LIFE SPARC AREAS

1. Depoldering Uiterdijk

What

This action involves the realization of a depoldering (also known as 'managed retreat') of an area called 'Uiterdijk'. This area has a surface of approximately 11 hectares.

Where

Uiterdijk is located along the river Scheldt, on the right bank, between the villages of Dendermonde and Baasrode, in the province of East-Flanders. This area is situated adjacent to the Flood Control Area with Controlled Reduced Tide (FCA-RTA) 'Vlassenbroek'.

How

The old river dyke of Uiterdijk will be lowered to a level of approximately 5 mTAW so it is on the same height as the polder, and this over a distance of approximately 950 meters.

An alternative has been considered during the studies such as a breach of 70 meters instead of the removal of the whole dyke. The option of a breach had a significant influence on the current and consequently on navigation. Breaches on this location in the Scheldt do cause transverse currents which are not desirable. Also from ecological viewpoint the chosen scenario was preferable, as mudflats and young marches will develop spontaneously.

Prior to this earth moving, the vegetation on the old river dyke will be removed, and as these areas often contain different types of waste caused by the use of the area as agricultural land or dumping of household waste on river banks for many decennia, this material will be removed prior to the lowering of the old dyke.

Quarry stones will be placed to secure the parts of the river embankment that are not allowed to be influenced by the water dynamics.

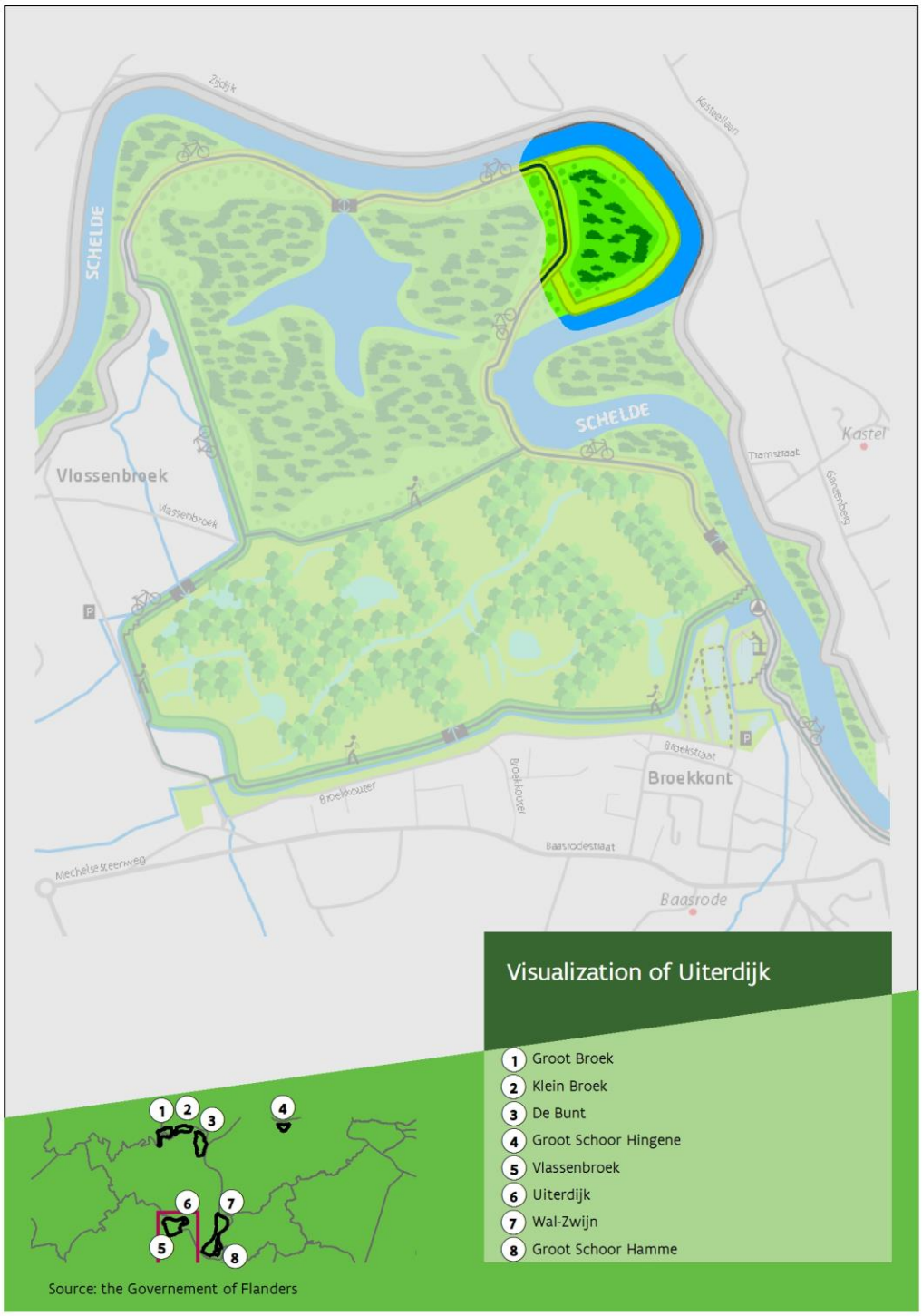
Why

There are several names to define the action of ‘literally giving the river more space by means of yielding land that was previously occupied for other purposes’. Common names are ‘depoldering’, ‘managed retreat’ or ‘embankment realignment’. The result of this measure is an intertidal habitat with a high nature value and an increased resilience to climate change. A stretch of the old river valley again comes under the influence of the natural dynamics of the river. Hence more space is given to the river and storage function is created.

The contact of the river with its expanded streambed creates an important shear on the water which causes a mitigation of the rivers force during events of high tide or storm tide. Consequently the pressure of the water is released so there is a lesser likelihood of flooding further inland. Therefore this ‘depoldering’ is considered as a best practice.

