Between adaptability and the urge to control: long-term water policies in the Netherlands

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Between adaptability and the urge to control:

making long-term water policies in the Netherlands

Triggered by recent flood catastrophes and increasing concerns about climate change, scientists as well as policy makers increasingly call for making long-term water policies to enable a transformation towards flood resilience. A key question is how to make these long-term policies adaptive so that they are able to deal with uncertainties and changing circumstances. The paper proposes three conditions for making long-term water policies adaptive, which are then used to evaluate a new Dutch water policy approach called 'Adaptive Delta Management'. Analysing this national policy approach and its translation to the Rotterdam region reveals that Dutch policymakers are torn between adaptability and the urge to control. Reflecting on this dilemma, the paper suggests a stronger focus on monitoring and learning to strengthen the adaptability of long-term water policies. Moreover, increasing the adaptive capacity of society also requires a stronger engagement with local stakeholders including citizens and businesses.

Key words: adaptive policies, strategic planning, flood risk management, flood resilience, Dutch water management

Introduction

Uncertainties have always existed in policy-making (see for example Friend and Jessop 1969); what has changed more recently, however, is the way we view uncertainties. Before, an optimistic view of science as 'steadily advancing in the certainty of knowledge and control of the natural world' (Funtowicz and Ravetz 1993: 739) dominated, leading to reductionist approaches trying to diminish or ignore uncertainty.

Nowadays, uncertainties have become accepted as ‘an unavoidable fact of life’, also in water management (Brugnach et al. 2008).

In water management, the most pressing uncertainty at the moment is climate change: most scientists agree that the climate will be changing with effects on sea levels, precipitation patterns and storm frequency; nonetheless, predictions are still uncertain, in particular for the regional and the local level (Cooney 2012; Jeuken and Reeder 2011). Moreover, future socio-economic development and interactions with the hydrological system are difficult to foresee (see Haasnoot et al. 2011). Water policy-makers are hence trapped: on the one hand, climate change has become an undeniable subject and asks for long-term planning; on the other hand, policy-makers also face ‘unknown unknowns’ (Termeer and van den Brink 2013) which means they do not know how to plan and what to plan for.

Within this context, scientists as well as policy-makers have been attracted by the resilience concept. Resilience is widely acknowledged as a new approach to incorporate uncertainty into planning, in particular with respect to natural hazards such as flooding (Davoudi 2012; Scott 2013; White 2010). Applied to flooding, the idea of resilience promises that a system like an urban region is prepared for both, the probability and the consequences of flooding, and even is capable to transform to a new, less flood prone state when necessary (Restemeyer, Woltjer, and van den Brink 2015). However, although resilience is highly advocated in theory and increasingly adopted in policy discourses, there remains a lack of empirical insights of how to govern for resilience in practice (Wilkinson 2012).

Various authors suggest that resilience requires an *adaptive* planning and management approach – one that can induce change and simultaneously is capable of responding to change (e.g. Holling 1978; Folke et al. 2005; Pahl-Wostl 2006; Wilkinson

2011b; Innes and Booher 2010). What this practically means for making long-term water policies has only recently been put on the research agenda (Reeder and Ranger 2011; W. E. Walker, Haasnoot, and Kwakkel 2013; Haasnoot et al. 2013). The focus, however, has mainly been on techniques and tools to make strategies more flexible (e.g. 'adaptation pathways', see Haasnoot et al. 2013), without paying much attention to the underlying conditions for achieving resilience, namely the content of the strategies and the governance process in which they are made and implemented. The aim of this paper is to complete the picture by defining main conditions for making long-term, adaptive water policies which can be used to evaluate current governance practices. Moreover, we inform current literature with an in-depth case.

The case comes from the Netherlands, a country known for their long-standing history in water management, often being a frontrunner in the debate. Currently, the Dutch are the first ones to apply an adaptive policy-making approach to a whole country, not only to a city or a region. The Adaptive Delta Management (ADM) approach is put forward in the recent Delta Programme, a comprehensive policy programme set out on a national scale and substantiated on a regional and local scale. With the ADM approach, the Netherlands aim at ensuring flood protection and freshwater supply until 2100 while remaining adaptable to changing climate and social conditions.

The paper presents the case by looking at the national level as well as the highly urbanised Rotterdam region. Prior to the empirical analysis, we define three conditions for making long-term water policies adaptive by combining insights from resilience and adaptive planning and governance literature. The case is tested against these theoretically defined conditions, illustrating that the ideas of resilience and adaptability are only partially adopted. In the conclusions, we give some recommendations for

increasing adaptability in the Dutch case and draw several lessons for making long-term, adaptive water policies in general.

Towards flood resilience: making long-term and adaptive water policies

In flood risk management, resilience is often associated with the shift from 'fighting the water' to 'living with the water'. It is based on the assumption that the chance of flooding can never fully be eliminated; hence, the land and the people behind the first protection line should be prepared for dealing with floods (Scott 2013; White 2010).

This reasoning goes back to a shifting world view. Traditional flood control is rooted in an anthropocentric worldview, assuming that water can be predicted and controlled by humans. Instead, resilience thinking, and particularly more recent understandings coined 'social-ecological resilience' or 'evolutionary resilience', emphasises the various interactions and the continuous evolvement of social and ecological systems (Adger et al. 2005; Chandler 2014; Davoudi 2012; Folke et al. 2010; Gunderson and Holling 2002). Uncertainties can then arise because of an unpredictable system behaviour, a lack of information and overview, and differing stakeholders' values and beliefs (Christensen 1985; Funtowicz and Ravetz 1993; Brugnach et al. 2008).

