



Experiments with artificial reefs. PHOTO ECOSHAPE

## LIVING COASTAL DEFENCES, WIDER **Innovative**

**Officials and engineers from Japan to Holland are experimenting with new types of flood prevention. Dikes and rivers are being widened and provided with natural buffers and wetlands. Nature is no longer the enemy – now she's our ally.**

JACO BOER

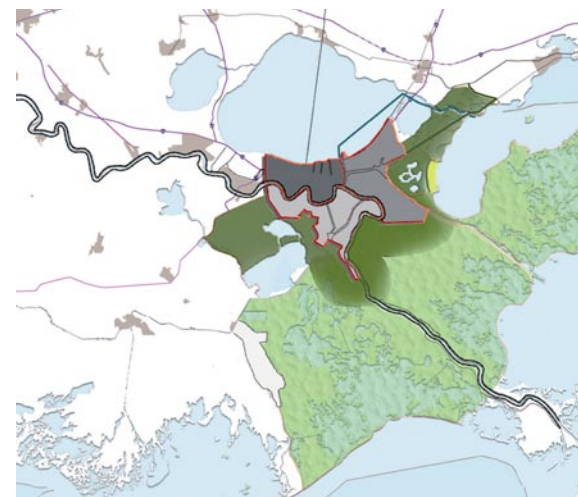
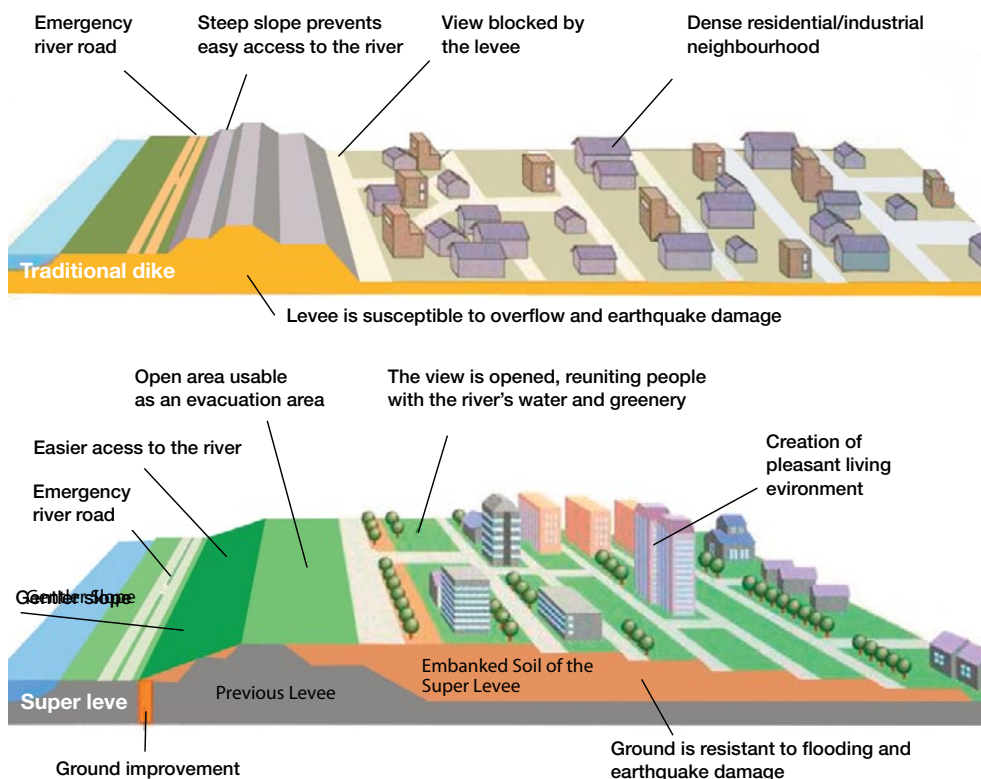
There's a lot going on in the world of the hydraulic engineer. In the past, when seeking to protect the coast and hinterland, engineers thought mainly in terms of dikes and dams, but now they're experimenting with new solutions. Even if they do opt for a dike in the end, it often looks very different from what we're used to. The water engineers in Tokyo, for instance, dreamed up the 'super levee'. Step-by-step since 2006 they have been building a ten-metre-high dike along the Arakawa River, with banking that can stretch as much as 300 metres. A wide defence like this is much sturdier than the traditional, narrow dike, because the bank on the landward side has only a gradual slope. Moreover, you can build housing, roads or offices on the dike, so the space can be used in two ways. This is a major advantage in densely populated cities where land is scarce and expensive.

### **Living coastal defence**

Hard flood defences are nowadays also often combined with natural buffers, like tidal salt marshes and swamps. These living barriers drain the power out of the waves before they reach the high dikes. Moreover, the area gains a valuable nature reserve, which people can use for recreation. Mindert de Vries from the independent research institute for Delta Technology

## RIVER BEDS AND OPEN WATERS

# flood defences



An example of the potential of Green Adaptation by Building with Nature for the Mississippi delta. Restoration of marshes could enhance the protection against storm surges and enhance the vitality of the local ecosystem. A comparable case in the Netherlands indicates that construction of a wave reducing marshland forest in front of a dike could be a safe, multifunctional and cost-effective solution.

Deltares is involved in a number of these 'eco-engineering' projects in America and Singapore. "The idea of building in cooperation with nature has been around for some time, but working with living organisms is quite new for the hydraulic engineer." Recently his company did a feasibility study for Louisiana, looking at restoring the swamplands that had been destroyed by hurricane Katrina. "That would protect the area against new storm surges as well as delivering 40 hectares of new nature reserve", De Vries said. The main challenge was to find inexpensive ways to create a dense swamp in a short time frame. They succeeded in the end, and Deltares is now

waiting for the green light from all parties so they can get on with the project.

### Mangroves and coral reefs

Deltares is also involved with Dutch engineering companies, such as DHV and Arcadis, in a study to improve coastal protection in Singapore. This doesn't involve setting up tidal salt marshes or swamps; instead, they're considering planting tropical vegetation like mangroves and sea grasses. They are also looking at constructing artificial reefs where coral can attach itself. The main thrust of the research involves the environmental conditions under which these tropical plants and

animals flourish best. In this way the scientists hope to discover how these ecosystems can be used deliberately as natural coastal protection. Deltares is mainly involved in actual experiments with these natural embankments. "We're doing a lot of field tests right now", says De Vries. The project is being conducted in close association with local government and universities in the region, both of which are interested in this new type of coastal protection, which should deliver solutions that are both more climate friendly and space saving. This is why the Government is paying a large portion of the research costs.

## Liberate the river from its straitjacket

### Room for the river

Many experts now agree that it is far better in many cases to give water more room and 'liberate the rivers from their straitjackets'. This increases their resilience and their ability to cope with extreme

flows. Solutions like this can even deliver building opportunities in urban areas. In the Dutch city of Nijmegen, for example, the city managers and several businesses have put together a plan to widen the bed of the River Waal by building a river park right in the city's centre. This will involve relocating the northern flood defence 350 metres inland. An extra arm of the river will flow through the new area outside the dike, which means that at high water the level in the Waal can drop by 27 centimetres or more. Marten Hillen, who is working on the plan for engineering company Royal Haskoning, believes the

project is unique. As he puts it, "The city is better protected against floods and right in the middle you gain a beautiful nature area, which can be used for housing or leisure pursuits. That will give an enormous boost to Nijmegen." ■

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Artist's impression of how the Waal River at Nijmegen will look after relocating the northern flood defence. ILLUSTRATION ROYAL HASKONING

