PROJECT
MSZD01 Fresh and salt water in the delta

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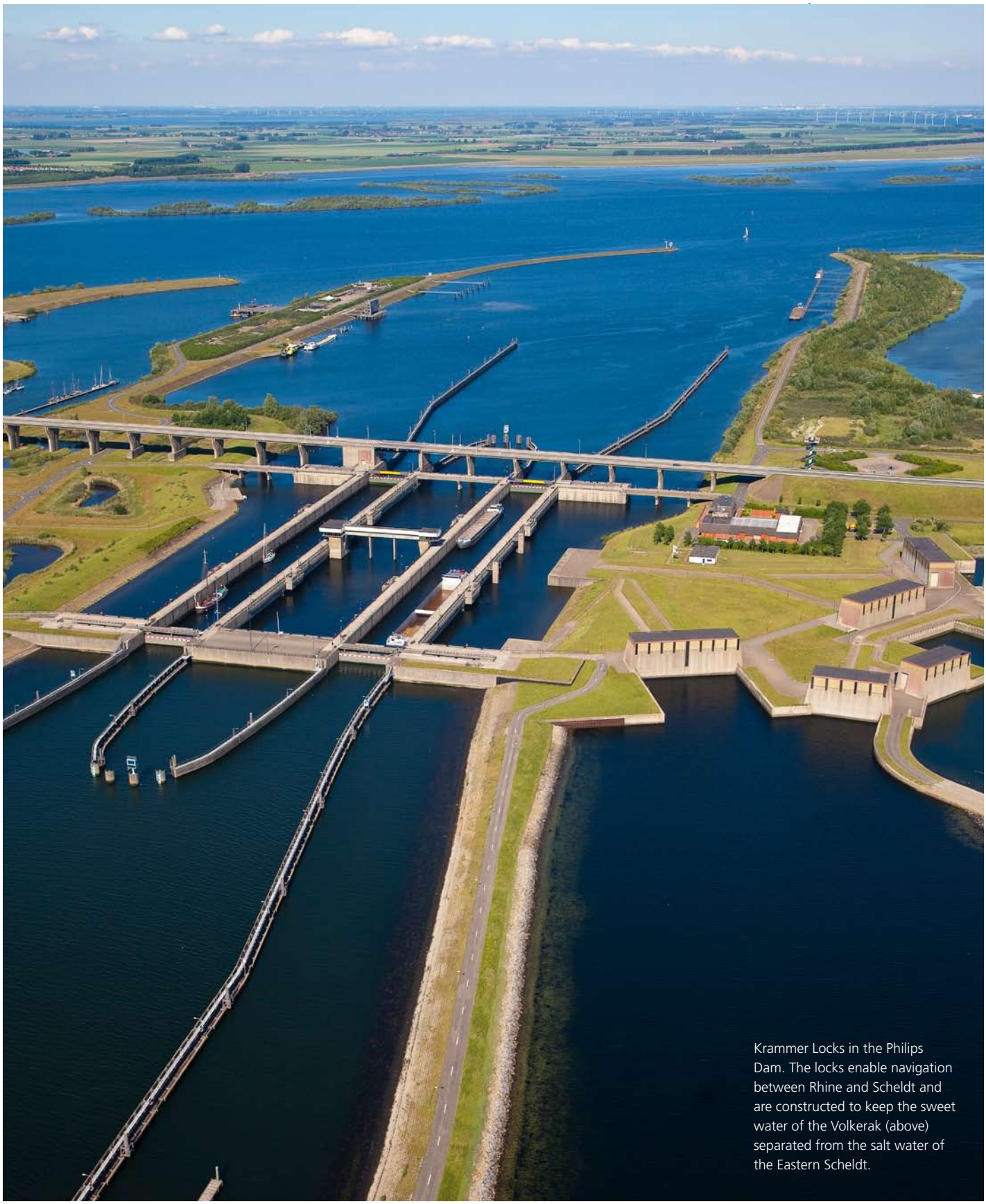
Fresh and salt water in the Delta

The South-western Delta consists of the estuaries of the rivers Rhine, Meuse and Scheldt. Interactions between sea, rivers and land are characteristic for the whole area.

