



# Final report

## **Pilot on cross-border solutions for maintenance dredging in the Scheldt**

WP 4.6

Department of Mobility and Public Works (MOW)  
Flemish Government



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## 1. Introduction and aim

The aim of this note is to report on the findings and achievements as obtained under activity 4.6 during the IMMERSE project period by execution of a field pilot on cross-border solutions for maintenance dredging in the Scheldt estuary.

This note consists out of nine sections. In sections 2 and 3, the problem addressed (estuarine pressure) and the solution developed are shortly introduced. Followed by, in section 4, an overview of the stages of measure development (exploration and feasibility phases), including licensing and permitting and the field pilot itself.

During the development of this measure, special attention was given to stakeholder involvement and transnational exchange, as described in more detail in sections 5 and 6. In section 7, the lessons learned are formulated, followed by in section 8 our main achievements.

Based on the lessons learned and achievements, next steps towards measure implementation on a full scale are concluded in section 9.

## 2. The problem: estuary under pressure

The Scheldt is a river flowing across France, Belgium and the Netherlands. It can be divided into the non-tidal Upper Scheldt and the tidally influenced part which includes the Flemish Sea Scheldt (from Gent to the Belgian-Dutch border) and the Dutch Western Scheldt (from the border to the mouth at Vlissingen). The Flemish Sea Scheldt is further divided in the Lower Sea Scheldt (from the border to upstream Antwerp) and the Upper Sea Scheldt (from Antwerp to upstream Gent).

The Scheldt estuary has a history of sand extraction for construction purposes and for commercial sand extraction. However, a reduction of sand volume in the estuary means an increase in water volume and a reduction of friction for the propagation of the tidal wave, which leads to hydrodynamic conditions which are less favourable for humans and nature. Examples: high water current velocities are less favourable for benthic life, may result in altered silt transport patterns, will lead to higher turbidity (concentrations of suspended silts) and a reduced capacity for photosynthesis by algae in the water column. A more intense propagation of the tidal wave may also lead to lower water levels at low water (undesirable for navigation) and to higher water levels at high water (undesirable for flood protection). As such, (commercial) extraction of sand from the Scheldt estuary is regarded as a pressure. During the last years the negative consequences of this pressure have become clear and the Scheldt managers have agreed to reduce sand extraction from the estuary to zero.



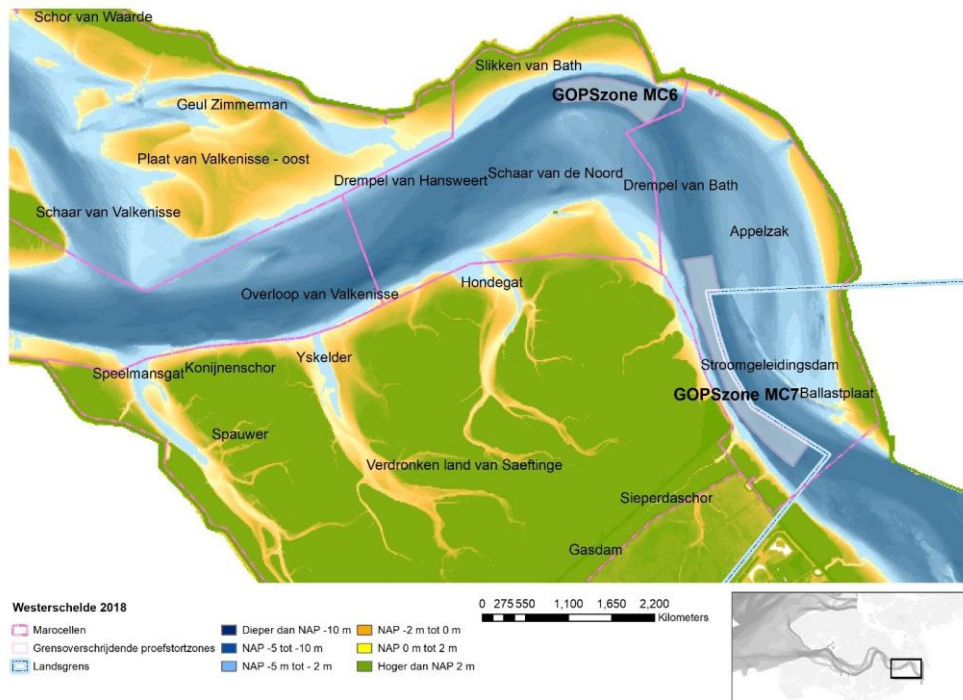
Source: Report 'Systeemanalyse Natuur schelde-estuarium' (Illustrations by Zuidhof A., rvo.nl)

In the Flemish Lower Sea Scheldt sandy material is currently dredged from the sills of the fairway and transported to the relocation site 'Schaar van Ouden Doel'. This submerged relocation site is protected from high water current velocities by a dam. The capacity of the site is maintained by allowing commercial sand extraction in a similar volume as the annual volume of sand that is brought in from dredging activities.

