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## **The rationales of resilience in English and Dutch flood risk policies**

[Short title: The rationales of resilience in English and Dutch flood risk policies]

*[Paper for Special Issue “The governance of adaptation in a European Comparative Perspective”; Journal for Water and Climate Change]*

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### **ABSTRACT**

We compared the governance of flood risk in England and the Netherlands, focusing on the general policies, instruments used and underlying principles. Both physical and political environments are important in explaining how countries evolved towards very different rationales of resilience. Answering questions as ‘who decides’, ‘who should act’ and ‘who is responsible and liable for flood damage’ systematically, results in a quite fundamental difference in what resilience means, and how this affects the governance regime. In the Netherlands, there is nationwide collective regime with a technocracy based on the merit of water expertise, legitimated by a social contract of government being responsible and the general public accepting and supporting this. In England there also is a technocracy, but this is

part of a general-political and economic-rational decision-making process, with responsibilities spread over state, insurance companies, individuals and communities. The rationales are connected to specific conceptions of the public interest, leading to specific governance principles. In both countries, flood risk strategies are discussed in the light of climate change effects, but resilience strategies show more persistence, although combined with gradual adaptation of practises on lower scales, than great transformations.

**Key words** | climate change, flood risk management, governance, resilience, the Netherlands, United Kingdom

## **INTRODUCTION**

Over the last few centuries societies have developed specific views on the governance of the public domain, especially with regard to the involvement and interrelationships of state, market and civil society (Arato & Cohen 1988; Edwards 2009). This has been accompanied by substantive and procedural principles related to decision-making and the specific roles of basic institutions in governance. Governance, however, is not only undertaken through social interaction, it also expresses and articulates existing social and institutional relationships or it creates new social relationships. This articulation is both through how decisions are made, but also by who acts and who has the responsibility for acting. One challenge of governance is the need to respond to the natural environment both to cope with and adapt to natural variability, including trend changes, such as climate change. Climate change creates new or increased risks that produce new governance dilemmas, and thereby tests existing and well-known principles (Haug *et al.* 2010; Termeer *et al.* 2011; Levin 2012).

Both academic literature and political practice dealing with adaptation to climate change often contain references to ‘resilience’ as an end state or a central evaluative concept for assessing climate adaptation policies (e.g., Adger 2000; Walker *et al.* 2010). This makes sense, as society’s main challenge in a dynamic physical environment is to anticipate and adapt to inevitable changes and perhaps find new equilibriums. However, analysing adaptation strategies in water management reveals that social-ecological resilience acquires different meanings depending on the social context (Keessen *et al.* 2013) and this is especially the case when we compare adaptation in different countries. Although the academic literature seems to suggest the possibility of ‘universal’ templates in resilience strategies (e.g., creating reflexive strategies, embracing variety, having back-up options, stimulating participation, etc.), we would like to stress that there is neither one straightforward application of a resilient

strategy for societies nor one resilient socio-ecological system. What is considered a resilient system is, at least in part, dependent on existing social relationships or the ‘social contract’ (Adger *et al.* 2013) and thus on existing governance structures and approaches and what is deemed appropriate in the policy and governance context. We argue that the strategy for coping and adapting to the physical environment, and thus trying to provide resilience, is a product of the form of governance arrangements in that society. In turn, providing resilience cannot be treated as a technical problem. It fundamentally involves arguments about what are and what ought to be the dominant social relationships.

In this contribution, we compare basic governance approaches in two countries, England and the Netherlands. In both countries, adaptation to climate change and related flood risks is considered highly relevant. Yet each has clearly different governance approaches which might reveal the prioritisation of other governance principles in the face of climate change. We will focus on topics related to flood risk management to make this comparison more fruitful and balanced and to be able to compare principles in similar policy domains. Our argument is that, in brief, the concept of resilience is different for English society and governance compared to Dutch society and governance. Different political theories evolved historically into a specific arrangement for water management and climate change, which provided different rationales for the role and interrelationships of the basic institutional spheres or mechanisms, in the common shorthand the state, market and civil society – the latter in the case of flood risks may refer to different models, the involvement of NGOs (such as WWF) or other organised groups, institutions of participatory democracy, communities as well as the direct involvement of the local citizens within flood risk management – and these, in turn, influenced the basic principles and instruments in policy and governance.

