

Safety from flooding in low countries

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1 The Netherlands: flood defence as technological lock-in

Ever since 'society' decided to start draining the coastal wetlands of what is now the Netherlands,¹ 'we' have gradually manoeuvred ourselves into a technological lock-in.² The drained land subsided due to physical and chemical processes,³ so to protect it and the effort spent, levees were built. Lack of flooding caused subsidence to increase,⁴ so levees had to be raised again, and so on: the difference between the crest of the levees and the land in some places now exceeds 10 meters. Add to this a gradually subsiding geological base⁵ and the prediction of sea level rise due to climate change, and you'd think we are in dire straits.

Look at the messages communicated by the Dutch water management community⁶ to US delegations, both at home and on visits to New Orleans, and you'd think the opposite. We have everything under control, our land is protected from flooding by the large engineering structures of the Delta works (and we'd like to sell you the know how). What isn't communicated at these meetings is the vulnerability of the system. Possible consequences of choosing this type of flood management are not discussed; I have shown above that present day choices may lead to irreversible worsening of the problem in the long term. However, this is not the whole story of the risks involved in the Dutch flood defence system, as I will explain below.

The 1953 flooding disaster in the south western corner of the Netherlands served as a reminder of what is at stake – the major cities were (only just) spared.⁷ It triggered implementation of the existing plans for the Delta works, which had been shelved for lack of funds and perceived necessity, in spite of engineers' warnings that a disaster could happen. It also triggered legislative action: high standards for the design of flood defence structures were incorporated into law.⁸ On the basis on expected damage, and I suspect a good deal of political wrangling as the financial consequences became clear,⁹ it was decided that these structures should be designed to a chance of failure of once every 10,000 years in the most densely populated areas, and once every 4000 years elsewhere.^{10,11}

So are we finally safe in the Netherlands then? No, and there are several reasons why not. On the face of it the remaining chances of failure (once every 10,000 or 4000 years) are too small to consider. However, on a human time scale it means a chance of at least 1% of having to face flooding once in your lifetime: small but not negligible. More importantly: if things do go wrong, they probably go badly wrong. Millions of people live several meters below sea level and in the worst scenario, the area will be covered in this amount of water within a few

hours: a lot of casualties will result. Economical, cultural and societal damage will be unimaginable.

Secondly, the uncertainties in the calculation of these chances of failure are at least an order of magnitude, and I am neglecting ignorance of what we don't know. This means that 1/10,000 might be 1/1000, and the chance of flooding occurring during a lifetime increases to 10%. To make matters worse, recent investigations have shown that protection standards may exist in theory, but in practice funding to maintain or improve structures is not sufficient. Only 50% of the levees can be shown to fulfil the legal requirements, for 35% it is unclear if they do and 15% certainly doesn't.¹² It now looks like more money will be made available as a fall-out from Katrina and the Indian Ocean tsunami, but still we also face the uncertain effects of climate change. In the long run living in this low country seems an untenable situation: a vulnerable technological culture indeed.¹³ Maybe we'd better start preparing our upstream neighbours for our mass exodus in a few centuries' time...

We are truly finding ourselves in a lock-in in the Netherlands, because there is no question whether we should continue to defend our land now. Our technological culture of flood defence is inseparable from our existence below sea level, for it is our entire culture we are defending: our history, our society, our economy, our buildings and infrastructure.¹⁴ As a Dutch civil engineer put it recently: 'There is one big lesson for the Netherlands from Katrina: we should never allow this to happen. If you want to live in these areas, you have to protect them.'¹⁵

2 The Netherlands, New Orleans and the future: lessons and learning

You might have thought: 'this is an engineer, he wants to keep his job', but the same message also comes from a US architect: 'Designers from outside think: shrink the city to manageable flood risk. However: people want to go home, no matter how big the risk. This is reality. The game of making the city smaller is over! So we need to protect the big city against category 5 hurricanes, and make the flood risk visible.'¹⁶ This awareness of flood risk is something lacking in the general public in the Netherlands. In most Dutch minds we are safe, in spite of government funded PR campaigns that say we need to live with water and find more space for it. So the lock-in also exists in people's minds, people who are not aware of the flood risks they face vote for politicians who are reluctant to spend more money, and won't if they can't 'score' with a visible result. The Maesland flood gates are fine (see picture), but maintenance is uninteresting.



*The most recent and final addition to the Delta works: the Maesland flood gates
(scale: put upright, each gate is as high as the Eiffel tower)*

Common to the Netherlands and New Orleans, then, is the impossibility of preventing human occupation in flood prone areas. This implies having to live with flood risks – no matter how much the engineers, the politicians and the public want to make sure it never happens again. Decisions on how to manage this situation have to balance resistance and resilience, rigidity and flexibility, as well as being acceptable from a political and funding perspective. And ‘what is the pertinence of knowledge when it comes to this decision making on flood management? How can we incorporate knowledge with politicians’ gut statements (‘we will rebuild no matter what’)?’¹⁷

The requirements and questions expressed here meet and can be answered in the design of solutions. ‘Policy and process meet in designs, we need to get to a concrete level.’¹⁸ Through innovative solutions vulnerability can be changed into something positive: ‘Vulnerability is not to be taken as something purely negative [...] it is even an important asset of our technological culture as a prerequisite for living with the quest for innovation.’¹⁹ Solutions need to reflect the remaining risk, and Chris Zevenbergen gives a concrete example of how this may be done: ‘to combine levees with controlled overtopping in certain, multifunctional areas. This keeps the awareness of flood risk alive, and might also stop people returning to those areas.’²⁰ Many more ideas exist all over the world; the designs presented at the 2005 Architecture Biennale in Rotterdam, *The Flood*, represent only a fraction.