‘Uiterdijk’ is an existing flood area which has been realised shortly after the floodings of 1976, maintaining its original use as agricultural land. The ‘summer’ dyke only flooded when peak surges occurred on the river. During the studies lying at the basis of the updated Sigma Plan was concluded that a depoldering of Uiterdijk would cause an important amelioration of the ecological condition of the river while creating more space for the river. This action will make the area prone to the daily movement of the tidal river. Only at low neap tide the area will not be flooded.

As the area lies between the flood control area ‘Vlassenbroek’ and the Scheldt, the construction of a ring dyke is unnecessary; an extra benefit in the analysis process towards the selection of the most suitable areas for depoldering.



2. Depoldering Groot Schoor (Hamme)

What

This action involves the realization of a depoldering (also known as 'managed retreat') of an area called 'Groot Schoor'. This area has a surface of approximately 26 hectares.

Two areas part of SPARC have the name ‘Groot Schoor’. The name ‘Schoor’ is a very common Dutch name that means ‘schor’ or ‘marsh’. We will therefore always specify in which city/village the area is located.

Where

Groot Schoor (Hamme) is located along the river Scheldt, on the left bank, on the territory of Hamme, near the village of Kastel, in the province of East-Flanders. This area is situated next to the FCA-RTA 'Wal Zwijn'.

How

For this area a new inland dyke is not required, because the ring dyke of the adjacent area ‘Wal Zwijn’ protects the surrounding villages against the water of the river Scheldt in case of controlled flooding. This ring dyke is under construction since the summer of 2016.

The old river dyke of the area ‘Groot Schoor’ will be lowered from a level of approximately 7 mTAW to approximately 4,5 mTAW, and this over a distance of approximately 1500 meters, so it is equally high as the polder.

Prior to this earth moving, the vegetation on the old river dyke will be removed. Also certain amounts of waste need to be removed to clear the area and give it a clean slate.

Within the area locally there will also be a removal of soil in the shape of onset of creeks.

Quarry stones will be placed to secure the parts of the river embankment that are not allowed to be influenced by the water dynamics.

Why

Just as ‘Uiterdijk’, this ‘Groot Schoor’ at Hamme, with its specific polder level, has a good potential to develop a young marsh vegetation spontaneously, if looking to the tidal window on the river.

It is expected that by the removal of the river dyke the marshes that will develop will be highly dynamic and will integrate fully in the existing marshes that are located on two sides of Groot Schoor.

The contact between the river and its estuary will be enlarged and space is created for natural dynamical physical, chemical and ecological processes. The result of this measure is an intertidal habitat with a high nature value and an increased resilience to climate change.

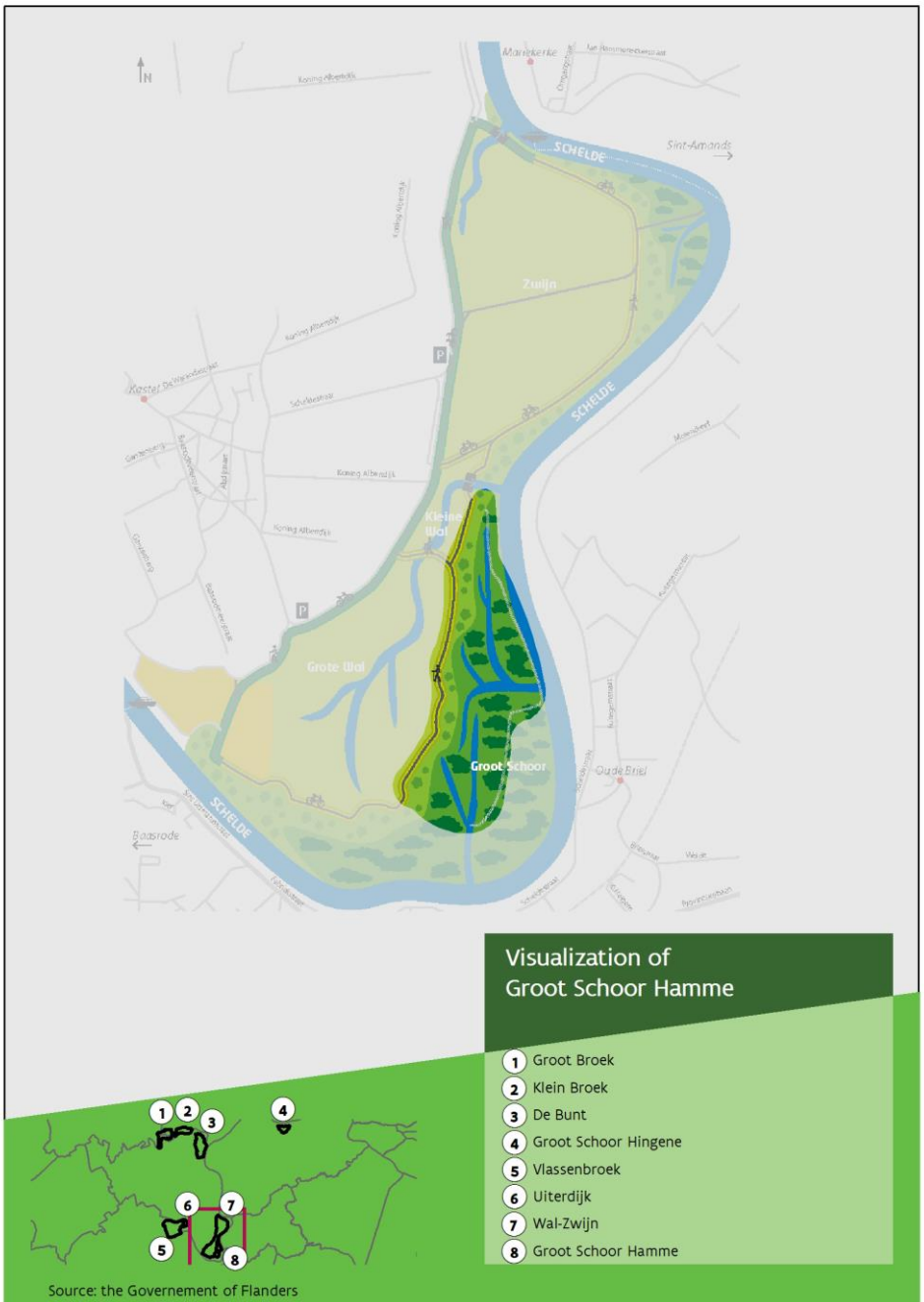
This area will hence contribute to the nature targets for the Scheldt estuary, as devised within the framework of the Bird- and Habitat directives. The contact of the river with its

