



TWIN DIKE CONCEPT: Flood protection linked to innovative agriculture and nature development

Solution: Watermanagement and Resilience

The Netherlands has a long tradition in Flood Protection measures. Hence, the Dutch flood management policy is based on more than just large-scale flood defence measures. It's also about legislation, organizational structures and collaboration. About 60% of the Netherlands is flood prone. That's why Flood Risk Management is taken for granted. To ensure the Netherlands will be resilient and climate proof, new approaches are developed. The concept of Room for the River is worldwide seen as an inspiring example, bringing water management and spatial planning together. Water safety is increased without heightening dikes. The approach also links local ambitions and water management. The Twin Dike solution works with the Room for the River concept but now along the coast, protecting Groningen from the rising Waddensea.

Introduction Twin Dike

The Twin Dike approach is a new and innovative concept along our coast that increases our resilience during climate change and sea level rise. It also links local ambitions with water safety measures. With the twin dike, a larger coastal area is being shaped in an innovative way. The twin dike is being implemented in the dike reinforcement project between the Eemshaven and Delfzijl in Groningen, The Netherlands. A new dike, inland from the existing dike, is being constructed. The existing dike is not climate proof, but due to this concept it does not need to become higher and wider. Because now both dikes together form a flood protection barrier. In the current dike, an inlet structure will be constructed which allows free tidal flow of the salt water in the area between the twin dikes. The structure will be closed during periods of storm water levels. The inner area, between the twin dikes, will be used for several functions: salt resistant agriculture, nature and sludge collection (to form new clay for future dikes). The agricultural area will be 30 ha and used for cockle, seaweed and sea-vegetable cultivation. Here the warm water pipeline of the nearby Google datacentre may be used to improve the growth conditions for the cockles. In the nature area, 25 ha, clay sediments will accumulate for use in future construction works and a kind of slick-wetlands will be formed. This new way of dike improvement supplies sustainable opportunities for economic growth, nature and tourism. The idea of transforming large areas along the coast into places where sea-vegetables can be cultivated offers a sustainable opportunity for huge amounts of people. In 2050, 70% of the world's population lives in a delta, with many people at risk to flooding and loss of agricultural lands due to salinization. The twin dike concept offers a worldwide, sustainable solution for flood protection and growing food on saline soils.

What are the benefits?

Water safety / Flood protection

Policy Challenge: the current dike is not climate change proof and needs to become stronger. The minimum safety limit for flooding is 1/3000 years.

The seaside dike absorbs the forces of the waves and storm water levels. It will be lower than in a one dike system (+8.00 mNAP instead of +8.25mNAP), so the possibility of waterflow over the top will be higher than allowed. (>5 l/s/m). The seaside lining (stoneblocks and asphalt) reaches to +3.50 mNAP (lower than the advised standard of +7.80m). Because of this, complementary safety is necessary and is guaranteed by the newly constructed inland dike of +4 mNAP high and slopes of 1:3 and 1:7. If in a 1/3000 event the seaside dike is damaged, the inland clay dike will prevent flooding.

Agriculture / economic diversification

Policy challenge: 1. this area is at risk for salinization of the soil, find a way to maintain and increase the value of the soil; 2. this area suffers migration and decreasing economic activity.

The cultivation of cockles, sea vegetables and the slicks will prosper in brackish condition. The cultivation of cockles and sea vegetables allows for a potential renting value of € 7,000 per ha per year. The common rent for seed-potatoes is approx. € 2,400 per ha per year (current situation). The possibilities for harvesting sea vegetables (tomatoes and even strawberries) are vast. The clay sediment value is – depending on the use (dike reinforcement or substrate for cockle cultivation) – at net content value (NCV) in year 2020 between € 8k and € 1.6million.



TWIN DIKE CONCEPT: Flood protection linked to innovative agriculture and nature development

Nature development

Policy challenge: 1. reduce sediment concentrations in Eems-Dollard estuary system 2. create brackish nature that reinforces adjacent N2000 area and provides habitat for several species.

The 25 ha of natural area contributes in decreasing the sediment content of the adjacent estuary. It is expected to enhance light penetration into the water and stimulate growth of photosynthetic organisms that allow for a development of macro fauna. It complements other type of initiatives along the estuary. The slick conditions offer feeding grounds for birds and flee-grounds in case of high tide caused by storm surges.

Finances

Policy challenge: find a way to reduce costs and speed up the process of dike reinforcement.

Only taking into account the water safety aspect, the difference in costs between the traditional reinforcement of the one dike solution (€ 25.5 million) and the twin dike solution (€ 18.3 million) is estimated as € 7 million applied to a 2.5 km length. Because of the expected production value increase of the land between the twin dikes and the ability to host more functions, stakeholders will more quickly cooperate with dike reinforcement.

Stakeholders

This project is a unique collaboration between two governmental bodies in the Netherlands (water authority Noorderzijlvest and the province of Groningen) and saline cultivation entrepreneurs. The parties combine their different objectives on water safety, nature and economic development within one project. This innovation is supported by the national government within the Flood Protection Programme, a dike reinforcement programme that will cost the Netherlands € 7.4 billion. To make this possible stakeholders are actively involved.

The most important stakeholders are:

- Saline cultivation entrepreneurs
- Nature conservation organisations (e.g. Waddenvereniging)
- Local municipality, Delfzijl
- Property owners
- (Local) farmers
- Other water authorities & dike specialists in The Netherlands
- Local NGO's
- Wageningen University & Research
- Flood Protection Programme
- Research institutes

List of authors

1. Esther Dieker, waterauthority Noorderzijlvest, area manager: e.dieker@noorderzijlvest.nl
2. Kees de Jong, waterauthority Noorderzijlvest, flood protection specialist; k.dejong@noorderzijlvest.nl
3. Matthijs Buurman, province of Groningen, project leader :
4. Marco Veendorp, Arcadis, flood protection expert

Key words

Water safety, innovation, flood protection, building with nature, resilience, saline cultivation, agriculture, nature development, collaboration, watermanagement, climate adaptation



TWIN DIKE CONCEPT: Flood protection linked to innovative agriculture and nature development

Location & visualisation