This world view implies that planning and management attempts can turn out differently than expected, yet we argue in line with other scholars (such as Davoudi 2012; Folke et al. 2005; B. Walker et al. 2004) that resilience can still be influenced by societal actors. Although flooding cannot be controlled, our environment can be adapted to be able to cope with flooding. Subsequently, policy-making should not only concentrate on short-term emergency responses to alleviate suffering after a flood event as is often the case today (Fünfgeld and Mcevoy 2012), but instead proactively build adaptive capacity (Davoudi 2012). This requires a new type of strategic policy and

decision-making: while a long-term perspective is needed to enable a transformation, acknowledging uncertainties also requires room for adjustment along the way; there is a need for 'adaptive' water policies.

Drawing from insights about flood management (e.g. Hartmann and Jüpner 2013; Vis et al. 2003), adaptive management (e.g. Pahl-Wostl 2006; Allen et al. 2011), adaptive co-management (e.g. Armitage 2008; Berkes 2008), adaptive governance (e.g. Folke et al. 2005; Dewulf, Meijerink, and Runhaar 2015), adaptive planning (Wilkinson 2011a; Balducci et al. 2011) and adaptive policy-making (e.g. W. E. Walker, Haasnoot, and Kwakkel 2013; Reeder and Ranger 2011), we argue that three points are crucial for making long-term water policies more adaptive; namely, 1) an agile governance process, 2) make flexible strategies and plans and 3) prioritise measures that prevent lock-ins.

An agile governance process

Two aspects crucial for dealing with uncertainties and fostering resilience are collaboration and social learning (Armitage 2008; Folke et al. 2005). The general reasoning is that complex issues, like the adaptation to climate change, involve diverging interests and do not know simple answers (Dewulf, Meijerink, & Runhaar 2015). Collaboration comprises calls for 'multi-level', 'multi-actor' and 'multi-sector' arrangements (Gupta et al. 2010). Because dealing with flood risk and climate change is a cross-cutting theme, multiple sectors such as water management, spatial planning and nature conversation need to be involved. Next to various governmental bodies, also non-governmental actors should be included to better understand the problem and the context (Pahl-Wostl 2009; Berkes and Folke 2002). Involving multiple levels (local, regional, national and even international) is important to improve information flows and knowledge exchange between these levels (Armitage 2008); in particular for issues such

as water which do not stop at administrative borders (Pahl-Wostl 2009). The general assumption is that multi-level, multi-actor and multi-sector arrangements foster learning: by combining multiple forms of knowledge the context can be better understood and finding innovative solutions can be stimulated (Pahl-Wostl 2009).

For making long-term water policies, we argue that agility asks for two ingredients: the capacity to steer towards a desired direction as well as the capacity to adjust based on new insights. Steering capacity can be associated with leadership. Two types of leadership seem to be crucial for making long-term policies; namely, 'visionary' and 'collaborative' leadership. Visionary leadership allows for making long-term visions which are necessary to enable a transformation towards a desired future (Gupta et al. 2010). Collaborative leadership refers to key individuals encouraging collaboration among different actors which is essential in multi-level, multi-actor and multi-sector arrangements (Folke et al. 2005; Armitage 2008).

The capacity to adjust presumes social learning. It requires on the one hand generating new insights, for instance through collaboration or experiments (Folke et al. 2002; Ahern 2011). On the other hand, it asks for continuously monitoring and evaluating practices and contextual circumstances (Allen et al. 2011). Feeding these insights back into the decision-making process should be subject to a broader collaborative process with recurring moments for reassessment (Pahl-Wostl et al. 2007). Monitoring and social learning can therefore be seen as two aspects that belong together (Cundill and Fabricius 2009).

Next to an agile governance process, a broader strategy or plan is required that balances short-term decisions with long-term considerations. Keeping this plan flexible is necessary to deal with uncertainties.

Make flexible strategies and plans

A more flexible strategy-making process does not start with a fixed, detailed end goal in mind, but means and ends can be adapted along the way (Balducci et al. 2011). Literature suggests three interrelated tools to make long-term plans more adaptable, namely scenarios, tipping points and adaptation pathways (Reeder and Ranger 2011; W. E. Walker, Haasnoot, and Kwakkel 2013; Haasnoot et al. 2013).

Scenarios can be a useful technique to anticipate the future and thus, improve understanding of what might come and what to prepare for (Albrechts 2005; Wilkinson 2011a; Pahl-Wostl et al. 2007). The power of scenarios is that they do not merely extrapolate the past and present, but present a range of possible futures. That way, scenarios can help to develop a set of measures to be prepared for each future. At the same time, they can indicate what to do to reach a preferred future (Albrechts 2005).

Tipping points and adaptation pathways, also called 'route-map approach' (Reeder and Ranger 2011) or 'dynamic adaptive policy pathways' (Haasnoot et al. 2013), can help policy-makers to think about the long run, moments when a measure is no longer sufficient and which measures would be a logical follow-up. This approach has only recently been developed together with water managers in England and the Netherlands (W. E. Walker, Haasnoot, and Kwakkel 2013).