expanded streambed creates an important shear on the water which causes a mitigation of the rivers force during events of high tide or storm tide. Consequently the pressure of the water is released so there is a lesser likelihood of flooding further inland.

Creeks improve the drainage of the water towards the river and enhance the ecological development towards the optimal habitat. The soil yielded from the creeks can be used for other purposes in the construction process ('work with work' principle).

Just like 'Uiterdijk', the 'Groot Schoor' in Hamme is an existing flood area which has been realised shortly after the floodings of 1976, originally maintaining its use as agricultural land. The 'summer' dyke only flooded when peak surges occurred on the river. Also for this area during the studies lying at the basis of the updated Sigma Plan was concluded that a depoldering would cause an important amelioration of the ecological condition of the river while creating more space for the river.

As the area lies between the flood control area 'Wal Zwijn' and the Scheldt, the construction of a ring dyke is unnecessary. This was an extra benefit in the analysis process towards the selection of the most suitable areas for depoldering.



3. Depoldering Groot Schoor (Hingene)

What

This action involves the realization of a depoldering (also known as 'managed retreat') of an area called 'Groot Schoor' (same name as previous area but different location, Hingene). This area has a surface of approximately 23 hectares.

Where

Groot Schoor is located along the river Scheldt, on the right bank, near the village of Hingene, in the province of Antwerp.

How

A inland ring dyke of approximately 1200 meters will be constructed to protect the urban area nearby. The ring dyke will be planted on the location of a small existing dyke around the polder. After the removal of the asphalt road on the original river dyke this dyke will be breached over a distance of 75 to 100 meters to allow the daily inflow of the river water.

In this Groot Schoor a single breach of maximum 100 meters was chosen instead of the complete lowering/removal of the river dyke. A sufficiently wide breach is needed to allow the full tidal cycle in the area.

Furthermore the onset of a creek is dug out for a better drainage and enhance the ecological development towards the optimal habitat. Quarry stones are placed for the protection of the dykes that have to stay in place.

Why

Many houses in Bornem and Puurs (villages nearby) are situated on a lower level than the mean daily high water level on the Scheldt. Measures are needed to guarantee the safety of these homes. Besides Groot Schoor (Hamme) other safety/nature measures are taken in this area of the Scheldt, but are not part of SPARC.

The contact between the river and its estuary will be enlarged and space is created for natural, dynamic, physical, chemical and ecological processes. The result of this measure is an intertidal habitat with a high nature value and an increased resilience to climate change.

This area will hence contribute to the nature targets for the Scheldt estuary, as devised within the framework of the Bird- and Habitat directives.

The contact of the river with its expanded streambed creates an important shear on the water which causes a mitigation of the rivers force during events of high tide or storm tide. Consequently the pressure of the water is released so there is a lesser likelihood of flooding further inland.

Creeks improve the drainage of the water towards the river and enhance the ecological development towards the optimal habitat.


Orthophoto of Groot Schoor Hingene
1 Groot Broek
2 Klein Broek
3 De Bunt
4 Groot Schoor Hingene
5 Vlassenbroek
6 Uiterdijk
7 Wal-Zwijn
8 Groot Schoor Hamme
Source: the Governement of Flanders
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4. Depoldering of Groot Broek

What

This action involves the realization of a depoldering (also known as 'managed retreat') of an area called 'Groot Broek'. This area has a surface of approximately 58 hectares.

A new inland ring dyke to protect the urban area nearby will be constructed but is not part of this LIFE application.

Where

'Groot Broek' is located along the river Durme on its left bank, on the territories of Waasmunster and Temse, in the province of East-Flanders. Groot Broek lies West from Klein Broek. Groot Broek and Klein Broek are separated by a main road (N41).

How

After the removal of the asphalt road on the original river dyke this dyke will be lowered with 1,2 meters over a distance of approximately 1200 meters. In determining the amount of soil to be removed from the dyke the environmental quality of the soil in the historical river dyke had to be taken into account.

Additionally two breaches will be created; one of 30m and one of 100m, combined with an onset of a creek. The location of the breaches is selected so they connect to the presence of existing brooks, ditches or historical breaches. The onset of the creeks will enhance the exchange of water between the Durme and the rivulets in the polder.

