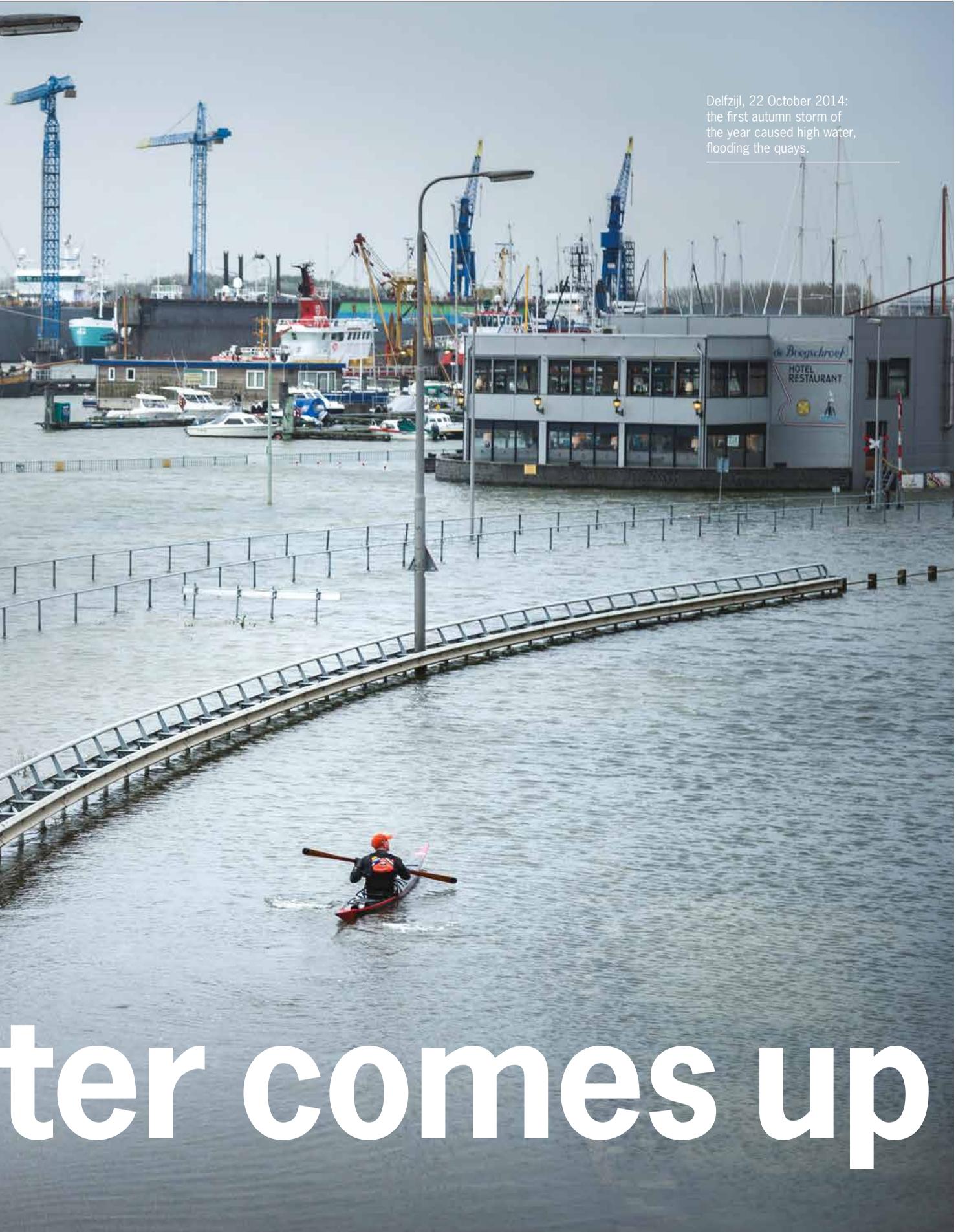


The Netherlands needs to be better prepared for dike breaches, says Judith Klostermann of Alterra Wageningen UR. Because although the chances of flooding are fairly small, the consequences could be massive. 'We don't like talking about floods in the Netherlands.'

