FACTSHEET

Netherlands Court of Audit

Beyond the dyke

Flood safety options

October 2023

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1. Executive summary

Imagine

You live in Gouda and it's raining. Hard. The heavens have opened. Non-stop for two days. The water washes over the dyke. By day 1, the streets are inundated and the river is flowing through your kitchen. The lights go out that evening and water doesn't come out of the tap. It's cold, the central heating has stopped working. The wifi is dead and the battery in your mobile is slowly running out. You start hauling furniture upstairs but the waters keep rising. Without an emergency kit, clean drinking water, a torch and a rescue boat, what can you do? Your parents also live in a flooded part of town but you can't contact them. How could this happen in the Netherlands? Happily, the scenario isn't true. But it is becoming more likely.

The Netherlands: a country of dykes

Our dykes are world famous: strong dykes meander across the land to protect the country and keep millions of people safe and dry. Building, maintaining and reinforcing them is a vital government task. The government is currently working on a major dyke reinforcement programme with completion planned for 2050 at a cost of more than €13 billion (according to the latest, 2023, estimate). It has invested huge resources in learning more about the risk of dykes overflowing or bursting and developing new solutions to strengthen them. The government is keeping a keen eye on the costs: every euro invested in the dykes has to be cost effective.

Flood safety increasingly important

The main strategy to protect the Netherlands from flooding is dyke reinforcement. The Minister of Infrastructure and Water Management (I&W) nevertheless wants to do more to protect the country. Even the strongest dykes cannot always prevent flooding, as was demonstrated in the province of Limburg in 2021. Climate change is increasing the risk of flooding. Rising sea levels, extreme rainfall and high river discharges are subjecting the dykes to ever more pressure. At the same time, more people are living behind the dykes and more businesses are setting up their shadow. The minister therefore wants to take additional measures to protect the people *behind* the dykes. His ambition is to maintain the Netherlands as the best protected delta in the world.

Multilevel safety

To realise this ambition, the minister has been working on a new flood protection strategy since 2009. Known as multilevel safety, it is made up of 3 protection levels. Level 1 comprises measures to prevent dykes bursting or overflowing. They include dyke reinforcement and river widening. Level 2 comprises spatial planning interventions to mitigate the impact of a dyke burst or overflow. They include emergency inundation areas, houses on stilts and planning measures to divert floodwater away from built-up areas. Level 3 is crisis management, in the form of evacuation plans and public information campaigns on what to do in case of flooding.

Multilevel safety making slow progress

Several studies have concluded that flood protection behind the dyke (levels 2 and 3) is making slow progress in the Netherlands. We analysed why this is and how the Minister of I&W can strengthen his grip. We looked at the minister's policy on dyke reinforcement. This policy allows dyke managers to take other measures than dyke reinforcement, such as river widening (a level 1 measure) and damage mitigation behind the dyke (levels 2 and 3). Dykes are managed by Rijkswaterstaat (the Directorate-General for Public Works and Water Management) and the regional water authorities, who carry out dyke reinforcement projects. We investigated whether Rijkswaterstaat and the water authorities considered alternative options in their dyke reinforcement plans.

We found that dyke managers often considered measures in the river and behind the dyke but soon abandoned them. In 65% of the projects we looked at, dyke managers opted for only dyke reinforcement. In 30% of the projects, dyke reinforcement was accompanied by secondary 'river measures', such as raising river banks to slow

down waves or reducing drainage from the water system behind the dyke in order to control the water level in the river. Only 5% of the projects we audited included damage mitigation behind the dyke. The measures included emergency inundation areas and the construction of an inner dyke.

Why are measures behind the dyke making slow progress?

We also investigated why dyke managers did not include measures beyond the dyke. Dyke managers are sensitive to public opinion. Public opposition can seriously delay a dyke reinforcement project and thus increase the risk of flooding. Water authorities and Rijkswaterstaat accordingly seek solutions that enjoy popular support. There is often scant support for measures behind the dyke, where residents already feel safe and oppose far-reaching interventions, especially ones that do not reinforce the dyke, radically alter the landscape or are costly to residents themselves (for instance, to adapt their homes).

Besides public acceptance, costs are a decisive factor. We found that it was very hard for dyke managers to estimate the cost of damage mitigation and crisis management accurately. Reinforcing an existing dyke often seems cheaper than taking innovative measures in the river or behind the dyke. This will in any event be the case until 2050, the target year for the minister's policy.

