

River pollution and coastal sediment quality

Reducing river pollution increases sediment quality

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Summary

Pollutants affecting the Dutch coastal zone mainly come from point and diffuse land-based sources. Transport to the sea is largely by rivers where the chemical compounds adhere to clay and silt particles. In the past there have been damaging effects on the environment. National and international efforts to reduce the contaminant levels of the rivers Rhine, Meuse and Scheldt have been successful, in the last two decades of the last century. This decreased polluting load resulted in a strong reduction of concentrations of chemical compounds in coastal sediments. Reductions have been observed in the load and concentration of metals, PCBs (Polychlorinated biphenyls) and in PAHs (Polycyclic aromatic hydrocarbon). The total nitrogen and phosphate loads were also reduced.

River basin management has been successful in contributing to the cleanup of rivers. The struggle to reduce contamination involved a successful, dual track policy:

- National efforts: to clean Dutch own sources and
- International efforts: to reduce the upstream emissions through long term, ministerial conferences and negotiations between the riparian countries of the river basins.

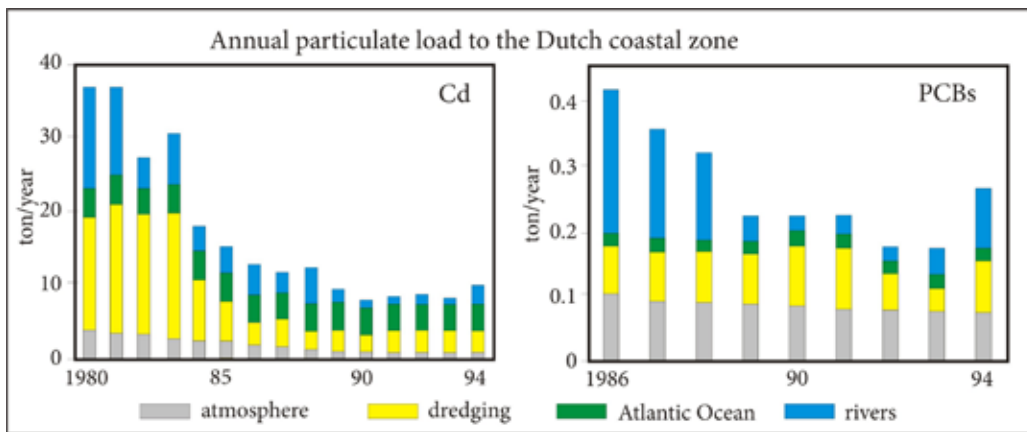
The basis for these negotiations was frequent and systematic monitoring and setting of pollution standards by scientists in close cooperation with the policymakers, in the river basins. The benefits, especially for the low-lying areas of the Netherlands were improved water and coastal sediment quality. This contributed, for example, to the improvement of the seal reproduction in the Wadden Sea (the Dutch, German and Danish intertidal area with its tidal channels and creeks).

The chemical compounds in the Wadden Sea sediments followed the same trend then those off the Dutch North Sea coast. However, a time lag between the cleaning of the river sediments and the decrease of pollutants in the top layers of Wadden Sea sediments, is observed. Possible mechanism to explain this are that bottom dwelling organisms, such as lugworms, and storms, mixing the deeper and more contaminated layers with the less polluted surface sediments freshly deposited. The released, resuspended polluted particles are transported further east into the Wadden Sea.

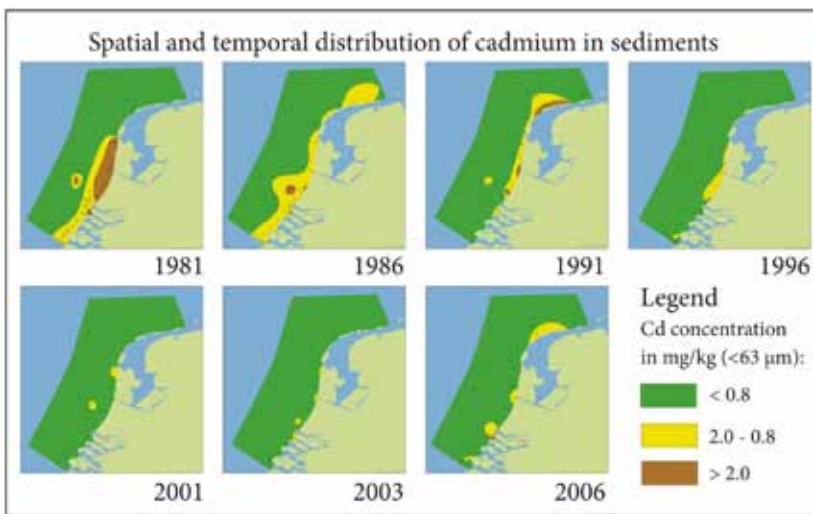
The spectacular cleaning of river, North Sea and Wadden Sea sediments, shows that meticulous cleaning of the sources of pollution, monitoring, international negotiations and cooperation benefit all the riparian countries.

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Reduction in pollutant load to the Dutch coastal zone, during 1980 -1994: Annual particulate load in ton/year of Cd (cadmium) and PCBs (Poly chlorinated biphenyl) from various sources to the Dutch coastal water during the years 1980-1994. (from Sonneveldt and Laane, 2000)



Spatial and temporal distribution of cadmium (Cd) in the surface sediments (grain size fraction <63μm) in the Dutch coastal zone illustrates a strong reduction of Cd in the North Sea coastal sediments. (from Hegeman and Laane, 2008)

**Serious warning during the 1980s...
Cleaning-up is needed:**

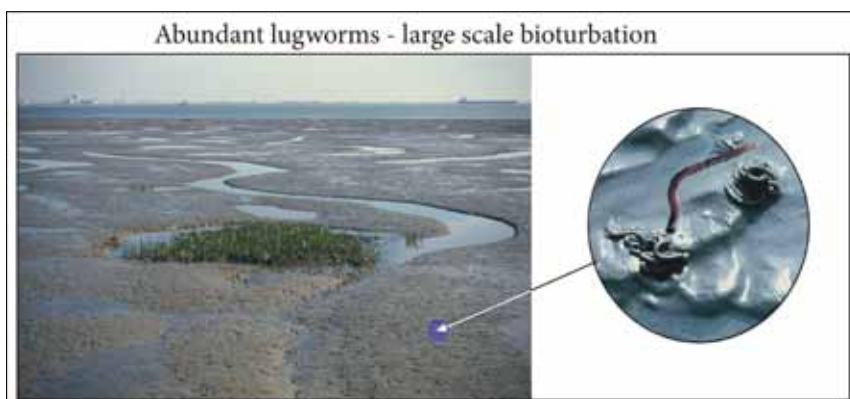
Foam of massive dying algae along the Dutch coast, related to high level of nitrogen and phosphate in Dutch coastal waters.

Liver cancer in the North Sea flounder. (Platichthys flesus L.)



(photo: Harry van Reeken)

(photos: Dick Vethaak)



Abundant pier piles in the freshly accumulated sediments of the Wadden Sea intertidal flats, indicating large scale bioturbation activities, which also contribute to the retardation of the “cleaning-up” process. (photo: // beeldbank.rws.nl, Rijkswaterstaat)