### 3. The solution: a cross-border sediment relocation pilot

The solution being developed is cross-border sediment relocation. The objective of this pilot is to find an alternative (cross-border) relocation site for sand such that the need for commercial sand extraction can be reduced.

One new relocation site in the Lower Sea Scheldt (Flanders) was already introduced in 2017, reducing the need sand extraction from approx. 1.5 Mm<sup>3</sup> to 1 Mm<sup>3</sup>. No other sufficient relocation sites are found in the Lower Sea Scheldt. The next step is to search for alternative relocation sites in the eastern part of the Western Scheldt (the Netherlands), which is just downstream of the Lower Sea Scheldt. Several (5) locations have been considered and evaluated during an exploration phase (2017), which lead to the selection of 2 relocation sites for a field pilot (i.e. the "cross-border pilot"). The execution of this field pilot is subject to licenses according to Dutch legislation (Waterwet and Natuurbeschermingswet) and to the European Directive on the cross border transport of waste.



#### Relocation sites GOPS MC6 and MC7

The field pilot includes the maximum relocation of 750.000 m<sup>3</sup> sand to relocation site 'GOPS MC7' in 2021 and of 750.000 m<sup>3</sup> sand to relocation site 'GOPS MC6' in 2022. The volume of sand which is used for the field pilot will remain within the estuary. Hence, when compared to the original sand extraction level a reduction of 50% can be achieved by executing the cross border pilot.

The IMMERSE activity 4.6, pilot on cross-border solutions for maintenance dredging in the Scheldt, included the following steps: 1) assessing the effects on sedimentation and turbidity, 2) selection of appropriate sites, 3) obtaining the necessary permits, 4) preparing and executing the field pilot, 5) organising the monitoring activities and 6) analysing and evaluating the monitoring results. Results are shared with key stakeholders and broader North Sea Region.



## 4. Development stages

### 4.1. Exploration phase

The concept of a cross-border sediment relocation solution to increase the capacity for relocation of sediment coming from maintenance dredging works in the Lower Sea Scheldt was initiated in 2015.

First research focussed on additional relocation sites in the Lower Sea Scheldt itself. Starting from 2017 the new relocation site 'Parelputten' was used of which the capacity does not need to be maintained by commercial sand extraction as the estuary itself redivides the sediment within the system. Other relocation sites of sufficient size within the Lower Sea Scheldt are not found. This started the process of looking across the border for a possible solution.

In the research phase of exploration, desk studies were carried out by Arcadis (consultancy agency) focussing on both relocation of sand and silty material, possible relocation sites and what the effects of relocation would be on the environment. Several locations for relocation were studied and tested based on criteria which give an indication of the effect on the environment.

General conditions which are adhered in the project are:

- Safety against flood risks must be guaranteed;
- The accessibility of the harbors needs to be ensured;
- The natural condition of the estuary needs to be maintained or improved;
- The dredged material must meet the standards set by the Dutch and Flemish;
- The field pilot is a 'no-regret'-solution, it will not have irreversible effects.

Five relocations sites had been proposed at the beginning of the project. Based on selection criteria these have been reduced to three locations. The selection criteria included: possibility of knowledge development, safety on the long-term (risk of high waters), accessibility (effects on the fairway), nature effects (short and long-term) and the practicality (influence on other projects, cost effectiveness, available volume) of the project. Some of these effects can be studied by numerical modelling (e.g. change in morphology), others by calculations (e.g. costs), others by measurements (e.g. available volume), others estimated based on previous data (e.g. nature effects) and other by comparison (e.g. effects on other projects).

Furthermore, the selection criteria include those criteria as stated in the legislations on which the required licenses are based. The execution of this field pilot is subject to licenses according to the Dutch legislation (Waterwet and Natuurbeschermingswet) and to the European Directives on transport of Waste. An appropriate assessment is carried out to ensure no negative influences on nature values are to be expected, caused by the pilot project.



## 4.2. Feasibility phase

The feasibility phase consists out of translating the desk studies of the exploration phase into a field pilot, taking into account and including licences and permitting.