So dykes are being reinforced. Public support also helps determine how they are reinforced. People do not want higher dykes to block their view of the river and they do not want wider dykes in their back gardens. Dyke managers are therefore inclined to raise dykes slightly less than they should, but the risk of overflowing is then higher and the need for damage mitigation behind the dyke becomes more pressing. Moreover, dykes are often reinforced on the river side whereas rivers will need more space to receive water as climate change progresses.

Lastly, we also found that multilevel measures could be taken behind the dyke only if dyke managers worked with provinces, municipalities and other parties such as the State Forest Service. This is difficult and time consuming.

Our conclusions: implementation and oversight of multilevel safety needed to protect the delta

The minister has placed multilevel safety at the heart of his flood protection policy but has not developed policies and guidelines to implement it. He has not set standards for damage mitigation or learnt about the costs and benefits of multilevel alternatives to dyke reinforcement. Nor has he ensured fruitful coordination between

the various parties responsible for spatial planning and crisis management. Instead, the minister is focusing on dyke reinforcement with little practical thought for multilevel safety. His policy, moreover, takes the very narrow perspective of reinforcing dykes as inexpensively as possible until 2050.

The minister must make serious work of multilevel safety by looking further ahead than 2050. And he must take a wider view, beyond the dyke towards ‘floodscapes’ in which flood safety is the outcome of measures before, on and behind the dyke. Other countries are already doing this, so it is possible. The measures can include providing home emergency kits for people who live in Gouda before it starts raining, placing domestic fuse boxes higher so that the lights stay on and building electricity substations on raised platforms, so that you can charge your mobile and contact your parents.

Flood safety embraces not only dry feet but also a functional society. Also after 2050.

2. Conclusions and recommendations

2.1 Conclusions

Extreme weather conditions are becoming more common. Floods can never be entirely ruled out and the Netherlands must be prepared for them. The Minister of I&W decided in 2009 to widen the scope of Dutch flood protection policy from preventive measures that reduce the risk of flooding to a multilevel approach that includes river widening and damage mitigation behind the dykes (by means of spatial planning and crisis management). This policy is nearly 15 years old but it is making slow progress. We investigated why.

The Minister of I&W makes too little use of multilevel safety

Our main conclusion is that the Minister of I&W has not put multilevel safety into practice. As a result, dyke managers cannot give multilevel solutions the consideration they deserve. In consequence, dyke reinforcement is the only measure actually taken. In the meantime, houses are being built in vulnerable locations and new nuclear power stations are planned on the Western Scheldt. This is increasing the vulnerability of the people behind the dykes and the potential losses. Instead of being widened to accept more water, rivers are being narrowed by dyke reinforcement. Residents are not prepared for the day the dykes overflow. This has consequences for citizens and businesses and, maybe more important, for future generations.

The minister has based his policy on multilevel safety. However, he has taken no steps to further develop this approach. Instead, he has opted for the more limited perspective of dyke reinforcement. He is not looking beyond the dyke.

Cause: policymaking and implementation stranded on dyke reinforcement
The minister's flood protection policy concentrates on dyke reinforcement. This is evidenced by new dyke safety standards implemented in 2017 and the supporting cost-benefit analyses that include only costs and benefits of different options for dyke reinforcement. The minister has thus taken the path of least resistance: the technical know-how necessary for dyke reinforcement is available, the targets and tasks are laid down in law and financing arrangements are well-known. Furthermore, dyke reinforcement is very popular among residents. By making use of existing know-how, policy instruments and administrative responsibilities, the minister is not gaining new insights, skills or opportunities for multilevel safety in practice.

The minister's oversight is also limited to dyke reinforcement. The Human Environment and Transport Inspectorate (ILT) informs the minister about the progress of dyke reinforcement, but not about the extent to which and way in which multilevel safety is applied in dyke reinforcement projects.

The minister: look further ahead and with a wider perspective
The Minister of I&W's narrow focus on dyke reinforcement is not fit for the future. Dyke reinforcement standards are oriented to the year 2050. What are we going to do after 2050, when the country has subsided further, sea levels are even higher and the risk of high river runoff and extreme rainfall has increased? Do we keep raising, widening and reinforcing the dykes bit by bit because that's the easiest and cheapest option?