THE AREA IS IMPORTANT as strategic fresh-water reservoir for the rural area to the east, for river-discharge regulation (peak discharges of the Rhine-Meuse are diverted from the port of Rotterdam), for recreation (aquatic and cultural), aquaculture (shellfish, lobster, etc.), nature (especially relict intertidal areas), and as gateway to the port of Antwerp (Westerschelde). While the Deltawerken are still an international icon for Dutch water management, current land-use and water-management plans put emphasis on their environmental impacts (water quality), as well as prospected climate change. Currently water management strategies and land-use plans are reconsidered in order to minimize flood risks, optimize freshwater availability, reduce salinisation, and improve water quality and biodiversity, as most recently described in the National Water Plan (2008). Two main fresh water basins, constructed as part of the Delta Works, are the Haringvliet and the Volkerak-Zoom lake. The unlimited fresh water availability created opportunities for the development of agriculture and drinking water supply, thereby boosting economic development.

It has recently been decided to manage the Haringvliet sluices in such a way that a small fresh-saline gradient is established ('Kier besluit'), in order to reduce the current water-quality problems. In the Krammer-Volkerak Zoommeer lake (especially algal blooms) it is an objective to restore estuarine dynamics (i.e. a saline gradient) in the year 2015 (the decision making process is on-going).

Re-introduction of a saline-freshwater gradient in the Krammer-Volkerak Zoommeer may reduce the occurrence of algae blooms, but it reduces fresh-water availability for agriculture, drinking-water supplies and greenhouse horticulture in the region. Possible solutions are increase of fresh water supply and distribution, inclusive alternative internal



Krammer Locks in the Philips Dam. The locks enable navigation between Rhine and Scheldt and are constructed to keep the sweet water of the Volkerak (above) separated from the salt water of the Eastern Scheldt.

A huge volume of fresh water is used to keep the system fresh, while only a small percentage is used for irrigation or potable water.

or external freshwater sources, (b) land-use and local water-management transitions geared at more efficient freshwater use and/or the introduction of other forms of agriculture (salt-water agriculture or aquaculture).

The project

The major challenge is to develop the southwest part of the Netherlands in a sustainable manner, including the restoration of the estuarine dynamics under a changing climate, thereby safeguarding the freshwater supply for agricultural and other uses. A number of possible approaches have been identified:

- supply follows demand, i.e. guarantee fresh water supply artificially by separation from the natural environment (external supply)
- demand follows supply; i.e. adaptation to the natural environment
- a combination of 1 and 2 including the applications of innovative technology

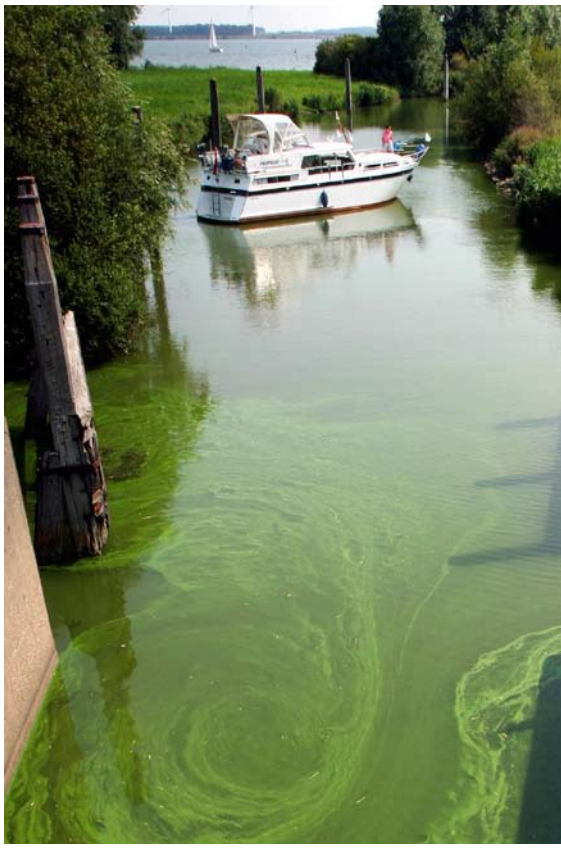
Specifically the project focussed on the following aspects:

- To investigate whether new approaches to the supply of fresh water and/or the current land use are desirable or required in the context of a changing environment
- To list the knowledge caps that need to be resolved before a substantiated decision can be taken towards possible changes to the water supply system and/or land use.