An adaptation pathway orders various measures in time, spanning from now until a defined time horizon (Reeder and Ranger 2011). Not all of these measures have to be taken; it depicts more various options and which measures work well together. According to Haasnoot et al. (2013), an adaptation pathway aims to show how long a measure is effective; the moment when a measure turns ineffective is defined as a 'tipping point'. A tipping point can be reached sooner or later, depending on the pace of, for instance, climate change. Thinking about tipping points can therefore be

informed by scenarios. An adaptation pathway depicts these tipping points and shows which measures can be taken as a follow-up. Thereby, an adaptation pathway should inform short-term decision-making without compromising long-term options; it can be a means to show which set of measures keeps options open and creates multiple benefits (Haasnoot et al. 2013). Keeping options open is important to prevent 'lock-ins'. Why this is important and which measures are less likely to cause a lock-in will be discussed in the next section.

Prioritise measures that prevent lock-ins

The strong focus on technical flood protection that dominated the last century is often considered to have caused a 'lock-in' (Huitema and Meijerink 2010; Wesselink et al. 2007; White 2013). A lock-in can be defined as a situation in which sub-optimal solutions persist because they have materialized in the physical as well as social environment; lock-ins result from 'path dependence' which means that the flexibility of a system is limited by how a system developed in the past (Martin and Simmie 2008; Couch et al. 2011). In the past, a flood control approach was often chosen because it gave room for developments and hence brought prosperity (Huitema and Meijerink 2010). Today, the disadvantages are recognized: traditional flood control is expensive, in several places economically infeasible, disadvantageous for nature and, above all, increased vulnerability because development in the hinterland took place without any restrictions (Hartmann and Jüpner 2013; Vis et al. 2003; Liao 2014). Nonetheless, stepping over to a different approach is extremely difficult because flood control has 'materialized' in terms of physical artefacts such as dikes, dams and sluices as well as social constructs such as water institutions (Wesselink et al. 2007).

According to B. Walker et al. (2004), the goal of managing resilience should be to 'successfully avoid crossing into an undesirable system regime, or succeed in

crossing back to a desirable one'. In other words, it is about preventing or getting out of lock-in situations. This does not mean that a resilience strategy in flood risk management will not include large scale infrastructure anymore. Large scale infrastructure will always remain important to withstand flood events (Restemeyer et al. 2015). However, next to this, it is important to reduce the vulnerability of the physical and social environment to be prepared for a potential flood (Liao 2014). This shift is partly already visible in flood risk management, which has developed from a rather sectoral policy field to a more holistic risk management, targeted at reducing not only the probability, but also the consequences of flooding (Meijerink and Dicke 2008, White 2010).

Breaking free from the current lock-in would mean adjusting the physical environment, for instance adapting existing buildings through wet- or dry-proofing or adjusting land-uses by the means of spatial planning (White 2010). Creating more space for water can also be a means to reduce the probability of flooding, for instance by giving more room for the river, which offers benefits for flood protection, nature development and recreational purposes (Vis et al. 2003). Vulnerability of the hinterland can further be reduced through risk communication and disaster management (O'Sullivan et al. 2012; Smith 2013). Because these measures are either easily reversible or offer multiple benefits, they are less path-dependent than dikes, dams or sluices. They can therefore be useful measures to prevent or move out of a lock-in (Liao 2014).

In summary, all three points are about fostering resilience by making long-term water policies that are capable of dealing with change and uncertainty. The first is about the governance process in which the strategy-making takes place; the second is about the flexibility of strategies and the third is about measures and hence the actual content

of the policy. Together they address the key questions subject to every planning process, namely what to do, how to do it and whom to involve. Each condition implies a shift for flood risk management, particularly for a country like the Netherlands known for its technocratic culture (Lintsen 2002; Wesselink et al. 2007; van den Brink, 2010). From a rather centralized and hierarchical management to a governance process based on collaboration and learning; from large scale interventions like the Delta Works to flexible strategies and plans, and from a focus on technical engineering measures to a more holistic risk management. By exploring the case of the Dutch Delta Programme, we will examine to what extent these points have already landed in practice and how Dutch policy-makers attempt to develop a more adaptive approach.

Case introduction and methodology

The Delta Programme is a national policy programme in the Netherlands set up to advice the national government on how to ensure flood protection and freshwater supply until 2100. It was established in 2010 based on the advice of the so-called Delta Commission because of increasing concerns about climate change (Deltacommissie 2008). It is a follow-up of the historical first Delta Programme established after the flood disaster of 1953, which made the Netherlands famous for their water-engineering skills manifested in the so-called Delta Works (van der Brugge, Rotmans, and Loorbach 2005). While the first Delta Programme was rather engineering-driven, the current Delta Programme proclaims to follow an adaptive and integrated approach. Thereby, the Netherlands attempts to create synergies between various policy fields with one of the goals being to avoid over- and underinvestment.

The Delta Programme is institutionally embedded in form of the “5 D’s”. The *Delta Act* ensures that there is a *Delta Commissioner* and a *Delta Fund* of 1 billion € per year (public funding, at least until 2028). The Delta Commissioner is a public servant at

the top of the Delta Programme, who ensures that a *Delta Programme report* is published every year, reporting on the progress of the Delta Programme towards the cabinet and the general public. Besides, he is responsible for developing and implementing the so-called *Delta Decisions* which represent the main choices with respect to flood protection and freshwater supply until 2100. The Delta Decisions were prepared between 2010 and June 2014. Currently, they are being incorporated into existing policy instruments, such as the National Water Plan and the Flood Protection Programme (in Dutch: *Hoogwaterbeschermingsprogramma*). Although the Delta Programme is a national programme, it was further substantiated in nine sub-programmes working on a specific topic (e.g. freshwater) or region (e.g. Wadden). The Delta Programme can therefore be seen as an overarching organization bundling resources and people working on water policy in the Netherlands.