New circumstances and new risks related to climate change challenge existing governance regimes, but pathways to reach new resilience equilibriums will be different. To put it more critically, the academic literature on adaptation and resilience generally pays too little attention to the differences in institutional path dependencies and the normative underpinnings of policy choices in the governance of adaptation. These underpinnings determine to a large extent what is possible or not, what is justifiable or not or what is considered legitimate. The central research question is how the challenges of climate adaptation are putting pressure on the existing governance arrangements and their underlying

normative principles: is climate change – and adaptation responses – leading to transformations in the rationales of resilience that have ruled governance in these societies?

## **THEORY ON RESILIENCE AND METHODS**

The concept of resilience stems from biology and was introduced more widely by Holling to understand the dynamics of ecosystems, especially their capacity to persist in some original state while being subjected to all kinds of environmental changes or perturbations (Holling 1973; Folke *et al.* 2010). Social science scholars were inspired by this and promoted the (holistic) idea of the crucial interrelationships and interdependencies between social and ecological systems. Part of the debate on – and perhaps confusion related to – resilience was that some stressed the importance of *persistence* ‘(...) as a buffer for conserving what you have and recovering to what you were’ (Folke *et al.* 2010, p. 6) and others stressed *transformations* and change of system regimes, while the stream of thought on social-ecological systems embraced ‘change as a requisite to persist’ (Folke *et al.* 2010).

Folke *et al.* (2010) attempted to combine both by saying that resilience is ‘the capacity of a system to absorb disturbance and reorganise while undergoing change so as to still retain essentially the same function, structure and feedbacks, and therefore identity, that is, the capacity to change in order to maintain the same identity’ (Folke *et al.* 2010, Table 1). In this line of reasoning we must distinguish between *adaptability* as a capacity of systems ‘to learn, combine experience and knowledge, adjust its responses to changing external drivers and internal processes and continue developing within the current stability domains (...)’ and *transformability* as ‘ (...) the capacity to create a fundamentally new system (...)’. In other words, we have *adaptability of regimes* and *transformability* related to regime *shifts*, a transformation from one equilibrium to another. *Adaptability* and *transformability* can occur at multiple scales. Sometimes, changes at lower scales (e.g., on critical issues) are needed to preserve the regime as a whole (Folke *et al.* 2010).

If we translate these, quite abstract, system-related ideas to the domain of water management and climatic change, the interdependent social-ecological system level would in our case be the English and Dutch society as a whole, whereas the social-ecological subsystem (lower scale) would in general be how flood risk management responds to the natural environment in terms of governance, policy discourse, including the leading governance principles and instruments. Even this subsystem level is too large and complex to tackle in one paper so we confine ourselves to the governance of sea and river floods: a

specific but prominent part of subsystem perturbations. As is elaborated in Keessen *et al.* (2013), resilience of social systems and related governance is not ‘neutral terrain’ but is dependent, next to the natural environment, on the political theories underpinning governance systems. These political theories steer and explain policy choices when it comes to adaptation to climatic changes. The question arises: What and who should be resilient? (Carpenter *et al.* 2001; Berkhout 2005). Political theory guides the way societies think of resilience in relation to governance; there can, in fact, be different types of rationales to contribute to resilience: resilience can be embedded in collective arrangements for the whole of society (e.g., national social security based on solidarity as a resilient institution) or, following a more liberal or even libertarian conception of resilience, communities or individual citizens ought to be more self-dependent and resilient themselves. Resilience, in short, can be about higher and lower scale elements of systems, and addresses institutions, groups or individuals, largely dependent on the political-theoretical basis of societies and their academic scholars.

Scholars on adaptation often stress diversity, polycentricity and flexibility (e.g., Folke *et al.* 2005; Pahl-Wostl 2008; for a critical discussion see Bakker & Morinville 2013) of governance and policy strategies. It seems as if the more diverse, polycentric and flexible a social-ecological system is, the more resilient it will be. In our view, however, many resilience and adaptation governance scholars use these ideas as (in fact, normative) templates and ignore the crucial role of the political groundings and deeply embedded governance principles in different societies. In the remainder of this article we try to unravel what often is not made explicit: the rationales behind the specific choices made in flood risk management. We will consider climate change and the adaptation challenge as an external perturbation influencing the policy subsystem. This system can adapt and persist, or transform its governance regime. Often, these responses will not have fully progressed.

