

## Questioning the 'Dutch Solution'

**KRAGGENBURG, THE NETHERLANDS**—Dutch scientists are making waves—literally. In a hangar here, researchers from Delft Hydraulics, a research and consulting institute, have built a 4-meter-wide slice of a dike at the end of a basin, used to mimic the North Sea crashing into the coast. Their goal: to test how different types of surface materials weather the thunderous onslaught.

Even after a millennium of hard-won experience, the Dutch are still perfecting the art of dike construction. They have little choice. More than half of the country—including Amsterdam, Rotterdam, and most of The Hague—lies below sea level and continues to sink, and the water is expected to rise as a result of climate change. Three major, often erratic, rivers compound the challenge. No wonder that many in the United States are wondering if the Dutch experience holds lessons for New Orleans.

Scientists in both countries agree that some of the technology developed here could be useful, and Dutch institutes and businesses are eager to help. But their offers come at a time when Dutch water management is increasingly questioned at home. Some scientists say the reliance on engineering prowess is not only ecologically harmful but has increased vulnerability in the long run. The national mindset shouldn't be exported without awareness of its downsides, cautions Toine Smits, a water management expert and professor at two universities.

The Dutch, too, learned their lessons the hard way. On 1 February 1953, a severe North Sea storm combined with a spring tide burst through neglected dikes in hundreds of places, killing more than



**Safety first.** The Delta Works, a response to the 1953 flood in the Netherlands, consists of a series of dams including a storm surge barrier across the Eastern Scheldt (*above, right*).

1800 people and flooding 2000 km<sup>2</sup> in the southwestern provinces. The answer, built over the subsequent 45 years, was The Delta Works, a series of dikes, dams, and other structures that closed off the major sea arms in the southwestern delta—destroying entire ecosystems in the process—and shortened the coastline by 600 kilometers.

Dikes that protect the most densely populated areas of the country are built to withstand all but storms expected once every 10,000 years, says Delft Hydraulics director Huib de Vriend.

Louisiana's geography is different, and no one is talking about damming the Mississippi Delta. Still, some Dutch solutions may work, says Bruce Good of the U.S. Geological Survey. After an intense political battle, for instance, the Dutch decided against permanently closing off one estuary; instead, the Eastern Scheldt was equipped with a "storm surge barrier" that shuts only in emergencies. Although pricey—the project cost more than \$1 billion—a similar solution could be used to block Lake Pontchartrain from the Gulf of Mexico while saving its ecology.

But in the end, protecting low-lying areas with dikes only is a "dead-end street" that should be avoided if possible, says Henk Saeijs, a former civil servant and professor at Erasmus University Rotterdam. When natural sedimentation stops and groundwater levels are kept low, the land sinks, requiring ever higher dikes and bigger pumps to get the water out. ("Pumping or drowning" is a national motto here.) Meanwhile, the illusion of safety lures people and investments, making future floods even more costly.

Although there is no turning back for built-up areas, it's "utterly crazy" to keep urbanizing areas far below sea level, as is still happening in the Netherlands, Saeijs says. Instead, he advocates "embracing the water"—an approach in which floods are not a major problem because people live on mounds, in higher areas, or "floating cities."

But Han Vrijling, a hydraulics engineer at Delft Technical University, says that in most cases, giving the water its freedom is a "romantic" notion that's not compatible with a modern economy. Besides, "we shouldn't be too nervous" about ever-higher dikes towering over a sinking country, he says.

—M.E. AND J.B.

30 years, so why not make the job easier by making houses that can float?"

Whether that is technically or politically feasible—Day, for one, calls it "not likely"—remains to be seen, especially because until now, the poorest residents lived in the lowest parts of the city. Any decision on how best to protect the city in the future will be tied to how many people will live there, and where. "There may be

a large contingent of residents and businesses who choose not to return," says Bill Good, an environmental scientist at LSU and manager of the Louisiana Geological Survey's Coastal Processes section. It is also not yet clear how decisions about the reconstruction will be made, says Good, "since there is no precedent of comparable magnitude." Every level of government is sure to be involved, and "the process is

likely to be ad hoc."

Even with the inevitable mingling of science and politics, we still have "a unique chance to back out of some bad decisions," says Good, who grew up in New Orleans. "I hope that we don't let this once-in-history opportunity slip through our fingers in the rush to rebuild the city."

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