To gain insights into the policy process and how the involved policy-makers defined and operationalized an adaptive approach, we studied the interaction between the national and regional level in depth by zooming in to one regional sub-programme. *Rijnmond-Drechtsteden* was selected as it is the most urbanised sub-programme comprising 1.6 million inhabitants and the city and harbour of Rotterdam with internationally economic significance (see Figure 1). Sea and rivers meet in this region, hence the sub-programme focused on tidal as well as fluvial flooding[1].

[Figure 1]

We applied a mixed-method approach consisting of policy document analysis, in-depth interviews with key actors, and participatory observation. The aim of the policy document analysis was to improve our understanding of the general governance

[1] Pluvial flooding and how to deal with it in cities was part of the sub-programme ‘new urban developments and restructuring’.

process of the Delta Programme, the principles of the ADM approach, and the developed strategies and measures. For this purpose, we examined the guideline for implementing ADM and yearly progress reports from the national Delta Programme as well as the regional sub-programme. We chose to study these policy documents as they were produced by the policy-makers themselves, presenting the results of the preceding negotiation processes. Policy documents can therefore be seen as 'social facts' (Atkinson and Coffey 1997: 47). However, policy documents might spare information or only present the 'bright side' of the story (Bowen 2009). We therefore also included voices 'outside' of the Delta Programme into our analysis, by searching for critiques in professional journals (e.g. *Cobouw* 2015/10/03, *De Ingenieur* 2014/09/10), on websites and so-called 'grey documents' from interest groups (e.g. LTO Website 2014/09/17, WNF 2012). Moreover, we triangulated the document analysis with interviews and participatory observation.

The interviews gave us insights about the story 'untold' in the policy documents, namely how collaboration with governmental and non-governmental actors was perceived and which problems occurred when putting the ADM approach into practice. We held ten interviews with key stakeholders from the national as well as regional level. These stakeholders were either selected due to their direct involvement in the ADM process or their central position in the governance structure (see Table 1). The semi-structured interview guide comprised questions about their understanding of the ADM concept, the application of ADM and the governance process of the Delta Programme.

[Table 1]

The aim of the participatory observations was to experience the translation process first hand and to contextualise the stories of the interviewees. For that purpose,

we participated in several meetings from the regional programme team between December 2013 and June 2014. This time period was chosen because it was the final phase of the regional programme team, where they had to develop a preferred strategy explicitly linked to ADM. In these meetings, our level of participation was *moderate* (see Hennink et al. 2011). All participants knew that we were investigating the sub-programme, we were sitting at the same table as the programme team members and we became part of their email list and therefore received all documents and minutes of their meetings. However, we did not actively participate in the discussions to keep enough distance to our object of analysis and thus ensure our objectivity as a researcher.

In addition, we attended two of the yearly organised National Delta Congresses (2013 in Utrecht and 2014 in Amersfoort), a symposium on Adaptive Delta Management (June 2013 in Enschede) and two lectures given by national Delta Staff members in Groningen (in 2013 and 2014).

The collected data (policy documents, observation protocols and interview transcripts) was analysed with Atlas.TI, a computer programme for qualitative data analysis. We used deductive and inductive codes to mark all text passages fitting under the umbrella of the three conditions for making long-term, adaptive water policies defined in Section 2. Together, they show how the Delta Programme operationalised an adaptive approach, with the inductive codes showing specific ideas coming forth from the Delta Programme. Within these marked text passages, we were looking for reoccurring themes and representative quotes, which finally brought us to the results as presented in Sections 4-6. To validate our findings, we presented our results to the regional programme team in May 2014.

The Dutch Delta Programme – an agile governance process?

Steering capacity

The Delta Programme has a high steering capacity through a strong institutional embedding also referred to as "the 5 D's": the Delta Act, Delta Fund, Delta Programme reports, Delta Decisions and Delta Commissioner (see Section 3). In particular, the creation of a new temporary figure in the political landscape of the Netherlands, the Delta Commissioner, shows how high water is put onto the political agenda (van Twist et al. 2013). In Dutch history, commissioners have only been installed if a topic deserved special attention (ibid). Appointed by the government in 2010 for seven years, he is particularly responsible for involving all relevant parties and guaranteeing the coherence of the developed strategies. The Delta Commissioner interacts closely with the ministers of Infrastructure and Environment and Economic Affairs and may even be the spokesman in the Cabinet and the House of Parliament, if the minister of Infrastructure and Environment asks him to do so. The Delta Programme therefore has the power to bring about change.

The Delta Programme incorporated the multi-level idea; policy-making simultaneously took place on the national and the regional level. Figure 2 shows the structure of the Delta Programme and the interaction between the national level and the regional level with the example of the regional sub-programme *Rijnmond-Drechtsteden*. This governance set-up followed directly from an advice of a national commission concerning infrastructure projects (Commissie Elverding 2008).

