RSPB Briefing Note: The Eastern Scheldt Storm Surge Barrier

The Eastern Scheldt Storm Surge Barrier was built in response to the devastating floods that hit both The Netherlands and Britain in 1953.

- **At 9km long, it is half the length of the proposed Wash barrage. Due to its length, an artificial island had to be created between two other islands.**
- **The overall cost of the project was £2.5 billion. In today's money, the cost would be between £7 and £16 billion to construct.**
- **The barrier was initially designed to be a closed system, but after public outcry over concerns for the future of the estuary behind, it was made permeable through a series of large gates which can be closed when there is a risk of tidal flooding. Each gate is 42m wide.**
- **The construction of the dam took over 10 years.**
- **It is supported by 62 pillars, each of which is made of 7000 cubic metres of concrete and filled with sand and stone once installed.**
- **There are Dutch laws which regulate when the dam can be shut; only once water levels reach 3 metres above normal height.**
- **Since completion in 1986, it has been closed 27 times.**
- **The barrier is human-operated, and costs around £14 million a year to operate.**
- **In 2015, 5 turbines were installed in one of the gates to demonstrate the ability to produce tidal power. They produce around 1.25 MW, enough power for 1000 homes.**
- **Millions of pounds have already been spent trying to reverse the impacts of the barrier on important habitats and species in the estuary (e.g. https://webgate.ec.europa.eu/life/publicWebsite/project/LIFE06-NAT-NL-000077/salt-marsh-restoration-eastern-scheldt)**

The impacts of the Eastern Scheldt barrier have been documented by a number of studies. These have assessed the ecological impact, as well as the changes to estuarine processes. The following provides a summary of the key findings:

Impact on Birds

There is now an extensive dataset available on bird trends on the Eastern Scheldt estuary. Waders have been significantly affected, with a 31% decline between construction and 2008. Oystercatcher appear to have been particularly impacted, with a decrease in survival rates and an increase in emigration rates detected during severe winters, in comparison to those rates prior to construction. In addition, birds using sites which have so far remained intact have demonstrated increased site fidelity, suggesting that birds need to rely on these sites more heavily than they would previously. Overall, this means the population of Oystercatcher is now less resilient to extreme environmental conditions and environmental change.

In addition, evidence indicates that erosion of the intertidal area has so far been primarily occurring in the upper reaches, those areas that are least important to foraging waders. Extensive modelling suggests that once the upper reaches have eroded the middle and lower intertidal area, those areas that are most important to foraging waders, will then start to erode. By 2080, it is predicted that, without intervention, the entirety of the intertidal area of the Eastern Scheldt estuary will have disappeared, with catastrophic consequences for wading birds.

Impact on Harbour Seal and Harbour Porpoise

Harbour Porpoise are known to use the Eastern Scheldt estuary, with adults and calves observed annually. They orientate themselves, and hunt, using echolocation. Due to the strength of the currents and strong turbulence caused as the tides pass through the barrier, this echolocation ability is restricted when in close proximity to the barrier. In addition, they do not like to move through narrow spaces. Thus, the barrier restricts the movement of Harbour Porpoise in and out of the estuary. At this time, no animals have been observed or radio-tracked crossing the barrier and there is some evidence to suggest that mortality of animals is higher in the estuary than along the rest of the Dutch coastline.
The barrier is believed to have a minimal impact on Harbour Seal, given the large size of the gates which allow animals to pass through. 12.5% of radio-tacked Seals have passed through the barrier readily. They are also expected to avoid collision with the turbines, due to their ability to detect moving turbines. There is around 5.5m of water between the lower blade of the turbine and the seabed, so in theory Seals could move under the turbines. Seals have been observed around the eddies generated by tidal currents, and there is suggestion that this could be a learned foraging behaviour where fish are either funnelled through or damaged by the strong currents that pass through the gates.

Impacts on the Tidal Range and Sedimentation

In the year construction was completed on the barrier, the mean high tide level dropped by nearly a metre, completely excluding higher parts of the saltmarshes in the estuary from tidal flooding. Despite the barrier only closing on a very small number of occasions, water exchange with the North Sea has reduced by 28% and the total area of the estuary under tidal influence has reduced by 22%, with subsequent changes in salinity and water quality. There has also been an overall decrease in sediment volume within the estuary. Erosion rates within the Eastern Scheldt have changed, with intertidal areas of the estuary strongly eroding. This observed change began almost immediately after the construction of the barrier. The intertidal areas are predicted to completely vanish by 2080, and whilst sand nourishment has been proven to reduce the observed degrading of intertidal areas, experts interviewed as part of the research on the barrier suggested the only long-term solution to preserve and protect the area is to recover the original hydrodynamics and geomorphology of the basin, in other words, remove the barrier.

For more information visit:
https://datazone.birdlife.org/sowb/casestudy/poorly-planned-responses-to-coastal-flooding-have-negatively-impacted-waterbirds-in-the-netherlands

References

de Bok, C. (2002). Long-term morphology of the Eastern Scheldt. Werkdocument RIKZ, 2002.108x. Rijksinstituut voor Kust en Zee (RIKZ): The Hague.

Duriez, O., Sæther, S.A., Ens, B.J., Choquet, R., Pradel, R., Lambeck, R.H.D. and Klaassen, M. (2009), Estimating survival and movements using both live and dead recoveries: a case study of oystercatchers confronted with habitat change. Journal of Applied Ecology, 46: 144-153.

Eelkema, M., Wang, Z, B., Hibma, A., & Stive, M, J, F. (2013) Morphological Effects of the Eastern Scheldt Storm Surge Barrier on the Ebb-Tidal Delta, Coastal Engineering Journal, 55:3.

Granda, M, S. 2018 Achieving Natura 2000 by Building with Nature in the Eastern Scheldt. University of Utrecht (UU) Faculty of Geosciences.

Jansen O,E., Aarts G, M., Reijnders P, J, H. (2013) Harbour Porpoises Phocoena phocoena in the Eastern Scheldt: A Resident Stock or Trapped by a Storm Surge Barrier? PLoS ONE 8(3).

Schekkerman, H., Meininger, P.L. & Meire, P.M. Changes in the waterbird populations of the Oosterschelde (SW Netherlands) as a result of large-scale coastal engineering works. Hydrobiologia 282, 509–524 (1994). https://doi.org/10.1007/BF00024652

SEAMARCO Position paper: Effects of the Eastern Scheldt Storm Surge Barrier and tidal energy turbines on Harbour Porpoise (Phocoena phocoena) and Harbour Seal (Phoca vitulina) movements. February 2019.

Smaal, A, C., Nienhuis, P, H. The eastern Scheldt (The Netherlands), from an estuary to a tidal bay: A review of responses at the ecosystem level, Netherlands Journal of Sea Research, Volume 30, 1992, Pages 161-173.

de Vet, P, L, M., van Prooijen, B, C. & Wang, Z, B. 2017. The differences in morphological development between the intertidal flats of the Eastern and Western Scheldt. Geomorphology Volume 281, Pages 31-42.

Protecting habitats, saving species and helping to end the nature and climate emergency.

Nature is in crisis. Together we can save it.

For further information, please contact:

Phil Pearson, RSPB Senior Conservation Officer (Norfolk & Lincolnshire)
07715041452
philip.pearson@rspb.org.uk

Ed Tooth, RSPB Conservation Officer (The Wash & North Norfolk Coast)
07823 553449
ed.tooth@rspb.org.uk