

## VOICE FROM THE FIELD

## The Dykes Are Safe—Surely?

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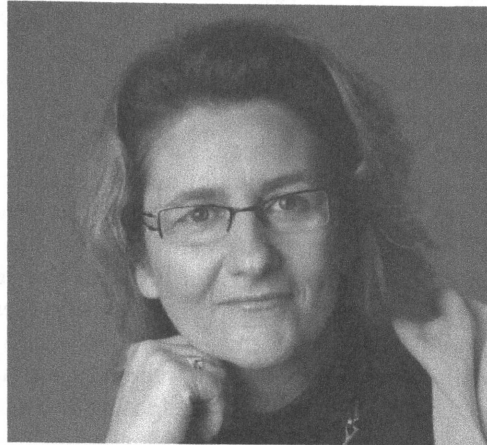


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Learning happens at school, from experience, and through trial and error. Learning leads to new capabilities and ability to modify one's behavior. Learning occurs at individual and societal levels, and involves more than storing information. It comprises the perception and evaluation of the environment, capacity to remember (memory), ability to link the unknown (inexperience) to the known (experience), and ability to apply what has been learned.

Regarding coastal defense for the European Wadden Sea, whose shoreline is shared by the Netherlands, Germany, and Denmark, learning began with the first human settlement. The shallow North Sea is very rough; low-pressure systems over the North Atlantic can cause storm surges, flooding wide swathes of land.

About 2,500 years ago, settlement of the coastal marshlands began with the construction of artificial dwelling mounds (warfts) which helped houses remain above water during storm surges (Bazelmans et al., 2012). Between 1000 and 1500 A.D. a significant transformation occurred in the coastal landscape, beginning in the Netherlands, then spreading north throughout the entire region. The littoral residents learned to defend themselves against storm surges. Every disaster was a lesson, and ever more effective forms of dyke construction resulted (Figure 5.1).

After the 1825 storm surge—the highest ever measured to that time—the following hundred years were relatively calm, causing people to forget past storm surges and their damages. Then, during the North Sea Flood on February 1, 1953, the period of calm ended. Two thousand Dutch lost their lives, leading to a comprehensive reassessment and strengthening of dykes. Due to a widespread sense of being safe, such efforts were not pursued as vigorously in Germany as in the Netherlands. On February 17, 1962, a severe storm surge reached Hamburg. Dykes were breached in more than 60 places, 315 people died, about 6,000 houses were destroyed.

After the 1962 storm surge, a new dyke protection program was initiated. A flood protection line extending over 100 km was built with dyke heights 7.2 m above sea level

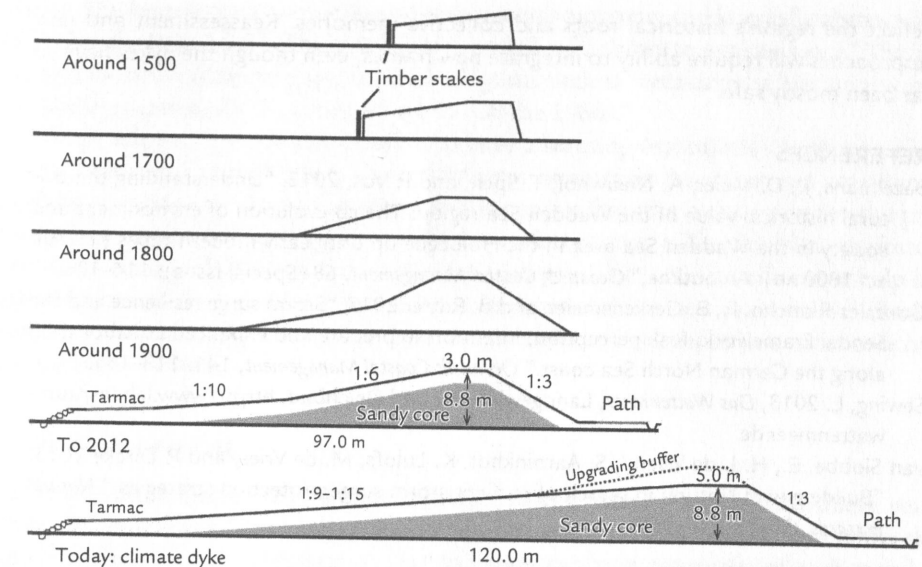


FIGURE 5.1 Historical dyke profiles from about 1500 to today.

Source: After Sewing, 2013.

along with a system of barrages, locks, and sluices. No significant problems have been encountered since.

Historical experiences, the learning curve in dyke construction, and the obvious success of dyking led to a deeply rooted framing of coastal defense, expressed as "God created the sea and Friesians the coast." This motto, emblematic for the social learning in the area, was codified into the learning of coastal engineers. The Expert Committee for Coastal Protection Structures has published its standard work *Recommendations for the Construction of Coastal Defences* (1972) for the last 40 years; it is regularly updated based on new knowledge and experience. Technological progress thus presented itself as the solution and led to construction of ever larger and stronger dykes—becoming ever more expensive, until eventually the state had to take full responsibility.

While this approach created a robust system of coastal defense, it also decreased the need for coastal residents to be proactive. Dykes have become an essential feature of the Wadden Sea coast, and large parts of the population believe that storm surges represent only a small risk. However, framework conditions are changing due to climate change. As a result, the current framing needs to be transformed to incorporate societal learning and technological developments. In this setting, however, such rethinking is difficult—after all, the experiences of the last 55 years have demonstrated that dykes are safe.

The challenge is not only to adapt the coast to changing circumstances. If sea levels continue to rise, the conventional strategy and its underlying frame of defense will reach financial and technological limits. Adaptation will thus require greater flexibility and openness to new options. In engineering, a paradigm shift is occurring—from building *in* nature to working *with* nature (Van Slobbe et al., 2013). Reframing society, however, is incomparably more difficult—great trust in protection by the responsible authorities remains (González-Riancho et al., 2017). Individual attitudes strongly

reflect the region's historical roots and collective memories. Reassessment and new approaches will require ability to integrate new frames, even though the dykes have so far been mostly safe.

#### REFERENCES

- Bazelmans, J., D. Meier, A. Nieuwhof, T. Spek, and P. Vos, 2012, "Understanding the cultural historical value of the Wadden Sea region: The co-evolution of environment and society in the Wadden Sea area in the Holocene up until early modern times (11,700 BC–1800 AD): An outline," *Ocean & Coastal Management*, 68 (Special Issue): 114–126.
- González-Riancho, P., B. Gerkensmeier, and B. Ratter 2017, "Storm surge resilience and the Sendai Framework: Risk perception, intention to prepare and enhanced collaboration along the German North Sea coast," *Ocean & Coastal Management*, 141: 118–131.
- Sewing, L. 2013, *Das Wattenmeer*, Landgewinnung und Deichbau, <http://www.lebensraum-wattenmeer.de>.
- van Slobbe, E., H. J. de Vriend, S. Aarninkhof, K. Lulofs, M. de Vries, and P. Dircke 2013, "Building with Nature: in search of resilient storm surge protection strategies," *Natural Hazards*, 65 (1): 947–966.

#### ABOUT THE AUTHOR

Beate M. W. Ratter is professor of integrative geography at the University of Hamburg and head of the Department of Human Dimensions in Coastal Areas, Institute of Coastal Research, Helmholtz Zentrum Geesthacht. Her research focuses on coastal regions and small islands in times of climate change. She is working on culturally embedded adaptation strategies based on the concepts of resilience and nonlinear dynamics in social-ecological systems in the European Wadden Sea, the Caribbean, and the Indian Ocean.