[Figure 2]

The national level, consisting of the Delta Commissioner and his Delta Staff (around 10 people mainly recruited from ministries[2]), primarily determined the process by defining deliverables for each year. The sub-programmes were asked to carry out a

problem analysis in the first year, develop ‘possible strategies’ (in Dutch: *‘mogelijke strategieën’*) in the second year, elaborate ‘promising strategies’ (in Dutch: *‘kansrijke strategieën’*) in the third year and choose a ‘preferred strategy’ (in Dutch: *‘voorkeursstrategie’*) during the fourth year. The preferred strategy formed the final advice for the Delta Decisions in 2015.

The actual content of the strategies, however, was developed by the core working group on the regional level: the ‘programme team’ consisting of around 25 people[2] mainly from ministries, provinces, municipalities and water boards. The developed strategies gained their political legitimacy through the regional ‘steering committee’, comprising seven political representatives from all levels, ranging from the mayor of Rotterdam and local aldermen to representatives from the ministry Infrastructure and Environment. They officially approved the plans and strategies developed within the sub-programme.

The parallel policy-making process stimulated a ‘joint-fact finding phase’, in which a variety of stakeholders from different backgrounds (i.e. professionals and academics from different disciplines such as water management, planning and agriculture) and different levels (national, regional, local) were brought together to discuss the issues at stake. That way, the Delta Programme tried to find new ideas and integrated solutions tailor-made for and broadly accepted by the region.

Nevertheless, the Delta Programme remained overall rather government and expert-driven. As van Buuren (2013) already concluded, the Delta Programme relied strongly on expert knowledge from the water domain with little involvement of local stakeholders and citizens . Non-governmental stakeholders were only represented in

[2] The numbers are only an approximation, because particularly on the regional level, personnel changed frequently throughout the process.

form of an *Advisory Committee*. The Advisory Committee consisted of eleven persons from social organisations, each representing a different interest such as nature, agriculture or shipping. Regarding their role in the strategy-making process the chairman of the Advisory Committee stated:

> 'A drawback from the Delta Programme is that the consultation structure is limited to governments. I find the advisory boards too weak. You should give social organisations a clearer place; then you share responsibilities for decision-making. Now, they are often a bit too far away from the process.'

Businesses and citizens did not have a formal role in the strategy-making process. As such it still resembles a more technocratic approach to water management. An explanation can be that providing 'dry feet' is part of the Dutch constitution; the government therefore feels high responsibility. It bears the risk though that public authorities remain caught in their old patterns, generating less innovative solutions and new insights than needed. On the other hand, the Delta Programme was also actively searching for new insights outside the public realm.

Capacity to adjust based on new insights

Knowledge generation stood central in the Delta Programme, resulting in a close interaction between knowledge institutes and policy-makers. For example, the Delta Programme was closely interacting with the national research programme 'Knowledge for Climate' (in Dutch: '*Kennis voor Klimaat'*), in which various universities and research institutes were exploring solutions for making the Netherlands climate proof. Moreover, all sub-programmes were asked to formulate particular research questions, which would then be answered by research institutes hired by the Delta Staff. *Rijnmond-Drechtsteden* also had a *Scientific Reflection Group* as a consultation board for the programme team. The Scientific Reflection Group consisted of twelve professors and researchers from various universities; they were frequently consulted by the

programme team. Moreover, the Delta Programme created the Top Sector Water – a collaboration of the Dutch government, business companies as well as research institutes working on innovative water technologies.

Still, the capacity to adjust based on new insights remained rather underdeveloped in the governance process of the Delta Programme. The 'Delta Decisions' were developed in a rather linear filtering process. It is not clear what will happen if the underlying assumptions change. Only the most recent Delta Programme makes clear that the national level will take a lead in setting up a monitoring system in the future; it aims at connecting to other running policy programmes (Delta Programme, 2014). Whether this future programme will establish the necessary linkages between monitoring on the one hand and learning from the monitoring results on the other (eventually leading to policy adjustment) remains to be seen. A clear strategy for establishing these feedback moments is at least not visible in the governance process; to what extent the strategies are still flexible can be evaluated by taking a closer look at the ADM approach.

ADM – making flexible strategies

National ADM principles

The Delta Programme (2010: 68) acknowledges that knowledge about the future is by definition incomplete, but uncertainty 'can be made manageable'. For this purpose, the ADM approach was developed. According to the Delta Programme report (2012: 45), ADM 'means doing what is necessary, neither too much nor too little, while not ruling out future options'.

For applying ADM, the national staff supported the regional level with an implementation guideline (*Handreiking Adaptief Deltamanagement* 2012) as well as

personnel. Two external advisors from private companies could be hired by the sub-programmes to help them putting ADM into practice, one of which also wrote the implementation guideline. The national level stimulated and facilitated ADM in the sub-programmes, but they did not dictate anything. As one of the external advisors said: 'There was a guideline, they *[the sub-programmes]* could hire people like me, but in principle they had to do it themselves'.

Because the Delta Programme was closely cooperating with the policy-makers and scientists from England and the Netherlands that developed the idea of adaptation pathways, the ADM implementation guideline suggests working with scenarios, tipping points and adaptation pathways. Based on scenarios for climate change (from the Royal Netherlands Meteorological Institute) and socio-economic development from 2006 (from the Netherlands Assessment Agencies), four futures were chosen, the so-called Delta Scenarios, that either assume rapid or moderate climate change, socio-economic growth or socio-economic decline (see figure 3). It was a conscious choice to work with the four most plausible scenarios, although further-reaching scenarios were considered, as a Delta Staff member explains: 'It is a policy choice not to prepare for very extreme or worst cases. We designed the strategies for plausible futures. The strategies that were finally selected were tested for more extreme scenarios.'