TEXT RIK NIJLAND PHOTOGRAPHY HOLLANDE HOOGTE

# When the wa

Delfzijl, 22 October 2014:  
the first autumn storm of  
the year caused high water,  
flooding the quays.



ter comes up

**O**f course you need strong dikes and dunes to protect the Netherlands from flooding: Judith Klostermann (51) of Alterra Wageningen UR does not doubt that for one moment. But the sense of security the Dutch get from these primary food defences should not turn into blind faith. Because hard technology sometimes lets you down, especially if climate change makes nature less predictable, bringing more rain and higher water levels. 'But we don't like talking about floods in the Netherlands. If you look back through history, we have had one or two disasters in every century, with hundreds, if not thousands, of deaths. Apparently that doesn't stick in our memories.'

In recent years, Klostermann has been working on the Wadden Sea Delta programme, one of the research projects that preceded the Delta Plan and Delta Decisions which were presented on budget day last September. These documents outline how the Netherlands intends to arm itself against greater volumes of river water and rising sea levels in the course of this century. Klostermann's report on climate change-related spatial planning and disaster prevention measures in the Wadden Sea region came out straight after the third Tuesday in September, the traditional budget day in the Netherlands.

Together, Klostermann and consultancy bureau HKV Lijn in Water studied how the northern Netherlands can defend itself better against water. The emphasis did not lie on dikes and dunes, the primary lines of defence. Plenty of research gets

done on that already. Klostermann focused particularly on spatial planning measures inside the dikes, in what is called the second line of defence, as well as on improving disaster prevention and making citizens more self-reliant – a third line of defence. She wondered whether such steps could make the Wadden region safer. Is it worth spending money on these things?

### EXTRA DIKES ARE COSTLY

What emerged from the report is that second-line measures are seldom worth it. Such measures as building an extra dike around a crucial installation inland, to limit the damage in case of flood, are expensive. So expensive that they rarely pay off, according to model calculations by HKV. These models calculate in the chances of a flood, the economic damage and the number of victims. 'If you spend money on improving security, it is almost always more efficient to spend it on the primary defences, so that you protect a much larger area at once,' says Klostermann.

There may be one exception to this rule: protecting the gas extraction and transportation installations in the north-east of Groningen province. It would only take the loss of a couple of these installations and the gas supply for the whole of the Netherlands would be brought to a halt, with causing disruption that would cost 20 to 30 billion euros. And this key infrastructure lies in a flood-prone area around Delfzijl. There is land subsidence in the area due to gas extraction and peat oxidation,

and there is cause for concern about the state of the dike along the Eems river. A north-westerly wind can cause North Sea waves to batter the dike, and if it should break a large area would be flooded, up to the city of Groningen. But that is not the only danger. Local waterways such as the Eems canal can flood too, as almost happened in 2012 after persistent rain. 'Because of climate change, we don't know exactly what to expect: how extreme the rainfall will be, and how high sea levels will rise,' says Klostermann. 'If that goes wrong, it will do a massive amount of damage. Yet here as well the conclusion was drawn in the end that these installations should primarily be protected just with the usual primary and secondary defences.'