Provided the development of solutions is set up as an open learning process, including smart process management, dealing with concrete situations focuses experts’ minds and forces them to work in an interdisciplinary way. A concrete reason makes dialogue easier and invites negotiations with and between politicians and other relevant social groups. I would hope, therefore, that New Orleans wants to be a flexible, innovative and learning place, doing as best as it can at the present time and improving as time brings new experiences. There is a chance to avoid the lock-in we Dutch seem to have got ourselves into by reflection before action, before jumping for super-Dutch ‘state-of-the-art protection’.²¹

3 Concluding remarks

I think I have shown the Dutch culture to be a technological culture vulnerable to flooding and, at least for the moment, unable to escape its rigid management of flood risk. I have also shown that this vulnerability is socially constructed, e.g. through managerial and political decisions on financing structures and through lack of risk awareness. Different cultures have followed a different historical path, and therefore do not make the same decisions in the present. Wiebe Bijker shows that ‘though the Dutch and American histories of coastal engineering stand out from the other histories by the central role that natural disasters played in shaping the coastal engineering practice, the way they did so is strikingly different. The American practice seems to focus on predicting disasters and mediating the effects once they have happened; the Dutch seems merely aimed at keeping the water out.’²² The task is, therefore, to ground solutions for a Newer Orleans in New Orleans culture: start the dialogues!²³

4 References

Bijker, W. (2005) The vulnerability of technological culture. In: Nowotny, H. (ed.) *Cultures of Technology and the Quest for Innovation*, 2005.

Bijker, W. (submitted) American and Dutch Coastal Engineering: differences in risk conception and differences in technological culture. Contribution to panel at 2005 4S Conference in Pasadena, CA; submitted to Social Studies of Science.

International Architecture Biennale Rotterdam (2005) The Flood. Catalogue.

¹ On a substantial scale this started around the year 1000, but evidence of earlier local efforts has been found. Around the year 1000, there was no centralized state to speak of; the area was ruled by small kings, dukes and bishops.

² I am using the inverted commas to indicate that the use of 'society' as a sole decision making entity is problematic. After this first sentence I will continue to use it without the inverted commas to improve readability.

³ Physical: drained peaty mud lands contain less water, and decrease in volume. Chemical: drained organic soil oxidizes when in contact with the air, which causes volume loss.

⁴ Beside the two processes described in footnote 4, to stop flooding means to stop deposition of new silt and clay, and to stop the growth of new peat.

⁵ This is due to the re-establishment of mass equilibrium between Scandinavia and the Low Countries after the end of the last Ice Age. Scandinavia is still bouncing back, having lost the weight of the ice, which causes the Netherlands to subside. Time scale: 10,000 years.

⁶ To include government ministries, engineering companies, scientific community, and even the royal family (Prince Willem-Alexander).

⁷ A large, relatively sparsely populated area in the Southwest of the country flooded from the sea, causing more than 1800 deaths and a lot of damage

⁸ This happened only in 1996: apparently another reminder was needed. In 1993 and again in 1995 the major rivers nearly burst their banks, and 200,000 people were evacuated. However, the standards were implemented in practice from around 1960.

⁹ However, the final engineers' proposals don't report on this...

¹⁰ More usual in Europe are allowable chances of flooding of once every 100 years. This is also the figure used in the USA (Bijker, submitted).

¹¹ I am only presenting information for the lowest lying areas that are subject to flood risk from the sea, because the situation resembles New Orleans. Areas subject to flooding from rivers have lower standards: once every 250 to once every 1250 years.

¹² Risico in bedijkte termen (2004); Veiligheid Nederland in Kaart. Hoofdrapport (2005)

¹³ Bijker, 2005

¹⁴ 'Only' 60% of the Netherlands is below average sea level, but in all cultural meanings mentioned it is the most important part of the country. All major cities, and many small ones, are located here: Amsterdam, Rotterdam, The Hague, Utrecht.

¹⁵ Piet Dircke (Arcadis engineering) at Newer Orleans symposium, NAI Rotterdam, 17 Feb. 2006

¹⁶ George Hargreaves (director Hargreaves Associates) at Newer Orleans symposium, NAI Rotterdam, 17 Feb. 2006

¹⁷ Katrina planning meeting notes, 15 December 2005

¹⁸ Eelco Dykstra (George Washington University, visiting Professor of International Emergency Management) at Newer Orleans symposium, NAI Rotterdam, 17 Feb. 2006

¹⁹ p.1, Bijker, 2005

²⁰ Chirs Zevenbergen (director Dura Vermeer Business Development & UNESCO/IHE) at Newer Orleans symposium, NAI Rotterdam, 17 Feb. 2006

²¹ Senator Landrieu on touring New Orleans with the Dutch ambassador to the US, 29 November 2005 (www.nola.com)

²² Bijker, submitted

²³ If I caught his words right, Tulane dean Reed Kroloff mentioned plans for a quarter-by-quarter rebuilding dialogue with the (potentially) returning inhabitants (Newer Orleans symposium, NAI Rotterdam, 17 Feb. 2006).