[Figure 3]

The ADM implementation guideline demands that strategies should be 'robust' and 'flexible' at the same time. According to a Delta Staff member, robustness means that a strategy works in all plausible futures (the Delta Scenarios), whereas flexibility means that – depending on the contextual circumstances – you can cut one strategy off and switch to another one. Identifying tipping points and making adaptation pathways, hence ordering various possible measures in time, was supposed to help finding robust

and flexible strategies. For being flexible, however, you need to know when to take action or change course, hence when a tipping point is reached. It presumes that you keep track of external developments as well as effects of certain measures, for example through monitoring. Such a monitoring system is still lacking though. The difficulty lies in finding appropriate parameters. A Delta Staff member responsible for ADM gave an example:

> 'You need a parameter that you can keep track of and that shows you on time: now we really have to do something in addition to what we have decided on earlier. That works perfectly for sea level rise; the Netherlands, however, does not only have to deal with sea level rise, but also with river discharge.'

River discharge however, conversely to sea level rise, can gradually rise for a certain period and at some point be very little again. It can go up and down without a certain pattern. In practice, identifying climate indications from discharge monitoring is perceived as a nearly impossible task as variability is large. The Delta Programme therefore chose to assume a fixed river discharge. They plan for accommodating 17000m^3/s in 2050 and 18000m^3/s in 2100. The Delta Staff member responsible for ADM recognizes that this goes against the idea of flexibility: 'It is kind of contradictory, because you actually say that, well, that you cannot rely on monitoring so you base your decisions on 'artificially fixed' worst case future conditions.'

Practice therefore reveals an interesting paradox intrinsic to working with tipping points and adaptation pathways. It assumes that we can actually know tipping points beforehand, or at least recognize them when they are reached. The difficulty of finding appropriate parameters, illustrated with the example of river discharge, shows the limits of our foresight capabilities though. While some indicators such as sea level rise can be tackled, others (e.g. river discharge) cannot. Choosing a fixed value in the end resembles more a 'predict and control' than an adaptive approach.

Rijnmond-Drechtsteden: Working with scenarios, tipping points and adaptation pathways

The regional sub-programme *Rijnmond-Drechtsteden* also experienced other difficulties in practice. Working with scenarios, for example, is easier said than done. The external advisor helping the sub-programmes with ADM said:

> 'Thinking in four scenarios was too difficult for people. That went completely different in practice than we thought. They actually only worked out the 'steam' scenario, because it is the worst case. And what then often happened is that they also made a sensitivity analysis for the 'rest' scenario. That seemed to be cognitively feasible for people.'

Rijnmond-Drechtsteden was a sub-programme that actively worked with all four scenarios; they first translated the more general Delta Scenarios to the regional context (see *Deltaprogramma Rijnmond-Drechtsteden*, 2011). But also in this sub-programme the effectiveness of strategies was only calculated for two scenarios ('steam' and 'rest') and the worst-case scenario ('steam') was considered to be the most important one. Interestingly, they came to the conclusion that the scenario actually does not matter too much. Whatever scenario it will be, today's system of dikes and storm surge barriers can cope with it: improvements are necessary, but no radical changes are required *(Deltaprogramma Rijnmond-Drechtsteden*, 2014). Obviously, this also had to do with the conscious choice of preparing not for the most extreme scenarios on the national level.

The conclusion that radical changes in the water system are not required also made it difficult for them to identify tipping points and visualize adaptation pathways. One member of the programme team responsible for ADM explained:

> 'We were very much searching for tipping points: moments that a strategy does not work anymore and that you really have to step over to another one. Our conclusion was that we do not have those moments in time. Then ADM gets much simpler, because that means that, with heavy climate scenarios, you do things earlier than with light climate scenarios.

So it is more about spreading measures in time than that there are moments where you say, “Oh, now we really have to step over to another strategy”.’

[Figure 4]

The general strategy until 2100 therefore seems rather determined, leaving little room for adjustments along the way (see Figure 4). The only option mentioned is the adjustment of the discharge distribution, which would imply reconsidering by how much dikes need to be strengthened. Although not clear from the figure, they consider it to be adaptive in that sense that they will do more or less of each measure depending on climate and socio-economic developments. How this will be evaluated, however, is not clear. The programme director adds another interesting point:

‘If there are two options to create extra storage capacity in an area and there is now the willingness to invest in them, then it is also better to do it now, even if the measures are only necessary after 2050. Hence, this *[points at the ADM scheme]* is of course nice, but the political reality is often different, and the political reality is in general more determining.’

Working with scenarios, tipping points and adaptation pathways is therefore not only rather complex; issues like power and money also make policy-making much less rational than the abstract idea of adaptation pathways suggests. Similarly, van Buuren and van Popering-Verkerk (2014) already concluded that the Delta Scenarios miss out the governance aspect, namely what the role of the state, market and civil society under different contextual conditions would be. Still, the developed adaptation pathway also shows measures that fit more into a resilience paradigm (e.g. ‘create more room for the river’). To what extent a lock-in is avoided will be discussed in the next section.

Preventing lock-ins?