To relate the flood risk approaches to the above ideas of resilience theory, we will first describe the overall existing regime (what is the role of state, market or community in flood risk management; who decides on what issues; what are important principles of governance) . Then, we characterise contemporary flood risk strategies and discuss institutional changes in both societies, focusing on critical issues of political and societal debate, zooming in on issues of water and spatial planning, multi-layered safety and insurance systems. This functions as a way to discuss lower scale practices to see if they relate to larger scale system adaptability and resilience. We will be sensitive to proposed changes in policy concepts, policy discourse, principles and policy instruments that are used. While giving these features, we systematically

try to answer the following questions: Who should actually be resilient? Who is mainly responsible for damages? How are considerations made concerning the public interest? This leads to an overview of the typical Dutch and English rationales of resilience.

Our analysis is based on data from different research projects on flood risks and climate change in England (this paper focuses almost exclusively on England due to the increasing differences in flood risk management arrangements among the countries of the UK; although there are some past and existing commonalities) and the Netherlands, both domestically and in a comparative perspective. These include the Dutch Knowledge for Climate Change program, more specifically a work package on normative principles in Dutch climate adaptation policy, where more than 20 interviews were held to describe both the principles and the focus of climate adaptation governance in the Netherlands, next to several smaller contract research projects. The English part was based on the expertise of the Flood Hazard Research Centre in London, that over the years has conducted a variety of research projects, e.g., for European comparative programmes (e.g., Knowledge for Climate, STAR-FLOOD, Floodsite) and domestic research on the English insurance system. Next to this, crucial policy documents were analysed to discover the underlying principles of governance. We thus developed a ‘helicopter view’ on the flood risk policies in both countries.

## **EXISTING FLOOD RISK GOVERNANCE IN THE NETHERLANDS AND ENGLAND**

### **The Netherlands**

The Netherlands is a low lying delta of four major rivers. The Rhine, the Meuse, the Scheldt and the Ems flow through the Netherlands into the North Sea. The Netherlands is vulnerable to flooding. Some serious floods occurred a long time ago, for example the *Allerheiligen* floods in 1170, and the *Zuiderzee* floods in 1916. The most recent flood was in 1953 and caused over 1,800 fatalities, huge economic and ecological damage and is seen as *the* national trauma. Without protective measures like dykes, more than half of the Netherlands is threatened by flooding from the sea or the rivers. Two-thirds of the population lives in this flood-prone area and two-thirds of the gross domestic product is earned there. In all, there are more than 3,000 kilometres of dams and dykes to protect against flooding and low-lying polders are drained for agricultural purposes and to keep them habitable. The Dutch flood safety policy is based on the premise that the State is responsible for flood safety behind the dykes. This public approach is long based on provisions in the Dutch constitution that the

government takes care of the ‘habitability of the country’ and the protection and improvement of the environment (now Article 21 Dutch Constitution). This is further elaborated in the Water Act of 2009, as one of the goals of Dutch water management is flood prevention (Art. 2.1 Water Act). The Dutch legal system provides for an elaborated public flood management system that applies to embanked areas. Rules provide for flood safety standards for different parts of the Netherlands, water management plans, measures banning activities on or near flood defences, water storage areas, maintenance, monitoring, and water management taxation. Therefore, the current Dutch flood safety management system has a strong public character.

Two institutions are mainly responsible for flood risk management. At the national level, the minister for Infrastructure and Environment is formally responsible for strategic planning, setting norms and standards, and reports to the Parliament and the EU. The main operational institution at the state level is *Rijkswaterstaat*, a national governmental agency. This executive body is responsible for public works and water management of the larger waters (North Sea, Wadden Sea, the greater lakes, rivers and canals) and some flood defence works along the coast. At the sub-river basin level, the regional water boards are responsible for the integrated water management of regional waters, which includes the protection against floods. They are responsible for planning, design, building, maintenance and most of the financing and monitoring of flood defence works and water storage areas and the regulation of activities which may influence the risks of flooding.

The current 23 Dutch water boards (hereafter called ‘water authorities’) arose originally out of thousands of community-based institutions, which institutionalised into regional, public water authorities (Van der Ven 1996). They have legislative power in the formulation of by-laws and make decisions with respect to the budget, annual accounts, taxes, control, water level, licensing and water management plans. They also have the authority to employ executive coercion. The central government mainly provides the national legal framework and a strategic policy. The provincial government supervises the water authorities and is authorised to establish or dissolve them. However, a recent low electoral turnout (24%) has prompted review and a potential shift towards indirect elections with municipalities electing board members for their residents or even to the abolishment of water boards (Van Rijswick & Havekes 2012).

