



IMplementing MEasuRes for Sustainable Estuaries (IMMERSE)

Executive Summary of the Report “System Analysis Nature Scheldt Estuary”

Prepared as part of *WP6.6 Develop a long term nature perspective with stakeholders in the Schelde estuary*

The following summary presents the main findings of the report “**System Analysis Nature Scheldt Estuary,**” prepared for IMMERSE Partner Rijkswaterstaat. The original report is available in Dutch on the [IMMERSE Output Library page](#). The main findings are summarized in English below to facilitate transnational knowledge sharing.

Introduction

In the Scheldt estuary there is a very complex government situation, with sometimes strongly opposing stakeholder views. In this situation the governments that are collaborating within the Flemish Dutch Scheldt Committee face ecological goals that are very difficult to reach, especially when taking in account the long-term development of the estuary. Therefore, the Flemish Dutch Scheldt Committee wishes to develop a ‘perspective for nature on the long term’, which goes beyond the legal obligations within the N2000 framework. Such ‘perspective’ requires proper insight on the actual state of the estuary in such a way that there is agreement on the facts. The initiative was taken to make a joint analysis of the natural system of the estuary, with the most important stakeholders and experts.

Many governments and interest groups accepted the invitation. In 2017, as the first step, a plan of approach was accepted by all participants. This plan described the process of joint fact finding. During the spring of 2018 the system analysis started. During numerous sessions a common understanding of the natural state of the estuary was developed. This system analysis was finalized in the first months of 2019 and then presented to the Flemish Dutch Scheldt Committee. It describes the state and trends of the natural system, as well as possible explanations for these observations. The subject is the entire estuary in between the embankments, influenced by the tide, from the weir at Gent up until the imaginary line between Vlissingen and Breskens.

The document focuses on four themes:

- Hydrodynamics and morphology
- Water quality
- Habitats
- Flora and fauna



Summary Hydrodynamics and morphology

The tidal intrusion changed strongly in the last century, shown by the increase in tidal range, which is strongest in the most downstream Flemish part of the estuary, the Sea Scheldt. This trend is caused by changes in the geometry (creating polders, embankments and other hard boundaries), the channels (wider, deeper) and the length (shortening by cutting of meanders) of the estuary. An increase in high-water levels is observed. This will most probably not lead to an end of the multi-channel system of the Western Scheldt. The intertidal areas are still following the rising sea level. This is relevant for ecology as the intertidal areas are important food sources for wading birds and offer rest areas for seals. There are changes observed in the zone from intertidal area to channel, as it is steepening. This is unfavorable for ecology as this has ecological importance for benthic life and birds. There is also a trend to 'less morphological dynamics': both intertidal areas and channels hardly migrate, in contrast to the past. This means that habitats lose pioneer stages.

The water in the Scheldt estuary has become more turbid in several sections. This is due to changes in tidal movement, fresh water discharge and disposal of dredged material containing much mud. The dominant cause differs per location. More turbid water is negative for nature as it decreases primary production. A regime shift to a hyper-turbid estuary is not expected and especially unlikely in the (Dutch) Western Scheldt.

Summary Water Quality

In the second half of the 20th century the water quality situation in the estuary was very bad, especially in the Sea Scheldt. Often periods with oxygen depletion occurred. There was a low rate of primary production by algae, with effect in the entire food web. Chemical pollution and eutrophication were also present. Measures were taken and the shift finally occurred in 2003. The oxygen level became high enough to start primary production, leading to a chain of effects using the ability of the system to restore itself on this part of the food chain. In the period up to 2009 a spectacular improvement was observed: more oxygen and algae, as well as a reduction of heavy metals and other toxic substances. This resulted, amongst others, in an increase of the fish populations in the Sea Scheldt. After 2009 no further improvement and sometimes small setbacks are observed. Even with the better oxygen levels the objectives of the Water Framework Directive are still not reached. The cause is this time an increase in turbidity, limiting primary production and hence oxygen production. As described in the hydrodynamics section a regime shift to hyperturbidity is not expected, but the concentrations observed now, still away from the point where hyperturbidity develops, are already problematic for the ecological functioning. In the waterbed and in organisms, in the whole estuary, there are still substances in toxic concentrations. New problems may be caused by (micro)plastics and endocrine disrupting substances.

Summary Habitats

Habitats provide the space for living to animals and plants. Quality and quantity of habitats are dependent of the (changes in) morphology and hydrodynamics. The system analysis limits itself to the changes during the last two decades but takes occasionally a look further back in time. Most important habitats in the estuary are low-dynamic intertidal areas. These are highly productive habitats with large amounts of benthic life, where birds and fish look for food. Various human interferences have been responsible for the decrease in area of these habitats. In the Sea Scheldt the mudflats bordering the river became higher, less wide and sometimes also 'more dynamic' (higher flow velocities). This is a negative development for benthic life. In the Western Scheldt low-dynamic intertidal area is found both along the banks as well on the shoals. The area remained stable since



2010, probably due to disposal of dredged sediments along intertidal areas. Marshlands are another characteristic habitat. These have increased during the last decade. In the Sea Scheldt this is due to the creation of new, controlled, floodplains. In the Western Scheldt new marshlands were formed on the shoals. One hypothesis is that these shoals are increasing in height as a result of the disposals next to it.

Summary Flora and Fauna

Shifts are observed in species composition and populations. Partly these are coinciding with changes in water quality and partly with changes in habitats. The estuary still houses valuable flora, but there is a trend to fewer pioneer stages and more final stages of succession. This is the result of higher and older marshlands. In the Sea Scheldt the biomass of benthic life did increase at first strongly, due to the better oxygen levels. Later it decreased again. In the Western Scheldt the total biomass of benthic life is stable, but at a low level. Striking is the decrease in the amount of cockle during the last years. Fish stock in the estuary is healthier nowadays. The whole estuary is again important for migratory fish due to the improved oxygen level in the Sea Scheldt. It also regained its function as a nursery area for fish, as can be deduced by the large number of young fishes in the Sea Scheldt. Developments in bird stock are less favorable. The number of birds that migrate to the estuary in the winter has gone down. In the Western Scheldt there is also a decrease in number of breeding birds. When this is compared to other birds in the rest of the Netherlands or Western Europe, it must be concluded that the causes of this decline are within the Scheldt estuary. The situation for seals is good. These had disappeared, but returned. The population seems healthy and is still growing.

Summary for Sea Scheldt

In the Sea Scheldt the water quality has developed in a very positive way, coming from an almost lifeless situation. The food web became more complex and varied during the last decade. For the future there are several points of concern. The first is the increase of salinity in the fresh part, possibly causing stress to fresh water organisms. Another point is the increasing turbidity, which seems to be limiting primary production. This may have consequences for the whole estuary. Finally, the quality of habitats along the banks is under pressure, as a result of increasing flow velocities and steeper slopes.

Summary for Western Scheldt

In the Western Scheldt the effect of improved water quality is less spectacular, as the situation wasn't too bad in the past. The biomass of benthic life is stable, but low. Fish stock and seal population are good. This does not hold true for birds, as almost all species show negative trends. The two main points of concern for the future are the area of low-dynamic intertidal flats and primary production.

Advice

Stakeholders that participated in the joint fact finding have expressed how they feel on the 'state' and trends of the estuary, based on the knowledge of the system analysis. This has led to an advice to the Flemish-Dutch Scheldt Committee.