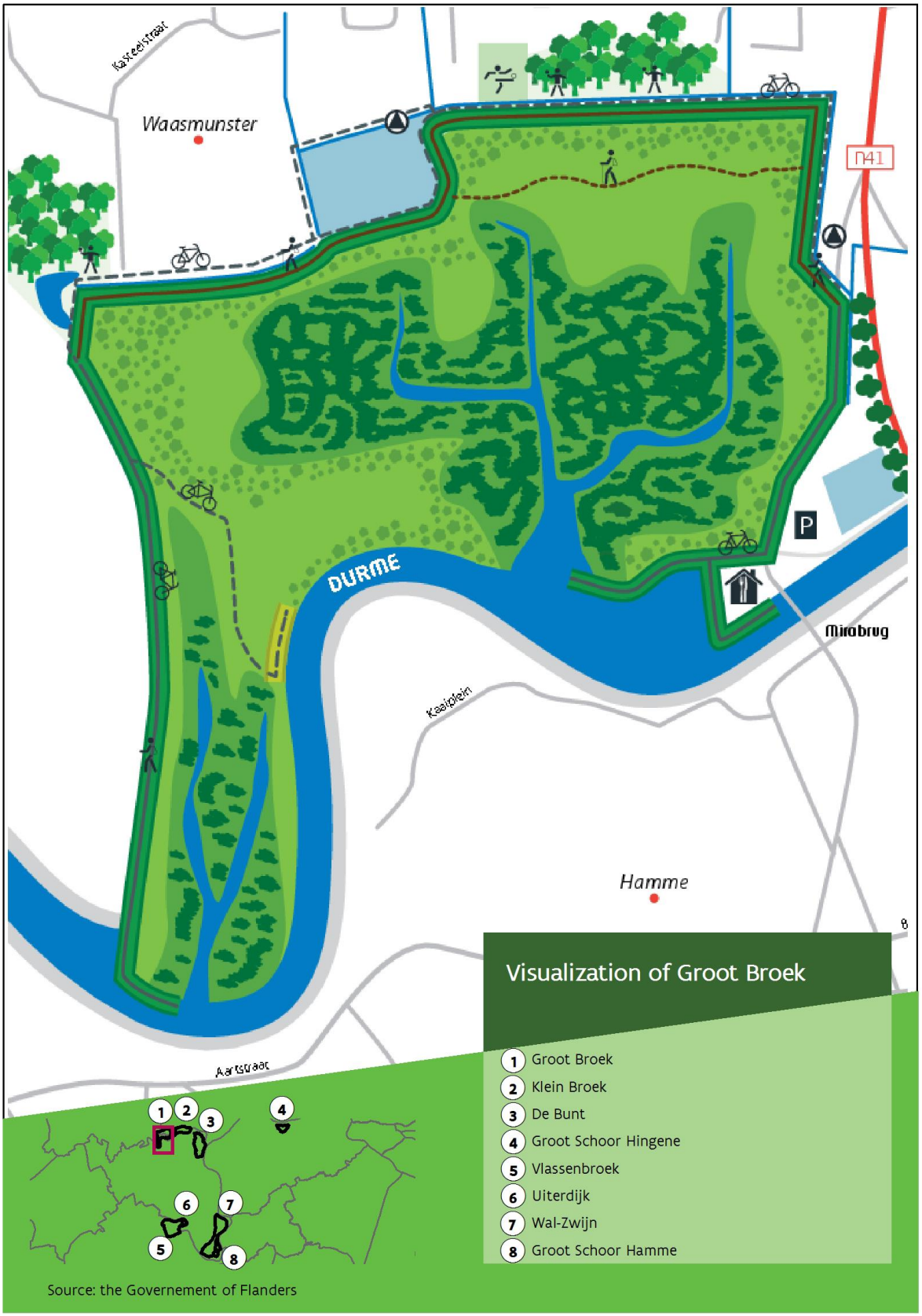
Quarry stones are placed for the protection of the dykes that have to stay in place.

Why

The river The Durme has a very distinct 'asymmetrical tidal profile'. That means that the tide from the main Scheldt does not flow in and out of the Durme equally, but that the tide is pushed with exceptional force from the Scheldt in the Durme valley twice a day. That causes the water level in the Durme to increase faster than the water can flow back to the Scheldt. With the water a lot of sediments are carried into the stream bed, causing the level of the river to rise even more.

This 'Groot Broek' (and Klein Broek) plays an important role in giving more space to the river and reducing the problems caused by high water levels in the river (combination of rain and storm surges). These areas will decrease the force of the river. Simultaneously the Durme is dredged. These measures together will give the river new dynamics which will pull sediment particles loose from the river bottom and bring them into the current.

With this depoldering an ecosystem of mudflats and marshes will be created. Especially in the freshwater part of an estuary this habitat type is very rare. Groot Broek (and Klein Broek) are situated for a large part on high mudflat and primary marsh level. Therefore the development of marsh will happen swiftly.


Waasmunster
N41
DURME
Mirabrug
Kaaiplein
Hamme
Aartsvaart
Visualization of Groot Broek
1 Groot Broek
2 Klein Broek
3 De Bunt
4 Groot Schoor Hingene
5 Vlassenbroek
6 Uiterdijk
7 Wal-Zwijn
8 Groot Schoor Hamme
Source: the Governement of Flanders

5. Depoldering of Klein Broek

What

This action involves the realization of a depoldering (also known as 'managed retreat') of an area called 'Klein Broek'. This area has a surface of approximately 38 hectares.

A new inland ring dyke to protect the urban area nearby will be constructed but is not part of this LIFE application.

Where

'Klein Broek' is located along the river Durme near the city of Temse, in the province of East-Flanders. 'Klein Broek' lies East of ‘Groot Broek’.

How

After the removal of the asphalt road on the original river dyke this dyke will be lowered with 1,2 meters over a distance of approximately 1000 meters. In determining the amount of soil to be removed from the dyke the environmental quality of the soil in the historical river dyke had to be taken into account.

Additionally two breaches will be created; one of 40m and one of 60m,combined with an onset of a creek. The location of the breaches is selected so they connect to the presence of existing brooks, ditches or historical breaches. The onset of the creeks will enhance the exchange of water between the Durme and the rivulets in the polder.

Quarry stones are placed for the protection of the dykes/embankments that have to stay in place.

Why

The river The Durme as a very distinct ‘asymmetrical tidal profile’. That means that the tide from the main Scheldt does not flow in and out of the Durme equally, but that the tide is pushed with exceptional force from the Scheldt in the Durme valley twice a day. That causes the water level in the Durme to increase faster than the water can flow back to the Scheldt. With the water a lot of sediments are carried into the stream bed, causing the level of the river to rise even more.

