schouselbroek also helps. You will be able to admire the typical Scheldt mud flats and marshes from the levee.

This area will buffer water in case of storm tide, together with the existing Tielrodebroek flood control area.

Surface area: 100 hectares
Territory: Temse
Phase: planning phase

Surface area: 850 hectares
Territory: Nijlen, Herenthout, Heist-op-den-Berg, Hulshout, Herselt, Westerlo, Laakdal, and Geel
Phase: planning phase

Grote Nete Valley

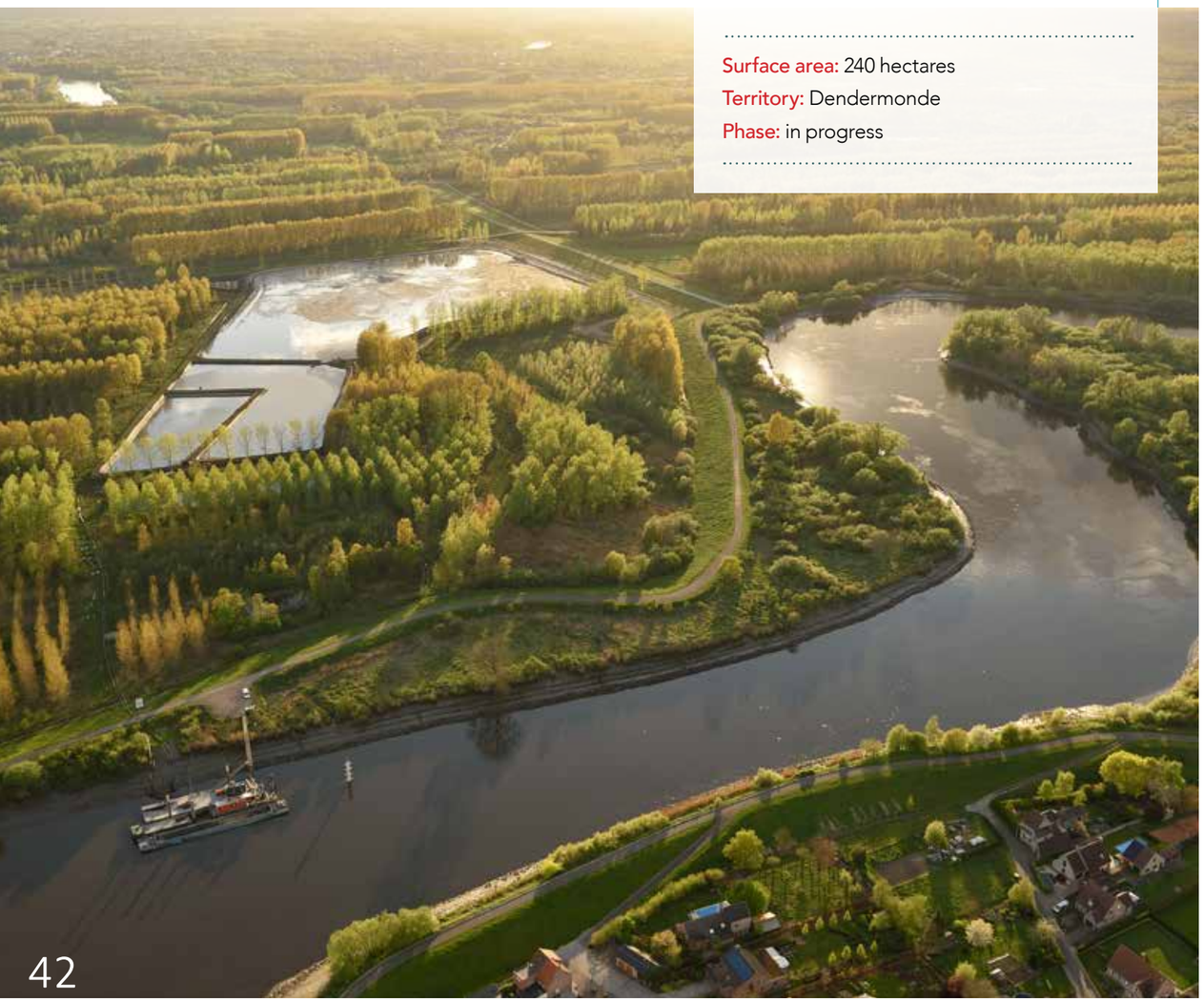
The Grote Nete winds its way through its valley, which is populated with castles, forests, and green meanders. Here, between Nijlen and Geel, we aim to develop a much more varied, lush, and open landscape. The sometimes-parched valley needs more wetlands. That is why we will develop 850 hectares of flowery meadowlands and reed beds. To this end, we will restore the winter river bed, so the river can break out of its narrow summer bed again. The groundwater level will be raised with river barriers, creating wide reed beds and wet grasslands. A perfect habitat for the bittern, the porcelain grouse, the bullhead frog, and the beaver. We will restore the connections between the river and its tributaries again. Fish will have more space to move around freely again too.

In this lush wetland, you should keep an eye out for the great bittern, the spotted crake, and the corncrake.

Vlassenbroek

Since the summer of 2012, the Vlassenbroek Polder in Dendermonde is being redeveloped as a 240 hectare flood plain. The northern part will be transformed into marshes and mudflats that attract a lot of waders, geese, ducks, and migratory birds. In the spring, you will see marsh marigold flowers here, and in the long term, rare willow tidal forests will grow in the marshes. The area is used only once or twice a year as a flood control area. The southern part will become a green patchwork quilt of marshy grasslands, alder, ash, willow, and open water. This area will only flood once every 50 years.