### *4.2.1. Licences and permitting*

For the execution of this field pilot, several permits needed to be obtained following legislation in Flanders and the Netherlands. For the maintenance dredging in Flanders all licences were available and no additional permitting needed to be acquired. For the relocation of the sandy material in Dutch waters, licences related to the Dutch 'Waterwet' (Water Law) and 'Wet Natuurbescherming' (Nature protection law) needed to be obtained. Furthermore, for the transport of the material itself, across the border of countries, we needed to adhere to European legislation (Waste Transport Directive). Dredged material is seen as waste in European legislation. Permission of both Flemish and Dutch authorities is needed for the transport.

During the development of the measure, extensive data analysis and numerical modelling studies have been carried out to assess that no negative effects were to be expected. The numerical modelling studies dealt with the expected effects of relocation on turbidity and sedimentation in the surrounding salt marshes (including the 'Verdrongen Land van Saeftinghe') and were used as input for the appropriate assessment. Next to modelling of the morphology, also analyses of the chemical and physical quality of the soil was carried out. This as part of the licensing process, to ensure good quality of the to be dredged material as well as to study the grain size distribution.

Required permits needed for the start of the pilot where all received by December 2020.

### *4.2.2. Field pilot*

The field pilot officially started on January 11, 2021 with the relocation of sandy material from the Lower Sea Scheldt towards the Dutch Western Scheldt in relocation site GOPS MC7. However, since the relocation of sand is dependent on the available sediment from maintenance dredging in the Lower Sea Scheldt, the first trip was carried out on January 20, 2021.

As mentioned above, the number of trips as well as the amount of sediment which is relocated cross-border is depending on the regular maintenance dredging works in the Lower Sea Scheldt (need for dredging) and the suitability of the sand for transportation (high quality and sand fraction).

The field pilot will continue until June 2022. Intensive monitoring will continue and adapted if necessarily, an evaluation will be made before switching relocation sites. Every two months the progress of the field pilot is discussed during a transnational steering committee 'Flexibel Storten' of the Flemish-Dutch Scheldt Commission.





## 5. Stakeholder involvement

Relevant stakeholders of the Scheldt estuary have been involved in the development of this field pilot through the 'Schelderaad'. The 'Schelderaad' is a council with Flemish and Dutch stakeholders of the Scheldt which gives input to the Flemish Dutch Scheldt commission. They have been notified of the project by presentations and kept up-to-date on the development of the project.

With one of the stakeholders, more specific one-on-one meetings have been held. This stakeholder was concerned about the increased sedimentation of the saltmarsh 'Verdrongen Land of Saeftinghe' that could result from the field pilot on 1 of the 3 considered relocation sites. Numerical modelling has been carried out to see what would happen in the 'worst-case scenario'. The result of this modelling showed that no significant effect was to be expected. However, this was not able to convince the stakeholder, for this reason, the considered relocation site was cancelled. The two remaining pilot locations should be enough to gain good results for the evaluation of the solution. Furthermore, a good relation with this stakeholder for the future is more valuable.

## 6. Transnational exchange

To share information related to this measure in an attractive manner, an IMMERSE story was created which explains the idea of the measure and its background in an easy to understand way. This IMMERSE story 'Moving sediment across borders' was published on the IMMERSE website and shared through IMMERSE social media channels in November 2020 (story in attachment). The measure will also be included in the IMMERSE interactive communication tool which is seen as the IMMERSE legacy product, targeting a broad audience to inform and inspire about the IMMERSE project and its activities.

The pilot was introduced and presented at the SedNet conference 2021 in the session on 'Impacts of distributed sediment continua and mitigation measures' on June 30, 2021 (abstract as attachment). This was followed with a discussion about the definition of dredging material as waste. This definition can hinder relocation and/or reuse of the sediment.





## 7. Lessons learned

IMMERSE helped advance this measure in its feasibility phase. During the IMMERSE project period, the challenge of cross-border licensing for the pilot, the field pilot itself and part of the evaluation was included. Based on the outcome of this phase, the measure will be able to advance to the preparation phase, however, this advancement is set to occur after the IMMERSE project has been concluded.

The knowledge development we wanted to achieve during this field pilot is two-fold:

- Knowledge related to the administrative burden and permitting required to carry out this activity.
- Knowledge related to the possible effects the relocation of sandy material might have on the environment;

The set-up and start of the field pilot has shown it is possible to organise the relocation of sediment from the Flemish Lower Sea Scheldt towards the Dutch Western Scheldt, across the Belgian-Dutch border. Following the set-up of a monitoring program and restrictions related to the type and quality of the sediment, permits could be obtained. One of the delays of the process however is the definition of sediment as waste. At cause of this European definition, an additional permit to relocate across a country border was required. This permit is only valid for 1 year, so as this field pilot runs for 2 years, this can cause a delay in the continuity of relocation activities. The theme of sediment as waste was a discussion topic during the SedNet Conference 2021 where this pilot was presented. It is the goal of the sediment community to bring up this topic with policy makers as it causes problems for new sustainable projects which make use of this natural resource as building material.