This ‘Klein Broek’ (and Klein Broek) plays an important role in giving more space to the river and reducing the problems caused by high water levels in the river (combination of rain and storm surges). These areas will decrease the force of the river.

Simultaneously the Durme is dredged. These measures together will give the river new dynamics which will pull sediment particles loose from the river bottom and bring them into the current.

With this depoldering an ecosystem of mudflats and marshes will be created. Especially in the freshwater part of an estuary this habitat type is very rare. Klein Broek (and Groot Broek)

are situated for a large part on high mudflat and primary marsh level. Therefore the development of marsh will happen swiftly.

6. Construction of CRT Vlassenbroek

What

This action involves the realization of a Controlled Reduced Tide (CRT) in an area called 'Vlassenbroek'. This area has a surface of approximately 91 hectares.

Where

'Vlassenbroek' is located along the river Scheldt on the right bank, near the village of Baasrode in the province of East-Flanders. To the East of Vlassenbroek lies the polder Uiterdijk.

How

First the construction of the last part of the ring dyke to close an area of 91 hectares that will evolve towards mudflats and marshes.

Consequently W&Z will construct the combined in and outlet construction through which the tidal dynamics will be introduced in a 'controlled' and 'reduced' fashion. ‘Controlled’ refers to the fact that the river water is guided solely through the inlet sluice, while ‘reduced’ refers to the fact that the tidal movement of the river is mimicked in the polder but in a cropped fashion to avoid the area would be flooded (as it would if the dyke would be breached). This design consists of a sluice with six inlet and six outlet pipes, placed in two rows on top of each other. The inlet pipes have a dimension of 3m x 2,10m, the outlet pipes have a dimension of 3m x 3,10 m.

As a third the onset of a creek will be dug out near this in and outlet construction. The available soil will be used for other works in the vicinity ('work with work' principle). A certain part of the construction of this CRT 'Vlassenbroek' has already beenexecuted in 2013/2014 within the framework of an Interreg 2Seas-project 'PRISMA'. PRISMA stands for 'Promoting Integrated Sediment Management' and focused on useful applications for dredged sediments. Hence approximately 1,8 kilometers of dyke was constructed with nearby dredged material, thus enhancing circular economy.

The construction of a CRT encompasses several large items of infrastructure such as an embankment to protect the rural environment (ring dyke), and the adjustment of the embankment at the side of the river to an overtopping dike, which is flooded by river water at very high water levels in the tidal river. An outlet construction allows the water to flow back to the river when the water level in the river is low enough for the water to flow out of the FCA in a gravitational fashion. When a FCA is combined with a CRT a high inlet construction will be added to the outlet construction. Subsequently with the rhythm of ebb and flow, water flows into and leaves the CRT-area twice a day. Beside those measures also smaller actions are done to tailor a flood control area into a controlled reduced tidal area.

Often is chosen for the onset of a creek; it accelerates the evolvement towards tidal nature as the water flowing in the area via the inlet sluice is pushed further. It also heightens the attraction for several birds such as duck, geese and other water fowl. This creek is dug at

mean low water level, and connecting drainage channels ensure that the area can drain sufficiently in the event of storms.

The area will flood daily in a controlled manner at high tide. A limited amount of water will be let into the area at each high tide via a new inlet construction in the embankment. At low tide, the water flows back into the Scheldt via the low outlet pipes. The imitation of the spring neap tide variation makes a difference in mud flat and marsh habitats and leads to a diverse, functional ecosystem. The estuarine nature that will develop here will contribute towards the conservation objectives for the Scheldt estuary.

Compared with depoldering, the situation in a FCA-CRT is highly controlled; the sluice settings will determine the dynamics and succession of mudflats and marshes. And above that it is to be avoided that a high level of sedimentation will undermine the safety function (loss of storage for river water when needed). The area needs to continue to serve as an FCA in extreme storm tides.

The combined inlet and outlet is a key element in the concept of the FCA-CRT. To introduce a tidal mud flat and marsh ecosystem into a FCA-CRT, a specific system of sluices is required that firstly enables the daily exchange of Scheldt water, and secondly, still ensures that the area can store sufficient water. On the one hand, the sluices must therefore dramatically reduce the inflow of water to ensure the function as an FCA (storage). On the other hand, they must guarantee an essential daily variation in water levels (the tide), maintaining a variation in level between spring and neap tides.

The sluices of an FCA-CRT consist of a system with high inlet openings and low outlet openings. The inlet openings can be adjusted by stop-logs. This system can reduce the tide while maintaining the spring/neap tide variation. This system allows the ecological continuity for the migration of fishes and other organisms between the river and the polder.

As the sluices have to endure serious forces of in and outflowing water and the pressure and shear of a river such as the Scheldt is very substantial, a solid construction is needed; earthmoving, foundations, concrete, gabion baskets and accessories as grids for solid waste, outlet gates and stop-logs are part of a ‘basic’ sluice.

The dimension and the exact location of the sluice is determined for every separate area based on its specific characteristics related to the functioning of the reduced tide (surface of nature to develop towards tidal nature) and an optimal outflow of the flood area (FCA).

By means of studies (computer models) an optimal combination of inlet openings is determined for a certain desired level of inundation in the tidal area (CRT).