The construction of the compartmentalisation levee between the northern and southern part of Vlassenbroek was a real feat. This levee was built using an innovative technique. The building material: 100,000 m³ of silty dredging material from the Scheldt. Since then, the new, efficient, and sustainable technique has also been implemented elsewhere in Vlassenbroek, including the northwestern part of the ring levee.



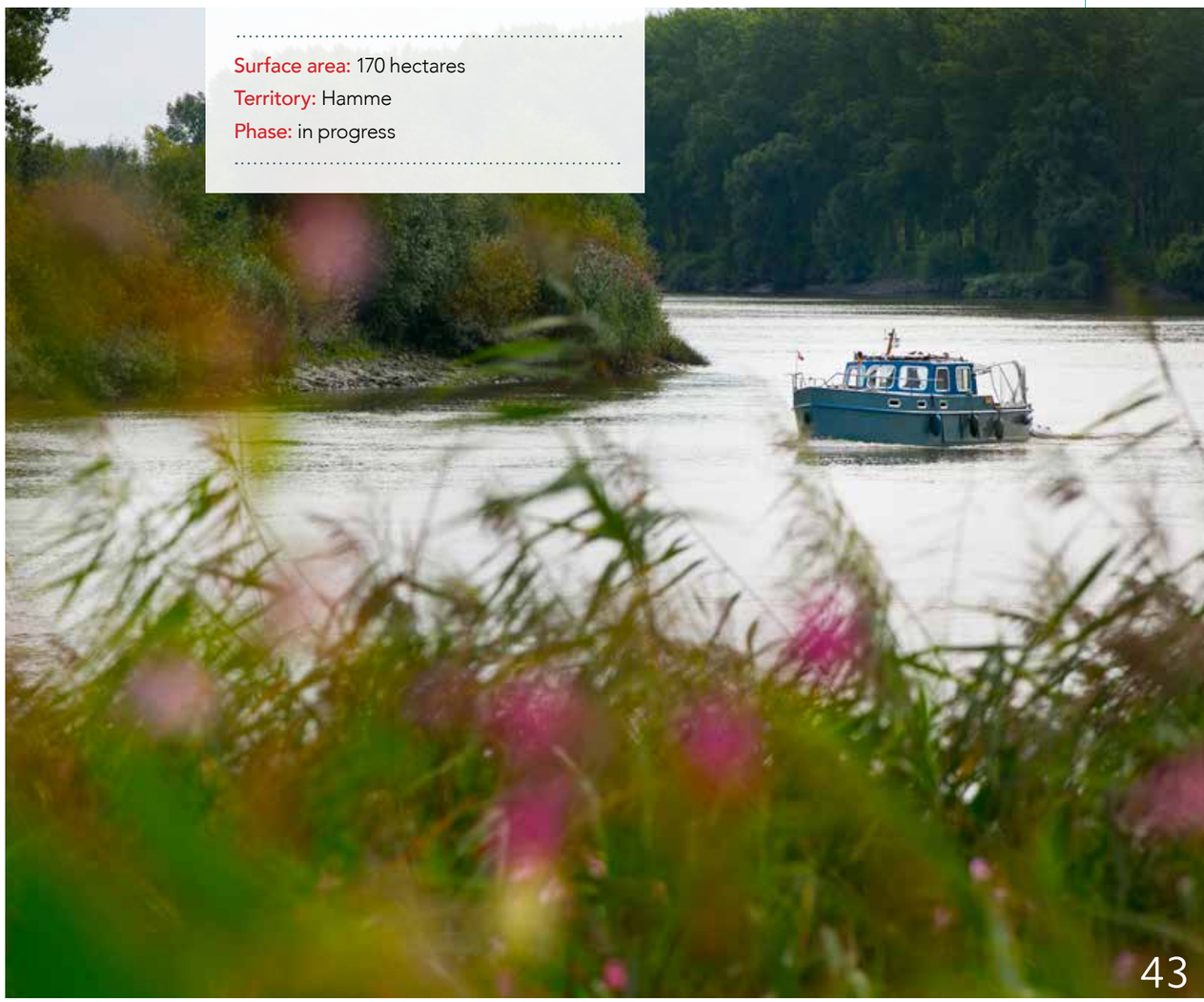
Surface area: 240 hectares
Territory: Dendermonde
Phase: in progress

Wal-Zwijn

Today Wal-Zwijn consists largely of poplar forests, fields, and marshes. The 170-hectare Wal-Zwijn will be the first to face a storm and flood. We will build a ring levee with sand from the Durme Valley, from where you can admire the changed Scheldt landscape.

Wal-Zwijn, which includes Grote Wal, Kleine Wal, and Zwijn, will be transformed into a flood control area with nature. We will depolder Groot Schoor on the banks of the River Scheldt by removing the summer levee. We hope to welcome such eminent visitors as the avocet, the oystercatcher, and the little ringed plover in the freshwater mudflats and marshes.

We will widen the summer levee in the wide Scheldt bend in Hamme so the water can flow more freely, creating rare marshes and mud flats.



Surface area: 170 hectares
Territory: Hamme
Phase: in progress

Want to know more?

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