The minister argues that dyke reinforcement is cost efficient. But we conclude that the cost-benefit analyses supporting the national flood protection policy do not consider the costs and benefits of measures to better protect people and buildings behind the dyke. It considers only the costs and benefits of dyke reinforcement. Moreover, it does so with a view to meeting the dyke safety standards set for 2050. The minster has not looked beyond 2050 to explain why dyke reinforcement is more efficient, especially in the long term, than multilevel solutions.

A practical plan is needed to make the most of multilevel safety. Other countries are already applying multilevel safety. Examples from Flanders, England and the United States are provided in this report. There are also multilevel safety initiatives in the Netherlands. For some time, experts such as the Chief Government Advisor on the

Built and Rural Environment and the Delta Programme Commissioner have been calling for new, area-based targets based on water carrying capacity (Waterdemocraten, 2022, Deltacommissaris 2021a, 2021b, 2022a). A floodscapes project at Wageningen University, for instance, is studying broad, area-based flood protection solutions. The Programmatic Approach to Great Waters initiated by the Minister of Agriculture, Nature and Food Quality (LNV) and the Minister of I&W to improve water quality in the Netherlands is also studying floodscapes in the foreland, dyke zone and hinterland.

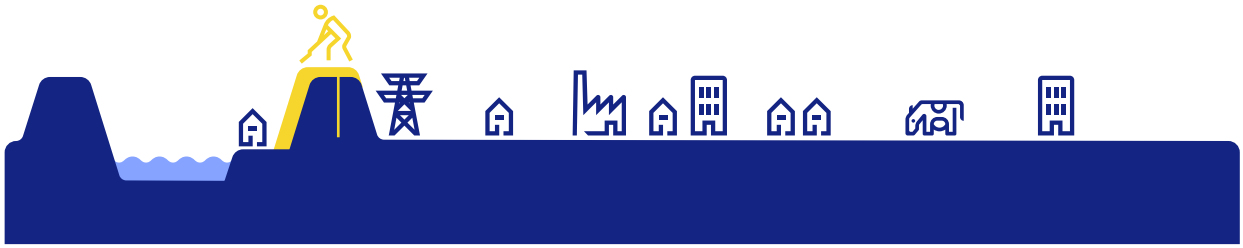
Our audit shows that multilevel safety requires coordination among the various authorities and organisations responsible for flood safety: in front of, on and behind the dyke. This is turn requires targets and administrative and financial agreements. But the minister has not yet formulated a fitting policy.

Imagine, you now live in Gouda or somewhere else in the Netherlands that is protected by dykes and reinforcement is still the minister's only solution. What does the future look like for you, your children and your grandchildren? Will the scenario we described at the beginning of this report have become a reality? Will we be able to discharge water quickly enough? If fuse boxes have not been placed higher, electricity substations have not been raised above ground level, evacuation sites have not been established and people do not have emergency kits at home, the damage to homes and businesses will be incalculable. And more people will be affected because they live in vulnerable locations. See figure below.

Future scenario 2023, 2050 and 2100

Current practice is not fit for the future

2023: current situation



2050: the water rises but the dykes hold it back

2100: the water rises further and the risk of flooding increases but we are not prepared

2.2 Policy, execution and oversight recommendations

Floods cannot be ruled out but we can limit their impact. We therefore recommend that the minister make serious work of his own multilevel safety policy. This report is illustrated with examples from home and abroad showing that other options are available for multilevel safety. We advise the minister to look abroad for inspiration. We also make 3 recommendations regarding practical aspects of his own policy.

Policy: long-term solutions

The minister has set legal standards for flood protection but they apply only until 2050 and only to dykes. We recommend that the minister work out his own multilevel safety policy and supplement it with measures beyond the dyke. He must learn about the costs and benefits of multilevel solutions in the long-term as soon as possible. He could include the long-term costs and benefits of drought, water quality and nature as well. This knowledge is needed now in order to take long-term decisions on flood protection.

Execution: clarification of multilevel solutions

The dyke reinforcement programme already allows water authorities and Rijkswaterstaat to opt for river widening, spatial planning and crisis management measures as wells as dyke reinforcement. However, the legal framework and financing arrangements for these alternatives to dyke reinforcement are complicated and time consuming. We recommend that the minister facilitate such measures by adapting the legal framework and financing arrangements to support the implementation of multilevel safety in practice.

Oversight: oversee multilevel safety

The Environment and Planning Act, which is due to come into force in 2024, will widen the ILT's oversight mandate. The minister could seize the opportunity to include multilevel safety in the ILT's oversight tasks to keep track of its implementation.

More information

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