National guideline: avoiding 'lock-ins' and 'lock-outs' wherever possible

Avoiding 'lock-ins' and 'lock-outs' is explicitly mentioned in the ADM guideline (*Handreiking Adaptief Deltamanagement* 2012: 4):

> 'Thinking about the first decision and possible follow-up decisions in the long run is important to be prepared on time for the long term challenges regarding water safety and freshwater supply. Being able to adjust flexibly to changing social and climate conditions is necessary to prevent so-called *lock-in* and *lock-out* situations.'

Lock-in and lock-out situations refer both to situations where decisions made in the past can compromise the adaptive capacity of a region in the long run; they only have a different origin. A lock-in is explained as a situation in which investments in flood defences attract more socio-economic activities behind the dike and therefore increases the need to protect the area even more. In a lock-out situation, socio-economic developments happen in the first place, for example next to the river, which 'locks-out' the option of creating more room for the river.

In the filtering process, strategies were scored on meeting the targets for water safety and freshwater, but also in terms of their effects for *e.g.* nature and shipping. Evaluation exercises were based on cost-benefit analyses and expert judgement. Regarding lock-ins and lock-outs the ADM guideline states that they do not always have to be prevented: 'It can be a justified decision if the choice is economically viable and made consciously' (*Handreiking Adaptief Deltamanagement* 2012: 6). Because most of the developments in the Netherlands took place without taking the possibility of a flood event into account, they consider the potential for more spatial measures as limited and only promising for a few areas (*Handreiking Adaptief Deltamanagement* 2012). Avoiding lock-ins was hence an intention, but already slightly undermined on the national level.

Rijnmond-Drechtsteden's preferred strategy: focus on prevention, but gradual adjustment

In *Rijnmond-Drechtsteden* the filtering process from possible to promising to a preferred strategy resulted in the conclusion that large-scale interventions, like for example a ring of weirs or a closed dam to the seaside still discussed in the phase of possible strategies, are not required. This decision is contested. Interest groups, such as a group of engineers and the Agricultural and Horticultural Organization (in Dutch: *Land- en Tuinbouworganisatie*) argue that closing the sea with a sluice would increase flood protection levels, lower costs and create an adequate freshwater buffer (*De Ingenieur* 2014/09/10; LTO Website 2014/09/17). On the other hand, nature organizations were in favour of opening the sea side to allow for more natural estuarine dynamics (WNF 2012).

In that sense, the sub-programme's choice for maintaining and improving the existing system can be seen as a middle course. In their perspective, the preferred strategy is 'robust' because it can cope with the predictions of the most extreme scenario ('steam'). Furthermore, they claim it is 'flexible' because it does not require large-scale measures, but only gradual adjustments of the existing system (*Deltaprogramma Rijnmond-Drechtsteden*, 2014). Although this fits within the logic of how the Delta Staff defines 'robustness' and 'flexibility', it does not necessarily lead to an increased adaptive capacity behind the dike line.

This is because the extra measures needed for gradual adjustment are mainly about reducing the probability of flooding, i.e. dike heightening, first optimisation and eventually replacement of storm surge barriers. Making more room for the river, rather prominent in the adaptation pathway, is actually only thought of as effective in one part of the region, to the east of the Island of Dordrecht. Reducing the consequences of

flooding through flood-adapted building and evacuation measures is only considered to be promising in the few unembanked areas (e.g. Stadshavens in Rotterdam) and the Island of Dordrecht, because most of the region lies below sea level and would be flooded quickly.

Dordrecht is a special case in that respect: it follows a more integrated approach, although most of the island is protected by a dike ring. Parts of the dike ring, however, are difficult to improve because the dikes are too close to historic buildings. Dordrecht therefore already started to search for alternative solutions previous to the Delta Programme, bringing forward the idea of a 'multi-layer safety approach' that combines preventive measures with spatial planning and evacuation measures (van Herk et al. 2011).

Although only exemptions in a predominantly preventive strategy, *Rijnmond-Drechtsteden* strongly emphasizes the integration of water management and spatial planning, much more than other sub-programmes do. Nevertheless, they start reasoning from dikes. As they say in their final advice: 'We see every dike as a spatial concept and an opportunity to integrate the dike better into its spatial surrounding.' The integration of water management and spatial planning therefore mainly gets down to a better integration of dikes into the landscape: for example, by building 'strong urban dikes' that are in that sense multifunctional that they can incorporate parking lots or shops. It is less about making the landscape resilient, so that a flood event can occur without causing too much damage. Similarly, Van Buuren and Teisman (2014) have already concluded that the integration of water management and spatial planning is not yet sufficient and requires more attention in the future.

Communication about flood risks and evacuation possibilities towards citizens is barely addressed in the preferred strategy. This seems to be intrinsic to all sub-

programmes as the parliamentary commission evaluating the Delta Programme in 2015 pointed out: it remains unclear if flood risks and evacuation possibilities should be communicated to citizens, and if so how (Letter to the minister of Infrastructure and Environment by the parliamentary commission, kamerstuk 34 300 J, no. 4). The urgency of this question increases in the light of a recent national survey highlighting that the majority of Dutch citizens (57%) feels insufficiently informed about flood risks, although they trust the government to prevent flooding (IPSOS 2016).

Overall, the preferred strategy still reflects the belief that they are able to control flooding. In case of technical failure or a flood event overtopping the dike line the hinterland remains vulnerable. Adaptability then gets limited to the idea of gradual adjustments instead of being able to deal with unexpected events.