The results of the monitoring program set up to study possible effects of the relocation of sandy material on the environment, have shown no long term effects on the morphology at the relocation site and bordering locations, as the stability of the sediment is low. This means sediment which is relocated, is almost immediately transported again following intrinsic transport ways of the system. Moreover, the amounts of sediment relocated as part of the pilot are low at cause of strict regulations regarding the quality of the material. The results of this monitoring are discussed during the steering committee 'Overleg Flexibel Storten' of the Flemish-Dutch Scheldt commission where the sediment relocation strategy of the Western Scheldt is discussed two-monthly.

The knowledge which is obtained during this measure development can be of great importance to others developing cross-border sediment strategies. Experiences can be shared on how such a process elapses. It is important to look outside of your own area, have good cooperation with others, to share experiences and to be able to look at the bigger picture (estuary/system wide). Especially the licensing process for cross-border projects can be a challenge, however, these are area specific.



Main challenges were the licensing process which takes up a lot of time as well as involvement and participation of stakeholders in defining the field pilot and its sites.

## 8. Achievements

The goal of this IMMERSE activity was to setup and start a field pilot.

The field pilot on cross-border solutions for maintenance dredging in the Scheldt estuary contributes to measure benefit category 'D. Reducing an estuarine pressure' as defined by the IMMERSE project in an evaluation tool for assessing the first result indicator on the increase of measure benefit.

The assessment method used is based on the volume of sand which did not need to be (reduction) extracted from the site 'Schaar van Ouden Doel'. The used indicator is the volume of sand extracted from this site with a baseline value the volume of sand extracted until 2016 (1.500.000 m<sup>3</sup>). The set target is to have an annual reduction in sand extraction of 750.000 m<sup>3</sup> by use of alternative relocation sites which are tested in the pilot. This reduction would mean an improvement of 50%.

## 9. Next steps

The next steps in the development of this measure is to further monitor the effects of relocation and make use of a second relocation site to see if any effects occur at a different location. At the end of the field pilot, the knowledge obtained will be evaluated. On the long term, this measure can be part of a general vision of sediment strategy in the Scheldt estuary, involving both the Flemish and Dutch part of the Scheldt. This measure could contribute to the limitation/elimination of need for commercial sand extraction out of the estuary, upkeeping the sediment balance which is more favorable for the estuary.



## Attachments



# Scheldt

## MOVING SEDIMENT ACROSS BORDERS

The Scheldt is a 355 km long river flowing across France, Belgium and the Netherlands. It can be divided into the non-tidal Upper Scheldt and the tidally influenced Lower Scheldt which includes the Flemish Sea Scheldt (from Gent to the Belgian-Dutch border) and the Dutch Western Scheldt (from the border to the mouth at Vlissingen). The Flemish Sea Scheldt is further divided in the Lower Sea Scheldt (from the border to upstream Antwerp) and the Upper Sea Scheldt (from Antwerp to upstream Gent).



Source: Report 'Systeemanalyse Natuur schelde-estuarium' (Illustrations by Zuidhof A., rvo.nl)

### Current Situation in the Scheldt Estuary

At the moment, sandy material is dredged from the Lower Sea Scheldt to ensure maritime access for the harbor of Antwerp. This material is relocated to the location 'Schaar van Ouden Doel' where the sand is commercially exploited to maintain the capacity of this site for future sediment relocations. However, reducing the amount of sand in the estuary results in an increase of water volume and an amplification of the tidal range.

This creates less favourable hydrodynamic conditions and impacts estuary uses, safety and environmental conditions:

- Navigation conditions are impacted due to lower water levels at low water;
- Flood risk is increased due to higher water levels at high water;
- The capacity for photosynthesis is decreased due to higher turbidity caused by higher current velocities.

For these reasons, commercial sand exploitation in the estuary is seen as a pressure which should be eliminated.

### Long-term sediment strategy

As part of a new long-term sediment strategy, Scheldt estuary management authorities and associated stakeholders are searching for solutions to address this pressure. A proposed solution is to search for new locations to relocate the dredged sediment to eliminate the need for commercial sand exploitation and thus keep all sediment in the estuary. One new relocation site was found in the Lower Sea Scheldt (Flanders) and introduced in 2017. In a next step, cross-border solutions for the continued maintenance dredging of the Sea Scheldt (Flanders) were investigated in the Western Scheldt (Netherlands). A pilot project for cross-border relocation of sandy material was set-up to determine the feasibility of this approach.





