TU Delft

Delft University of Technology

Case Study: Kinderdijk - Schoonhovenseveer
Dike reinforcement lekdijk

Tromp, E.

Publication date
2017

Document Version
Final published version

Published in
Integral Design of Multifunctional Flood Defenses

Citation (APA)
Tromp, E. (2017). Case Study: Kinderdijk - Schoonhovenseveer: Dike reinforcement lekdijk. In B. Kothuis, & M. Kok (Eds.), *Integral Design of Multifunctional Flood Defenses: Multidisciplinary Approaches and Examples* (pp. 110-111). Delft University Publishers.

Important note
To cite this publication, please use the final published version (if applicable).
Please check the document version above.

Copyright
Other than for strictly personal use, it is not permitted to download, forward or distribute the text or part of it, without the consent of the author(s) and/or copyright holder(s), unless the work is under an open content license such as Creative Commons.

Takedown policy
Please contact us and provide details if you believe this document breaches copyrights.
We will remove access to the work immediately and investigate your claim.

This work is downloaded from Delft University of Technology.
For technical reasons the number of authors shown on this cover page is limited to a maximum of 10.

Ellen Tromp

CASE STUDY: KINDERDIJK - SCHOONHOVENSEVEER

DIKE REINFORCEMENT LEKDIJK

The dike reinforcement project Kinderdijk – Schoonhovenseveer (KIS) is part of the Lekdijk, a primary flood defense that directly protects two major polders in its hinterland from flooding by the Rhine: the Alblasserwaard and the Vijfheerenlanden polders. The initial expansion of local villages (in the Middle Ages) was concentrated near the dike and around the churches, resulting in ribbon development along the dike (see Figure 1). Beyond the dike, part of the floodplains is a nature conservation area. The local population is aging, and village shops, businesses, and local activities are slowly disappearing. There is a shortage of housing for young people.

The Dutch regional water authorities regularly monitor the flood defenses that fall under their jurisdiction, and perform periodical assessments as required by law. Water Authority Rivierenland is responsible for KIS. This specific part of the dike protects 175,000 people.

In 2005, the KIS dike section failed to meet the flood safety criteria, and as a result it was added to the Second Dutch Flood Protection Program (DFPP-2). Under DFPP-2, dike reinforcement is funded by central government, provided that three criteria are met: projects must be frugal, robust and efficient (DFPP-2 2011). Dutch national policy formally divides a dike reinforcement project into six phases (see Figure 2). At the end of each phase, the plan is formally reviewed before final approval by the DFPP-2 Program Board.

The soil under this dike consists of layers of clay and peat on top of a Holocene sand layer, resulting in macrostability problems and forming an impediment to traditional dike reinforcement. As a result of previous dike reinforcements, many historic and characteristic houses are now situated against the dike or partly on it.

A number of businesses would like to expand, such as the Streefkerk Marina. Moreover, the municipality of Molenwaard identified a number of developments to improve the social facilities of the village Streefkerk and enhance the landscape quality as well. The municipality initiated a process to develop an integrated, long-term planning vision that connects these objectives with plans for dike reinforcement and third-party plans.

No further dike reinforcement is currently possible, without removing a substantial number of houses, since the houses in KIS are typically located within 30m of the dike. Recognizing how much dike strengthening projects can inconvenience residents, the KIS project manager considered using innovative techniques that might reduce the problems. The Rivierenland decision-making process included numerous opportunities for different stakeholders to interact. The project involves developing a multi-purpose levee; and changes were made in the proposed tender to enhance the use of innovative dike strengthening techniques during construction.

In our research, this case study was analyzed using the sender–receiver framework. We saw that different barriers and failure mechanisms occur at different interaction moments (see Figure 3). The problems seem to depend on which stakeholders are involved, the role they play in the whole design process, and the knowledge gap between the sender and receiver. Within a given interaction, we also saw that the sender and receiver roles change, with the sender becoming the receiver and vice versa. The transfer of knowledge occurs as part of a communication process and not in isolation.

The success of knowledge transfer depends on four matters:
- Relation between the two parties,
- Degree of a knowledge gap between them,
- Trust between the parties, and
- The strategy the sender chooses to transfer the knowledge.

Multi-purpose levee

One of the proposed solutions at the village of Streefkerk was to build an unbreachable dike. In order to preserve the historic and characteristic homes behind the current dike, the dike would need to be reinforced in the direction of the river. Camouflaging the dike by over-dimensioning the crest gives the best chances to combine flood protection with all the other ambitions and plans. The dike would offer space for new accommodations or even a new town center oriented towards the river and the marina. To prevent the new buildings being damaged by future flood protection tasks (or even having to be removed), the design has to be very robust.

In the current design, both an over-dimensioned outer berm and water-retaining walls are used to improve the connection of the built environment with the river, the marina and the adjacent floodplains. While developing this design, the regional governments found that their joint plans had to be decoupled, due to a tight time frame imposed by DFPP-2, which financed the dike reinforcement. For the municipality, the main challenge was to organize funding for their ambitious plan. Currently, some parts of the plan, such as the walking promenade and cycling path, are currently being built. The marina will be responsible for developing the area on top of the multi-purpose levee. While developing the project, the municipality attempted to maintain a constructive relationship with Rivierenland. Some difficult decisions had to be made, with financial consequences, as well as consequences for the planning; e.g the decoupling of the joint plans, as the legal changes for the improvement of the spatial quality were not organized in time for the dike strengthening.

.

During the process, Rivierenland organized many stakeholder meetings, both formal ones and 'kitchen table' meetings with local residents. In this way, they were able to inform residents on the progress of the dike reinforcement, as well as trying to include available local knowledge in this specific project. This process helped to implement the project successfully, with consent from the local stakeholders. During the construction the contractor actively involves local stakeholders to keep them informed about the process, while using social media and events.

Figure 1 (right). Ribbon development along the Lekdijk at Kinderdijk.

Figure 2 (mid). The different phases in a design process of a flood defense (DFPP-2, 2011)

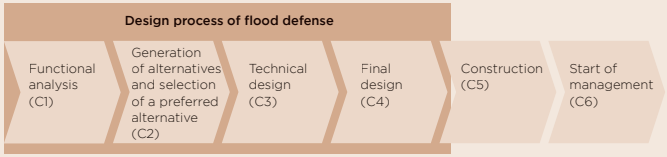
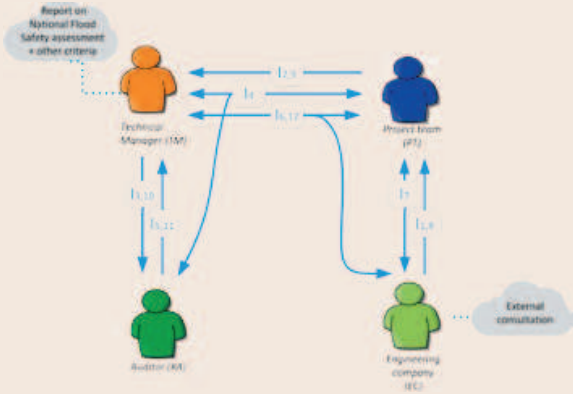
Figure 3 (bottom). Example of the diagnosis with the Sender-Receiver framework.