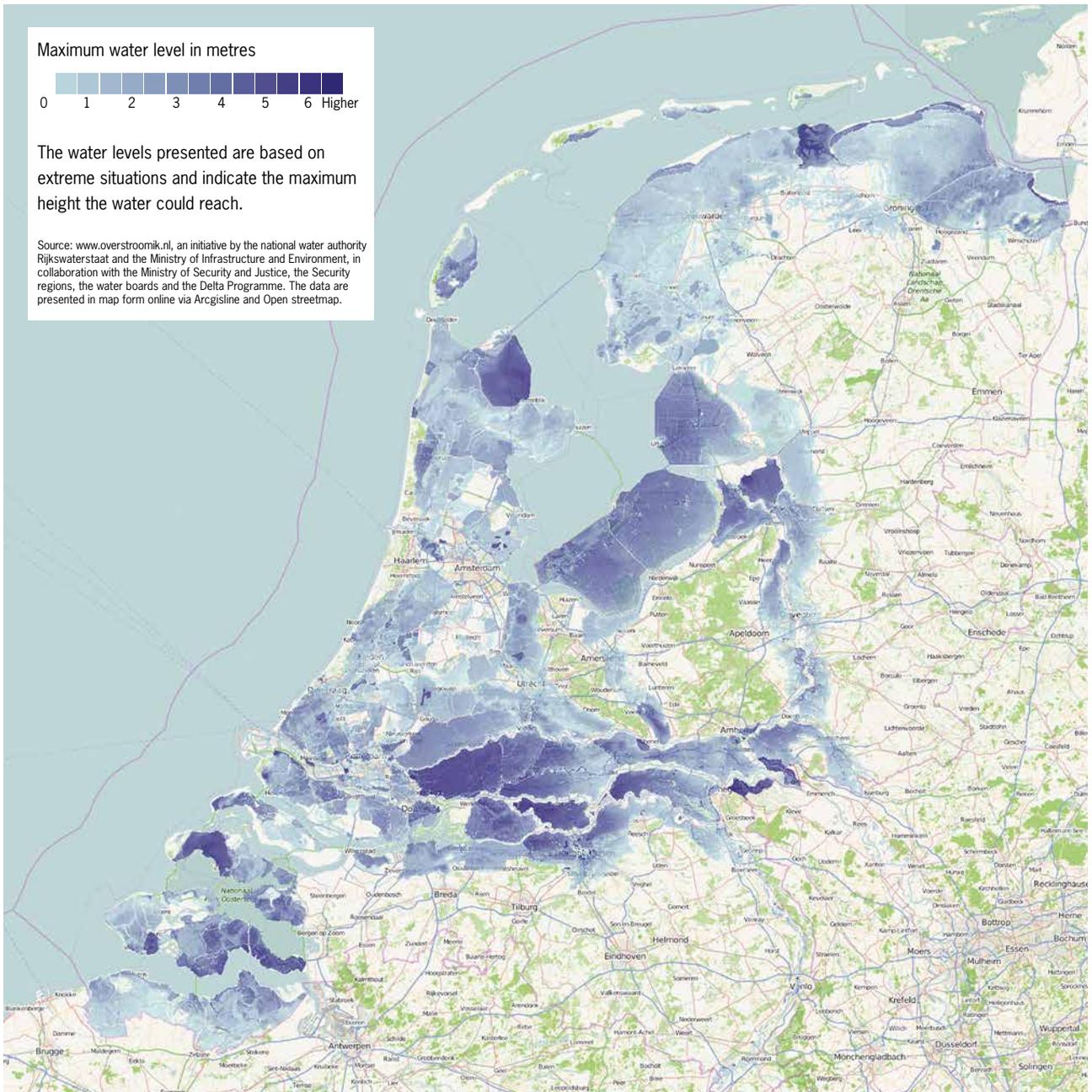
### BUILD ABOVE SEA LEVEL

The provincial government of Groningen supports this conclusion, says civil servant Matthijs Buurman of the provincial government, one of the study's clients. The water boards in charge of the dikes are working on improving the sea dike and the dikes along the local waterways. 'After that it is up to the NAM and The Hague to determine how the remaining risks are dealt with'. Buurman thinks Klostermann's work will force central government to face the facts: safety from water must play a role in spatial planning. Wherever possible, build new housing estates on slightly higher ground, and make sure hospitals would still be accessible after flooding. 'We need to make building projects more flood-proof,' says Buurman.

This is certainly the case in places which lack primary flood defences, such as the village of West Terschelling, which lies outside the dike, and in parts of the harbours along the coast between Den Helder to Delfzijl. The report calls for a lot more attention to addressing this issue with preventive measures such as locating new businesses and electrical installations higher above sea level.

Even right at the coast, the theme of water security has not really caught on, as the

‘Getting everyone out of the area is not always the best solution’



## WILL I BE FLOODED?

At the end of September, minister of Infrastructure and Environment Melanie Schultz presented the website [www.overstroomik.nl](http://www.overstroomik.nl) and an app to go with it. By filling in their postcode, anyone can see what would happen if dikes or dunes gave way. About 60 percent of the Netherlands could flood, but how high would the water come in your street? Would it be life-threatening or just a big nuisance?

Where will it still be dry, and which roads will still be passable? 'Everyone can then weigh up whether it is sensible to stay put and look for a dry spot in the neighbourhood, or to get out,' explained the minister when she presented the site and app. 'A Delta Plan does not provide 100 percent security. People also need to be better prepared themselves for what could happen.'



## WAGENINGEN SOLUTIONS

Protection from the sea and flooding rivers has traditionally been the domain of Delft engineers. But Wageningen experts have a role to play too. One of them is Pier Vellinga, professor of Climate Change at Wageningen University, who supports the use of the unbreachable dike. This is a broad, heavy line of defence that not only holds back the water, but can also serve as a carpark, for example, or provide housing.

