

The Dutch water sector: Resourceful and cooperative



From reclamation of the Zuiderzee... (Source: Rijkswaterstaat)



...to designing and building a floating city (Source: Dura vermeer).

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tion, port development, coastal zone management and dredging) and 'water technology' (including wastewater treatment, drinking water and sanitation). But the Dutch are equally at home in sustainable irrigation techniques and wetland conservation, in the use of ICT and GIS technology to enhance water management, and devising smart (i.e. small-scale, cost-effective) sanitary, water supply and treatment facilities to help improve living conditions.

Sustainable
On a different level, research, education, capacity-building and institutional development

rank high on the Netherlands' international water agenda. The Dutch government is strongly committed to an international water management effort and has signed a number of bilateral agreements to advance integrated water management across the globe by exchanging knowledge and experience and cooperating in the sustainable development of water systems. The Dutch water sector covers every aspect of modern water management. It is therefore able to act as both a reliable and knowledgeable partner in the search for solutions to the world's water challenges.

Solving delta dilemmas

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ered in relation to spatial planning, economic development and nature development. Delta technology encompasses all forms of

hydraulic engineering and water control. This integrated approach ensures the sustainability of measures. The Netherlands uses delta technology not in response

to change, but in anticipation of change.

Threats and control
Dikes and dams can keep water out, but only up to a

Delta works: A series of innovations

The first of the Delta Works was already in operation in 1958. This was the storm surge barrier in the Hollandse IJssel river. This barrier (not a dam) was of great importance because it protected the densely populated Western Netherlands conurbation. By 1976 seventeen 60-metre-wide sluices were operational in the mouth of the Haringvliet, draining off excess water from the Rhine. The Brouwers Dam, situated south of the Haringvliet Dam, was finished within the next year. Also in 1976, the government agreed to build an open barrier, the Eastern Scheldt storm surge barrier, containing a number of sluices to protect the Zeeland

delta and preserve the saltwater habitat of the Eastern Scheldt. The sluices were only to be closed when storms and high water levels made it necessary. To maximise the amount of salt water passing through the sluices and maintain tidal flow, the 3,000-metre-long barrier (completed in 1986) has 62 openings, each of them 40 metres wide. It is still one of the biggest structures in the world. The Maeslant barrier in the Nieuwe Waterweg is the final part of the Delta Works masterplan. Completed in 1997 it consists of two swing gates that can be closed at will to protect about one million people in the province of Zuid-Holland.



Eastern Scheldt storm surge barrier (Source: ©iStockphoto.com/Klaas Lingbeek-van Kranen)

The Netherlands

Total area: 41,500 km²
Land: 33,800 km²
Water: 7,700 km²

Primary flood defences

Total: 3,500 km
River dikes: 1,430 km
Lake dikes: 1,017 km
Coastal defences: dikes (430 km), dunes (260 km) and a wide range of flood barriers, dams and weirs.

point and certainly not for ever.

Living with water is a more sustainable approach than waging a constant battle against it. The Netherlands has always tried to strike a balance between the two. The result is a form of mutually beneficial give and take. Land reclamation (for example, to provide extra space for agriculture or industry) goes together with the deliberate surrender of some areas for purposes of water retention and storage. The building of massive storm surge barriers

to manage water and use it in sustainable ways. They are born innovators.

Building barriers

Dutch expertise in the design and construction of storm surge barriers has been put to good use both at home and abroad. As recently as 2002, an inflatable dam was constructed at Ramspol: a flood barrier consisting of three huge bellows made of rubberised cloth, which fill with water and air when flooding is imminent. This provides effective protection against

Moving earth



State-of-the-art creation of new land (Source: Boskalis).

When it comes to dredging, the Netherlands has an outstanding reputation. Two Dutch dredging companies account for some 40% of the global market. From primitive forms of dredging and land reclamation have sprung sophisticated techniques and methods, now used in the construction and maintenance of ports and waterways, the protection of coasts and shores, and the creation of new land. The Netherlands itself still acts as a testbed for

even more efficient, innovative or sustainable dredging techniques. At a dredging sludge depot on the Maasvlakte (De Slufter), for instance, primary separation of sediment is achieved by combining separation techniques. Part of the resulting product is sand of such high quality that it can be used immediately as a construction material. The remaining sediments can be re-used following treatment in an extractive cleaning plant.

Deltares: Enabling delta life

In order to concentrate and apply relevant knowledge and experience, the Dutch water sector has established the Deltares Institute for Delta Technology. The purpose of this independent institute for applied research and specialist advice is to assist in the sustainable development of densely

populated delta regions. By bringing together expertise on water, soil and the subsurface, the institute seeks to meet the challenges posed by the physical planning, design and management of vulnerable deltas, coastal areas and river basins throughout the world.



The Meuse, combining flood protection with the creation of new conservation areas and the improvement of wildlife habitats (Source: Rijkswaterstaat).

world's coastal areas, Dutch dredging companies are involved in broadening beaches, extending ports or industrial areas, and even creating entire new islands. Modern dredging methods are increasingly being used to fight coastal erosion. Keeping the coastline in its current position is a process of constant measuring, monitoring and planning to ensure that the right amount of sand nourishment takes place in the right places. Sand supplementation is not just a way of keeping beaches intact; it is a fundamental measure to protect land against the force of the sea. Not surprisingly, sand nourishment is increasingly being used to provide a 'soft' defensive line in several places all around the world. But why stop at maintaining the coastline? At present, the Dutch coastline has some weak spots which need to be improved in order to meet current safety requirements. At the same time, the Netherlands faces rising sea levels and heavier use of the coastline for recreational and wildlife purposes. A broader, stronger coast would provide

an answer to these challenges. As part of an innovative approach, the sandy beach could be reinforced by more substantial sand supplements. If the extra sand is deposited in the right places offshore, the current and waves would automatically spread it along the coast in such a way a naturally balanced coastline will be created. This is regarded as a promising approach, using natural processes to create more space for wildlife and reinforce coastal defences in a sustainable, low-maintenance way. An example of what the Dutch like to call 'building with nature'.

Room for the river

A similar new approach is being used in the field of river basin management and flood control. It takes the spatial claims and natural values of the river as the starting point. In view of anticipated climate changes, it is thought likely that the rivers in the Rhine delta will have to accommodate ever-higher peak discharges. Until recently it was standard policy to maintain the required level

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to hold back the sea goes hand in hand with 'building with nature': using valuable natural features as the starting point for the design of delta landscapes and coastal zones.

Engineering

The Dutch have specialised in hydraulic and civil engineering. As early as the 6th century BC, settlers built artificial mounds - 'terpen' - on which to seek refuge from floods and high tides. In the 15th century, windmills were used to pump away unwanted water.

The Delta Works were constructed in the 20th century. This series of massive dams and barriers designed to protect the Dutch Delta against the sea, is famous around the world. Today, Dutch engineers are designing entire climate-proof floating cities. Whatever the challenges, the Dutch always respond by developing new techniques and technologies

the rising water, does not obstruct shipping and is relatively cheap. It is the only inflatable dam of this size and operating on such a scale anywhere in the world. Because storm surge barriers offer a more flexible method of protection against flooding than dikes or dams, Dutch experts are consulted on projects around the world. Teams of consultants and engineers have been involved in the development of protective barriers in Venice, London and St. Petersburg. From carrying out feasibility studies and environmental assessments to the actual construction of water defences, the Dutch water sector covers every aspect of flood control.

New land

In densely populated areas, where space is at a premium, the construction of new land creates exciting and necessary opportunities. In many of the



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