Reflections and conclusions

The paper started out with arguing that fostering flood resilience requires a new type of strategic policy-making which considers the long run to enable a transformation. At the same time, it should be adaptive to deal with uncertainties and changing circumstances. To clarify how to make long-term water policies more adaptive in an applied sense, the paper has put forward three theoretically defined conditions that can be used to evaluate current governance practices: 1) an agile governance process, 2) making flexible strategies and plans and 3) prioritising measures that prevent lock-ins.

Comparing the Delta Programme and its ADM approach to these three theoretically defined conditions reveals certain tensions though. The main dilemma seems to be between the desire for adaptability and the urge to control. On the one hand, the Delta Programme shows signs of an integrated and adaptive approach to deal with uncertainties. A vast policy programme was set up, which improved linkages and information flows between different governmental bodies and levels. Besides, the Delta

Programme was actively searching for new insights outside the public realm, in particular through a strong interaction with research. One of the results was the 'Adaptive Delta Management' approach using scenarios, tipping points and adaptation pathways to make strategies more 'robust' and 'flexible'. Moreover, policy-makers were very aware of possible 'lock-ins', acknowledging spatial and evacuation measures next to preventive measures.

On the other hand, the governance process remained mainly government- and expert-driven, which limits the extent of social learning to a specific part of the social system. Also the adaptability of the ADM approach can be questioned, when a monitoring system is missing and strategies are designed on the basis of fixed parameters instead. In the case of *Rijnmond-Drechtsteden*, this led to a preferred strategy in which adaptability mainly gets down to gradual adjustments of certain measures, in particular dike strengthening. Overall, the dominance of governmental authorities, the linear process of filtering strategies, and choosing fixed parameters for designing strategies still show the struggle of making uncertainties 'manageable'. More critically speaking, this shows the persistent urge to 'predict and control' in Dutch water management; an outcome of centuries of technocratic-inspired policies.

To overcome this dilemma, we suggest a stronger focus on monitoring and learning. A clear monitoring system, evaluating existing practices as well as external developments, is still missing at the moment. However, in the current logic of the Delta Programme a monitoring system is needed to identify moments when to adjust strategies and decisions. Checking the underlying assumptions of the Delta Programme with the regular update of existing policy instruments – as planned at the moment – seems only a beginning. A stronger institutionalisation of a monitoring system, defining what to monitor, with whom to discuss the results and when to take action, is needed.

Particularly, because more radical changes might be necessary in the future. Institutionalising monitoring and learning on the one hand increases the adaptability of the current strategies; on the other hand, it gives the government an opportunity to remain in control, as it would clearly be a governmental task.

Nonetheless, social learning should also be understood in a broader sense. Increasing the adaptive capacity of society asks for a more active engagement with local stakeholders and citizens. Risk communication is necessary to create more awareness and gain support for spatial as well as evacuation measures. Furthermore, it is highly recommendable to make better use of local knowledge and local capacities. Through this, measures will better suit the local context and, more importantly in the long run, local stakeholders will feel more ownership when it comes to flood risk management.

Based on the empirical reflection of the Dutch case, we can also draw some general lessons for planning and policy research as well as practice. First, to facilitate an *agile governance process* it is crucial to think about ways to embed learning and monitoring in the policy process before starting to develop strategies. Cundill and Fabricius (2009) have already emphasized ‘collaborative monitoring’ as a means to deal with uncertainty in environmental management; however, more research is needed to substantiate the details of such an approach. Second, the case gives some interesting insights about techniques and tools to *make strategies more flexible*. Adaptation pathways and tipping points as suggested by various authors (Reeder and Ranger 2011; W. E. Walker, Haasnoot, and Kwakkel 2013; Haasnoot et al. 2013) are useful to think about the long run, but are rather complex and abstract for strategic policy-making on a national and regional level. Developing adaptation pathways on a local scale seems more feasible, because then specific measures can be discussed in depth and better embedded into the physical, social, and political reality. Third, the case shows how

difficult it is *to prioritise measures that prevent lock-ins* when the system is already caught in a lock-in. The integration of flood defence infrastructure into a broader urban planning agenda, increasing flood protection and spatial quality at the same time, is a valuable approach as it creates multiple gains. However, it does not really overcome the lock-in situation. Policy-makers so far seem to have little evidence base to choose for a more radical adaptation of the physical and social environment. As Liao (2014:745) already concluded, this seems to be 'not a question of possibility but of choice'. We recommend building a bigger knowledge base, based on small-scale projects and experiments (Folke et al. 2010; Liao 2014; Pahl-Wostl 2006).

Overall, the Dutch case shows how much the institutional context matters. Because flood risk management is a public responsibility in the Netherlands, even laid down in the constitution, the state needs to guarantee protection and justify money allocations. As the existing protection system is already highly advanced and no disastrous flood happened since 1953, it seems logical to continue with this path. It therefore raises the question: how realistic is resilience thinking under such conditions? The Adaptive Delta Management approach shows that the Dutch interpret 'adaptability' in their own way – with a strong reliance on governments, experts, techniques and tools. Thereby, they build upon their past. This has the advantage that they continue with what they are good at and which has grown for centuries. On the contrary, there is the risk that they might be caught in old patterns, paying too little attention to increasing the adaptive capacity on land. For further research it therefore seems interesting to explore how the adaptability discourse unfolds in other (national) contexts, and which conditions and policy arrangements are advantageous or disadvantageous for applying a resilience approach. Clearly, putting resilience and adaptability from theory into practice still remains a key challenge for the future.

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