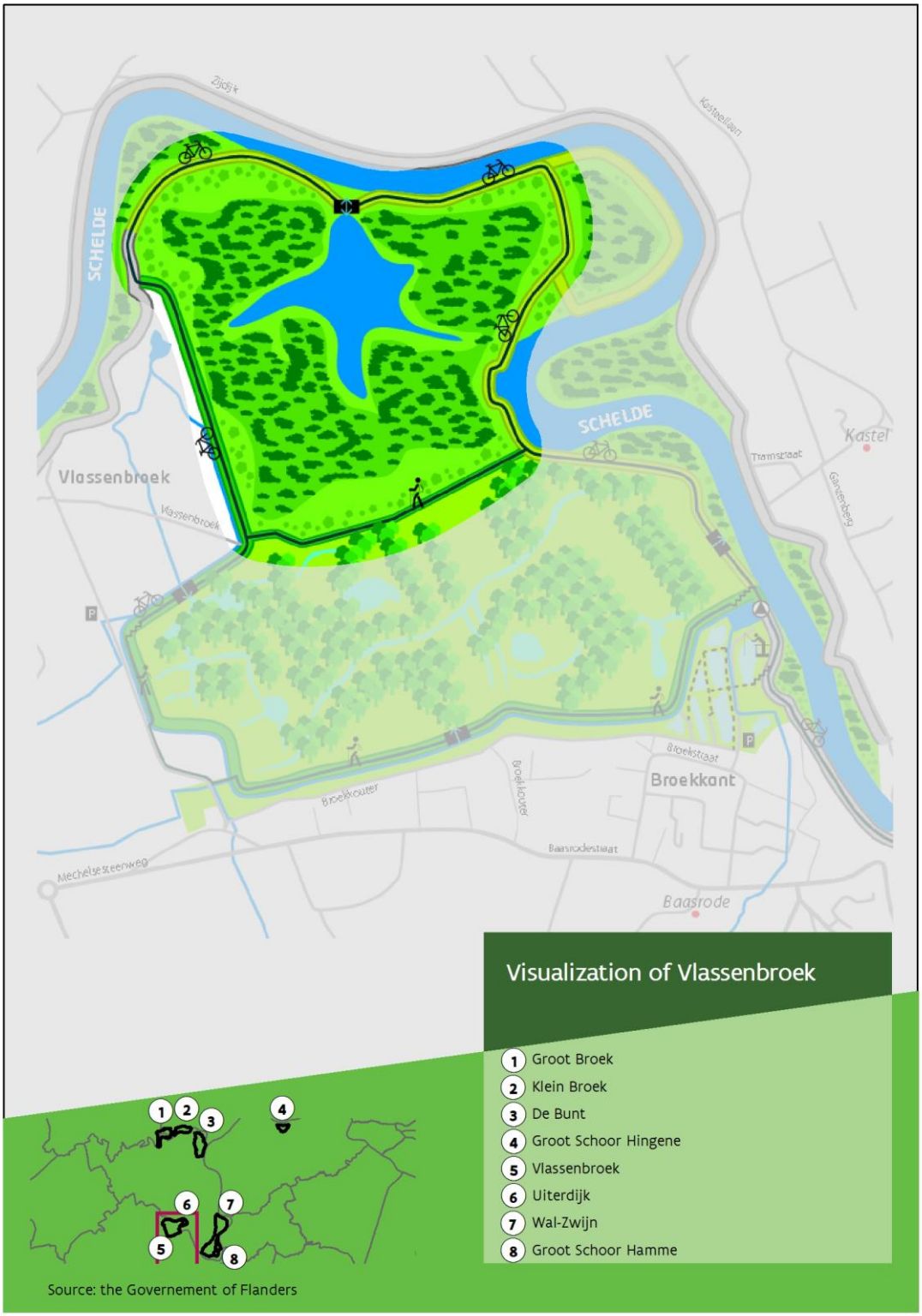
Why

Especially the more upstream parts were subject to a gradual increase of the high tides, with a maximum in the river section between Schelle (Antwerp) and Dendermonde (East-Flanders). The flood control area Vlassenbroek is located in this river section.

The flood control area Vlassenbroek with a total surface of almost 240 ha, will have a large impact on safety for its large surface and its location along the Scheldt. This areas has been

flooded a lot in the past during events of storm, hence in an uncontrolled fashion. Dendermonde, a large and densely populated city, is prone to great potential damage, and will benefit greatly from an operational FCA Vlassenbroek.

By means of an in and outlet construction this FCA will be combined with the development of tidal nature with a surface of 91 ha. The estuarine nature that will develop here will contribute towards the nature objectives for the Scheldt estuary.



7. Construction of CRT Wal-Zwijn

What

This action involves the realization of a Controlled Reduced Tide (CRT) in an area called 'Wal Zwijn'. 'Wal Zwijn' is the combination of 2 areas located right next to each other; Wal in the South and Zwijn in the North. This area has a total surface of approximately 148 hectares, from which 114 ha will develop in tidal nature.

The construction of this FCA-CRT has already been initiated; the construction of the ring dyke, which has a length of almost three kilometres has started in the summer of 2016. The construction of the in and outlet construction will therefore be part of this action.

Where

'Wal Zwijn' is located along the river Scheldt near the village of Kastel in the province of East-Flanders. It is located 5 kilometres downstream of 'Vlassenbroek'.

How

For the sluice of Wal: 3 inlet pipes on top of a row of 6 outlet pipes with dimensions of 3 m X 2,20 m. When comparing the shape of the area with an hourglass, the sluice of the Wal-part is located in the central part of the hourglass between 2 historical dykes, where the ground level is relatively low. The dyke South from the sluice will be breached (and a bridge will connect both sides of the breach) to allow the flow of water from and towards the sluice.

For the sluice of Zwijn: 4 inlet pipes on top of a row of 6 outlet pipes with dimensions of 3 m X 2,20 m. This sluice will be constructed in the upper North of the area at the lowest part, where a naturally existing creek is situated, enhancing the distribution of inflowing tidal water in the area.

Why

When looking towards the evolution of the measurements of the mean high water level in the Scheldt estuary in the 20th century, it was clear that especially the more upstream parts were subject to a gradual increase of the high tides, with a maximum in the river section between Schelle (Antwerp) and Dendermonde (East-Flanders). The flood control area ‘Wal Zwijn’ is located in this river section.

Hydrological models in combination with a cost-benefit model, while considering the impact on agriculture, yielded several alternatives for the increase on safety while enhancing the ecological value. The models showed that alternatives considering ‘space for the river’ proved to be most robust and sustainable.