# Scheldt

## CROSS-BORDER SEDIMENT STRATEGY PILOT

### Cross-border Pilot Project

The objective of this cross-border relocation pilot (GrensOverschrijdende ProefStorting - GOPS) is to find an alternative relocation site for the dredged sandy material. Several locations have been considered and evaluated, out of which two final locations were selected.

The pilot aims to study the effects on the environment such as how estuary morphology may change and how ecosystems will be impacted, resulting from the relocation of dredged sandy material. The dredged material will originate from maintenance dredging works in Flanders and will be relocated just across the border at two selected sites in the Netherlands. An extensive monitoring program is set-up to measure influences on the morphology and ecosystems surrounding the relocation sites

### Role of IMMERSE

This pilot is an initiative of the Flemish Department of Mobility and Public Works, division Maritime Access as part of and funded by the Interreg North Sea Region Project IMMERSE (IMplementing MEAsuRes for Sustainable Estuaries). The participation within IMMERSE offers the opportunity to improve the pilot and future sediment management in the Scheldt estuary through the exchange of knowledge and results between partners and stakeholders.



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## Cross-border sediment relocation pilot to prevent sediment disbalance in the Scheldt estuary

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### Impacts of disturbed sediment continua and mitigation measures?

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Thematic session number: 7

**Introduction:** The Scheldt estuary is of major ecological and economic importance. It forms the fairway to several harbors and has valued protected nature areas. However, at the moment, the sediment budget of the estuary is decreasing due to persistent sediment extraction, which is a major pressure.

Sandy material is dredged from the Lower Sea Scheldt (Flanders) to ensure maritime access to the harbor of Antwerp. This material is relocated to a sheltered location 'Schaar van Ouden Doel' where the sand is commercially extracted to maintain the capacity of this site for future sediment relocations. However, reducing the amount of sand in the estuary causes a sediment disbalance, resulting in an increase of water volume and an amplification of the tidal range. This creates less favorable hydrodynamic conditions and impacts estuary uses, safety and environmental conditions. Navigation conditions are impacted due to lower water levels at low water, flood risk is increased due to higher water at high water and the capacity for photosynthesis is decreased by high turbidity caused by higher current velocities.

For these reasons, (commercial) sand exploitation in the estuary is seen as a major pressure which should be eliminated. A pilot is set-up to study a possible cross-border solution to decrease the need for commercial sediment extraction.

**Methods:** The objective of this cross-border relocation pilot (GrensOverschrijdende ProefStorting – GOPS) is to find an alternative relocation site for the dredged sandy material. Several locations have been considered and evaluated, out of which two final locations were selected. The pilot aims to study the effects on the environment such as how estuary morphology may change and how ecosystems will be impacted, resulting from the relocation of dredged sandy material at these sites. The material will originate from maintenance dredging works in Flanders and will be relocated just across the border at two selected sites in the Netherlands. An extensive monitoring program is set-up to study influences on the morphology and ecosystems surrounding the relocation sites.

**Results:** The field pilot commenced in the fall of 2020 and will run for two years. Intensive monitoring at the two relocation sites and their surroundings will be carried out and analyzed during the project period.

**Discussion:** The multiple aspects regarding the set-up of this project will be evaluated. This includes the exploration phase with definition of the aims of the pilot and the preparation and execution of a field pilot. Suitable sediment relocation sites for a field pilot were selected using a multi criteria analysis. In preparation of the field pilot with cross-border relocation sites, the environmental effects were assessed to assure compliance with applicable legislation, including the European regulation on shipments of waste. During the field pilot intensive monitoring allows to study the impact of this project on the morphology, ecosystems and the sediment disbalance.

Based on experiences of the permitting process as well as the results of the monitoring and the influence on the sediment disbalance, the pilot will be evaluated. As part of the Scheldt estuary's long term vision, sediment disbalance in the estuary needs to be reduced. This initiative may provide a good measure which can be implemented permanently in the estuary.

**Acknowledgements :** This pilot is an initiative of the Flemish Department of Mobility and Public Works, division Maritime Access as part of and funded by the Interreg North Sea Region Project IMMERSE (IMplementing MEasuRes for Sustainable Estuaries). The participation within IMMERSE offers the opportunity to improve the pilot and future sediment management in the Scheldt estuary through the exchange of knowledge and results between partners and stakeholders.

**References:** IMMERSE (Interreg North Sea Region program) <https://northsearegion.eu/immerse/>