Approach

The investigation has been carried out for eight different areas in the southwest delta, that are directly affected by the planned interventions and climate change. For each of these study areas, data and scientific insights have been collected on the current water demand for the different sectors and on water supply. Based on different climate scenarios [1] and the proposed interventions to the system, the bandwidth of expected changes to the available fresh water has been determined.

In order to select the most important factors affecting the water demand and availability, besides the scenarios, the water- and salt balances of the different regions have also been looked at. The factors include the intensity of up-welling of brackish groundwater, the actual volume of freshwater being used for different uses, the chloride concentration in the drainage system and the salt sensitivity of different crops and natural ecosystems.



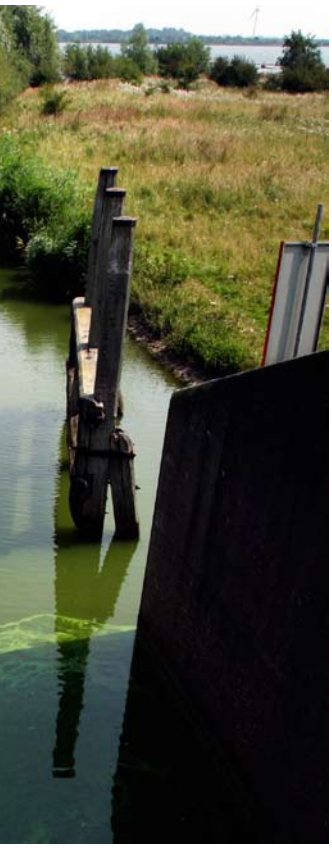
Given the possible approaches the study suggest different viable options for land use, water-management, and water-technology for the long-term future. Also for the near future the study suggests no regret measures in order to adapt or resist to the expected changes.

Results

The preliminary water balances clearly show a low conveyance efficiency [2] of a number of areas with respect to the fresh water use. It has been shown that only a small percentage of the total fresh water intake is used for irrigation or drinking water. The largest part of the intake is used for flushing out the salt from the system and for sustaining the water levels. In other words, a huge volume of fresh water is used to keep the system fresh, while only a small percentage is used for irrigation or potable water.

Resisting strategy

Given the small demand with respect to the total intake, it seems logical to look at measures that limit the volume of water required for washing out and sustaining the water levels. The dependency on external supply will decrease while the self-



In summer algal bloom is a major problem in sweet water bodies in the Netherlands.

sufficiency will increase. The measures to be taken would include structural changes to the whole water management system.

Adaptation strategy

For this strategy the salt water intrusion is no longer controlled. The system is no longer maintained fresh implying that that the intake of fresh water is no longer required. It does imply that the fresh water supply is separated from the natural system. This could involve a change in cropping patterns or to innovations in water-technology, such as desalinisation.

Outlook

The challenge is to select the most viable strategy. The preference mainly depends on the characteristics of the area, and the inefficiency in particular. The characteristics would include the sensitivity to salinisation but also the type of agricultural practices. The study has clearly shown that in order to develop strategies to cope with climate change in areas sensitive to salinisation it is essential to understand the water balance both in terms of quality and quantity. It has been illustrated that in some areas the inefficient fresh water use is the major challenge while other areas can be climate proof with only limited interventions.

Knowledge caps

The study has identified a large number of technical knowledge caps that need to be answered to make a selection of measures that eventually leads to a climate proof freshwater supply. In addition to technical knowledge, a number of policy considerations have been proposed to focus the research for the coming years:

- Before selecting and implementing measures, make a well considered choice of a policy strategy
- Consider whether a top down policy approach is required or whether there are opportunities for local initiatives
- What are the opportunities, challenges and benefits of a participative approach when formulating regional options in policy strategies
- Fresh water supply should be considered in relation to other water issues, such as safety, saltwater intrusion, and storage.

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2] Definities van field application efficiency (efficientie van watergebruik landbouw) and conveyance efficiency (efficientie van water distributie) die FAO hanteert invoegen.