The flood control area Wal Zwijn with a total surface of approximately 148 ha, will have a large impact on safety for its surface and its location along the Scheldt. During storms the FCA Vlassenbroek will be flooded first, as its overtopping dyke is constructed slightly lower, consequently FCA Wal Zwijn will become operational if water levels are still high on the river Scheldt.

During extreme events Wal Zwijn and Vlassenbroek together form one great temporary buffer for river water. By means of 2 in and outlet construction this FCA will be combined with the development of tidal nature with a surface of 114 ha. The estuarine nature

that will develop here will contribute towards the nature objectives for the Scheldt estuary.

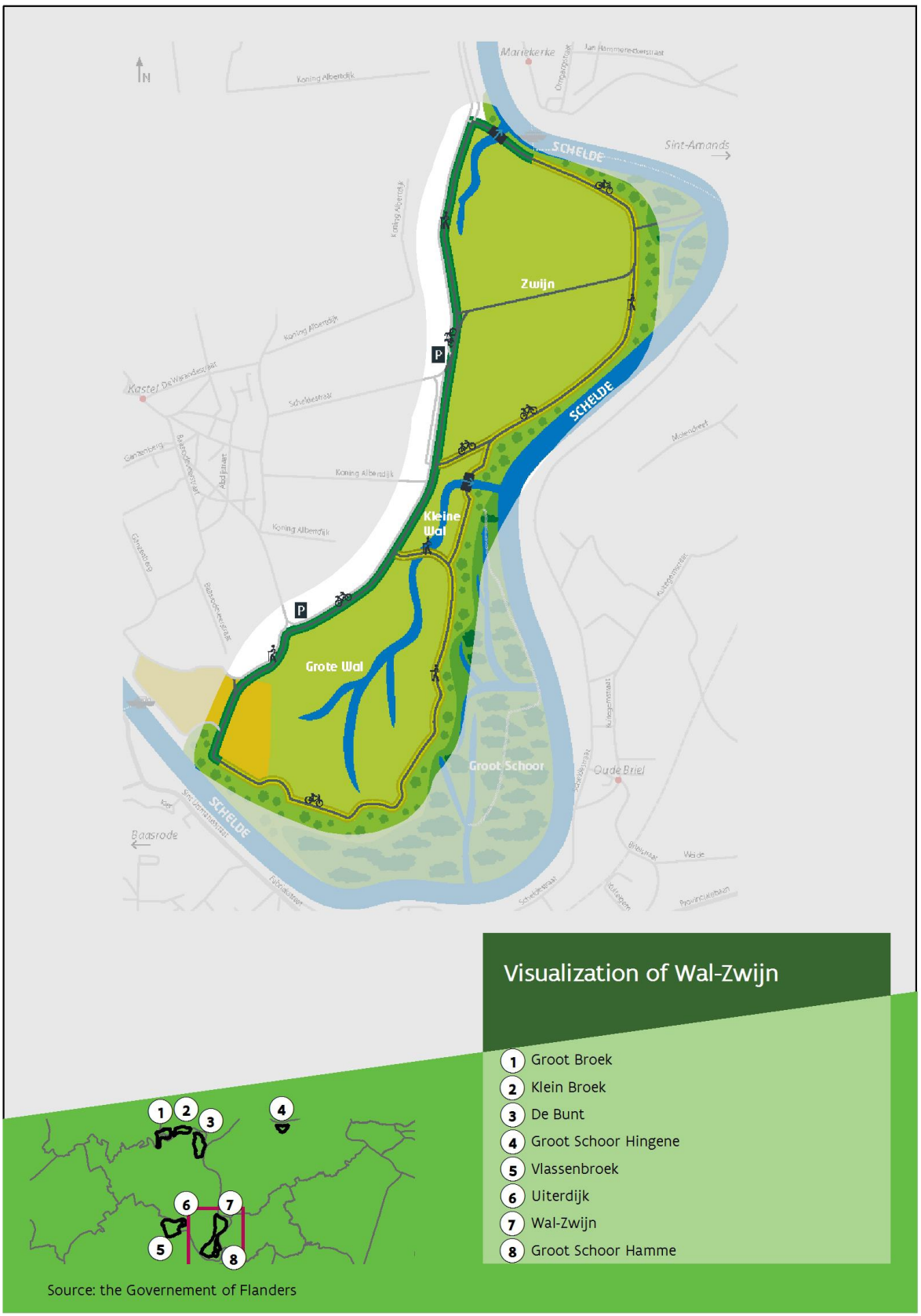
The use of two sluices

The reason for the realization of two sluices is to be found in the specific (historical) characteristics of the area. The Northern 'Zwijn' part of the area has in general a lower ground level, with levels ranging between 1 to 2,5 meters, and a large part between 1 and 1,5 meters. The Southern 'Wal' part on the other hand has a level ranging between 2 and 3 meters, and a large part between 2,5 and 3 meters.

To develop tidal nature in the Wal part by means of one big sluice would demand a repletion of the Zwijn part which is not favourable for two reasons. It is not favourable for the development of tidal nature in the Zwijn part, but neither favourable caused by the loss of storage capacity during the event of a storm tide (safety issue). Therefore the two parts have their own sluice with a different amount of inlet pipes; which can be adjusted with an accuracy of decimetres according to the ecological demand (monitoring). A good drainage is essential for mudflats and marshes

to develop, allowing a healthy succession and the establishment of the typical flora. The lobe shape of the total area does not allow good water transport between the two parts; the narrow part of the hourglass would have to endure erosion processes which would undermine the embankments.

The central historical dyke at the bottom of the 'Zwijn' part has a large archaeological and scenical value, and was put in place during the Middle Ages. Therefore this dyke will be maintained as a comparting dyke and will keep on playing an important role in the recreational network for cyclists and hikers in this area. A second historical dyke in the small part of the lobes in the 'Wal' part will be breached (after compromises were achieved) to allow the in and outflow of the water towards the sluice in the 'Wal' part. A bridge will be constructed over the breached part of this dyke allowing recreational activities.