At the beginning of October, Jantsje van Loon got her doctorate for research under Vellinga's supervision on the protective function of vegetation on mud flats with a green dike behind them. The theme running through Wageningen's contribution to water security is making use of nature. An example from IMARES Wageningen UR is the work of researchers Alma de Groot and Marijke Tangelder on Building with Nature using 'bio-builders' such as shellfish on coastal reefs and dunes. The role of dunes in climate change is the topic of University researcher Michel Riksen's work too. Besides nature, a second Wageningen angle is governance. Together with Deltares and IMARES, Saskia Werners of Wageningen University and Jeroen Veraart and Annemarie Groot of Alterra Wageningen UR researched the socio-economic, governance and ecological design criteria for sand replenishment.

Wageningen researcher noticed at the port of Eemshaven, just north of Delfzijl. 'About one third of the 25 or so businesses located outside the dike there are well aware of the possible dangers. Especially the storage and transshipment companies, which have experience of the sea. But many of the businesses which have been attracted by the economic opportunities here, such as caterers or employment agencies, have no idea. The harbourmaster of Groningen Seaports has a list of phone numbers of companies that should be warned in an emergency, but most of the companies did not know of the existence of that list, or that they were on it.'

### EXTREME WEATHER

Awareness-raising about the risks, development of resilience and an emergency plan for rescue workers – the third line of defence – have been neglected, says Klostermann. Renewed efforts are especially important for the Wadden islands,

she thinks. 'Because of their location, the islands have always been on their own in extreme weather, and the medical facilities are limited. What is more, a lot of tourists stay there who do not know the area.

Where should they go if the water comes up? How will the emergency services be organized? You had better sort these things out when it's quiet rather than wait until the crisis is in full swing.'

Awareness-raising and emergency services often slip through the net. There is no culture of discussing risks of flooding in the

Netherlands, says Klostermann. And in the security regions there is a lack of knowledge about the complex issue of water security. They face many different tasks, from fire fighting to emergency services for road accidents and terrorist attacks. If they hear that the chances of a breach of a dike are 1 in 4000 years, flooding goes to the bottom of the priority list. They think: if it happens, we'll just follow the water board's instructions. But security regions have a lot more contact with the public so they are in a better position to get to message over to people. To do that, though, these organizations need to be in tune with each other.' The chances of a flood may be small, but the consequences are big. You can compare it with using seat belts in your car, says Klostermann. 'The chances are that you will wear them all your life without ever needing them. But if the moment does come that you need it, that belt will be the difference between life and death.'

### RESIDENTS EVACUATED

This weighing up of costs and benefits is important in the third line of defence too, she believes. At the beginning of 2012, areas near Woltersum and Tolbert in Groningen province were in danger of being flooded. Residents and their livestock were hastily evacuated, perhaps unnecessarily. 'There was a risk of flooding, but not to a life-threatening extent. Most of our experience in the Netherlands is with horizontal evacuation: get everyone out of the area. But that is not always the best solution. Horizontal evacuation is expensive and affects the residents a lot. It can be necessary if the

**'I think citizens have the right to know where they stand'**



Delfzijl, 22 October 2014: the highest water level measured was 4.06 metres above sea level.

water comes up really high, but often you can go up to the first floor, or to the neighbours who live just a bit higher – a kind of vertical evacuation. The advantage of that is that people in these areas can carry on with their lives as soon as the danger recedes.’ In order to make sensible decisions about such things, people need good information. Is there just minor flooding, and should we remove anything valuable from the cellar, or could the situation become life-threatening? It is not easy for individual citizens to assess this. At one spot there may be hardly any problem while a couple of kilometres away the water may come up to three meters high.

‘The app developed by the ministry of Infrastructure and Environment (see box), on which you can fill in your postcode to see how high the water could come, is certainly a step in the right direction, in my view.’ As for the question of whether the money the ministry spent on the app could have been better spent on dikes, if the chances of flooding are extremely small, Klostermann is quite clear: ‘According to HKV’s calculations, the second line is expensive but the third line isn’t. What it requires above all is a change of mindset. I also think citizens have the right to know where they stand. A lot of people will just shrug: a risk of

flooding is something abstract, but people who have experience of high water, or who were evacuated from the Betuwe in 1995, understand the importance of good information. In 2006 high water did a lot of damage in the harbour at Delfzijl, in spite of all the water board’s warnings. There was high water again in 2007, but then there was much less damage. Everyone had taken precautions. The trick is for the government to get that message across in areas where there hasn’t been any flooding yet too.’ ■

[www.wageningenur.nl/en/delta](http://www.wageningenur.nl/en/delta)