Source: the Governement of Flanders

8. Construction of CRT de Bunt

What

This action involves the realization of a Controlled Reduced Tide (CRT) in an area called 'De Bunt'. This area has a surface of approximately 99 hectares, from which 67 hectares of tidal nature.

Where

'De Bunt' is located along the river Scheldt on its left bank, near the village of Hamme in the province of East-Flanders. On the east side the area is flanked by the river Scheldt, on the North side flows the Durme which is a tributary of the river Scheldt and also knows tidal dynamics.

How

The construction of this FCA-CRT has already been initiated; the ring dyke surrounding this FCA-CRT will be finished in 2016. Therefore the construction of a combined in and outlet sluice, and the onset of a creek which will be part of this action.

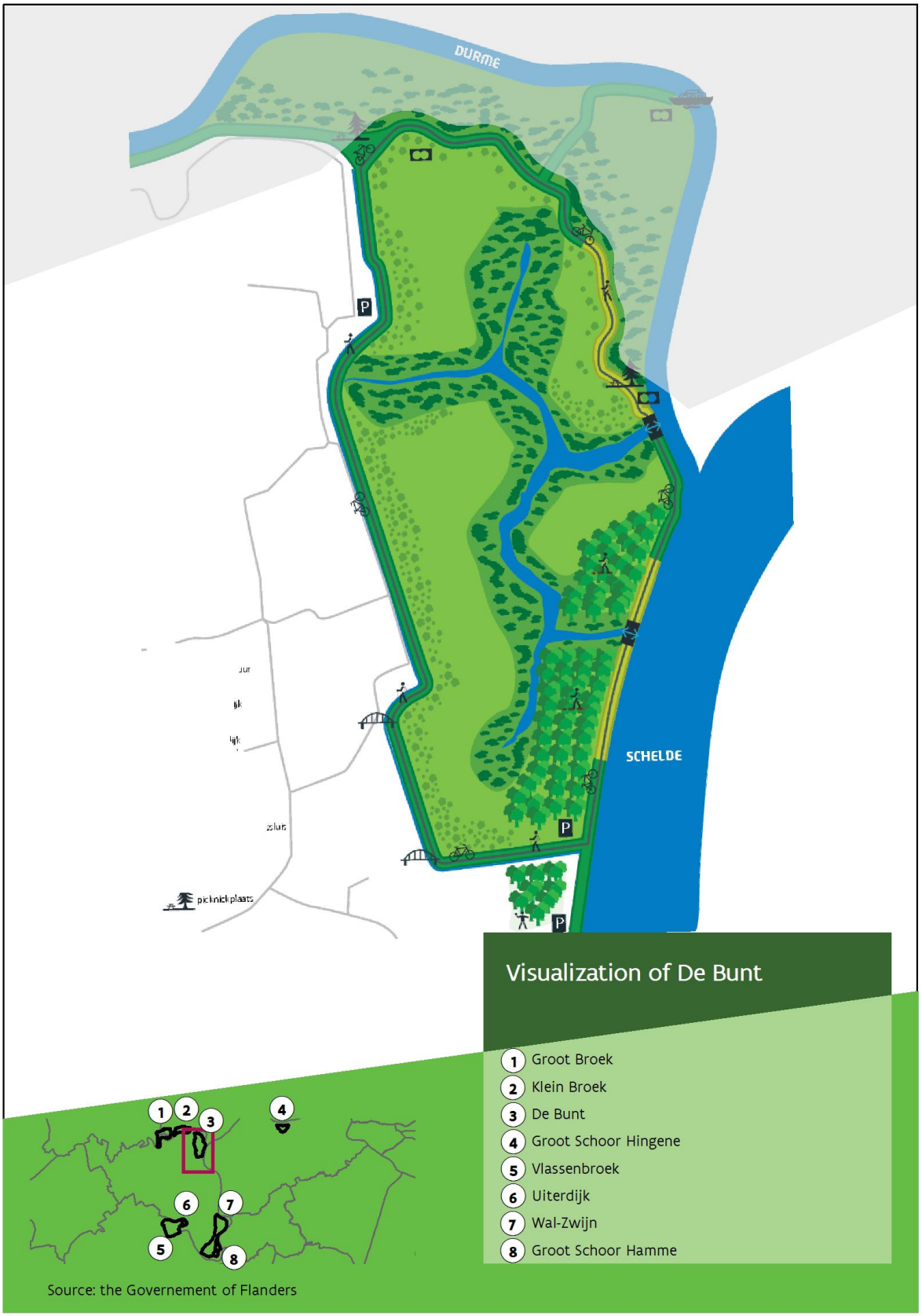
The sluice will have six pipes for the inflowing water and six for the outflowing water, built as two rows on top of each other. The outflow pipes have a dimension of 3m x 3m, yhe inlet pipes are slightly smaller: 3 m X 2,2 m.

Why

FCA-CRT De Bunt is part of a series of measures to ameliorate the river valley of the Durme (also Groot and Klein Broek). As the river is prone to a high rate of sedimentation it suffers from problems in the areas water management (navigation, safety), nature and even recreation (loss of attractiveness).

De Bunt will capture the crest of the storm surge coming from downstream, this way the valley of the Durme has to deal with a lower tidal wave flowing up the river. The chance of flooding in the Durme valley decreases substantially.

By means of an in and outlet construction this FCA will be combined with the development of tidal nature with a surface of 67 ha. The estuarine nature that will develop here will contribute towards the nature objectives for the Scheldt estuary.


DURME
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Visualization of De Bunt
1 Groot Broek
2 Klein Broek
3 De Bunt
4 Groot Schoor Hingene
5 Vlassenbroek
6 Uiterdijk
7 Wal-Zwijn
8 Groot Schoor Hamme
Source: the Governement of Flanders