With flood risk management being practically a sole responsibility for state institutions in the Netherlands, there is little stimulus left for either market or communities to

take up flood management tasks themselves. Living in flood-prone areas is more or less the 'normal situation' in most of the Netherlands. The only flood management tasks formally left to civil communities or citizens themselves is flood management in un-embanked areas and in the case of excessive rainfall-induced urban flooding. The strong role for the government in flood protection has not only led to extremely high standards of flood safety, but also to a serious lack of public awareness of flood risks (OECD 2014).

### *Dutch policy instruments and principles*

Dutch water management is based on integrated long-term strategic planning and mid-term strategic and operational planning. In the national, provincial and regional water plans we find differentiated responsibilities for all governmental authorities. The Water Act contains flood risk safety standards and provides for a system of six yearly monitoring (to be changed in a ten year monitoring cycle) and reporting to the Parliament. These reports are followed by new investments in case the safety standards are not met. Although certainly not all flood defence works meet the safety standards (currently around 60% meets them), the constant programmatic investment and implementation of dyke improvement programmes has ensured that there were no serious floods in the last 60 years.

The Dutch approach is characterised by the focus on prevention and the high flood safety standards which are established by an Annex to the Water Act. These legal standards determine the acceptable probability of flooding within the dyke rings. Although these standards are set differently for specific regions, they can be regarded as uniform standards because they follow a rationale of evenly spread risks. The west of the country has a 1:10,000 flood risk because of the high economic and social consequences related to the dense population and sudden onset of sea floods that make evacuation problematic. The flood risk in the east of the country is around 1:1,200 years, because the economic and social consequences behind a ring of river dykes are less severe. It should be noted that each dyke ring has its own standard of protection, reflecting the principle of solidarity between the people within a dyke ring.

Both at the national and the regional level, regulations apply that have the aim to prevent or regulate activities that may increase flood risks. A water permit from the water authorities is required for almost all activities that increase flood risks. In addition, the Water Act provides for several instruments to enable the authorities to build or maintain flood defence works, create space for the river or water storage areas. The water authorities have

far-reaching instruments to force citizens to accept works or – in the case of necessary storage – water on their land. Of course, these powers are combined with a duty to compensate disproportionate financial losses, based on the principle of equality for public burdens (*égalité devant les charges publiques*) or full financial compensation of the damage in case of water storage.

Water management costs are around 6.5 billion Euro per year. Landowners (farmers), nature reserve organisations, businesses and residents pay a water management tax to their water board. Democratic legitimacy is guaranteed through the representation of various categories of stakeholders in the governing bodies of water boards (Van Rijswijk & Havekes 2012). In line with the adage ‘no taxation without representation’, each group can elect the water authority board members and is eligible to take a fixed number of seats on the board. The water boards’ tasks of water quantity control and flood protection are thus carried out on the basis of ‘stakeholder participation’ and the ‘benefit principle’. The financial mechanism exemplifies the importance of the solidarity principle: Those who benefit from the activities of the water authority pay taxes for its services and have a (proportionate) say in the assembly in return (the stake-pay-say triplet). Regional water authorities pay for maintenance of flood defence works and most of the investments in new flood defence works, and the state pays part of the costs for large investments in flood defence works and for flood defence works that affect more people than those who live in the water board region.

By contrast, urban flooding in public urban areas is a municipal responsibility and citizens are responsible for floods in urban areas on their own territory, except when there are such exceptional circumstances that they cannot be expected to take care of their own flood risks. The duty to protect against urban flooding (from rain water, waste water collection systems or groundwater) is less stringently formulated than the responsibilities that rest on the regional water authorities. There are no legal standards and municipalities formulate their policy goals and foreseen measures and investments in a non-binding local plan, thus clarifying the division of responsibilities between the citizens and the municipality. In addition, municipalities have powers to regulate activities that may influence urban flood risks and they have the power to raise taxes for specific water management tasks.

We conclude that the focus in Dutch flood risk management is therefore on the following leading principles: *decentralisation, prevention and solidarity* combined with cost recovery and classical democratic institutions for *public participation*, further elaborated and put into practice with the help of powerful legally binding public policy instruments.

## England

As part of an island, the runoff and hence river flows experienced by England are internally generated. Its rivers, in global and European terms, are considered to be small and only 15% of the population are at risk from flooding (Environment Agency 2009). Many catchments have little variation in terms of river flow and therefore resulting floods are often not large. However, flash floods do occur in upland areas creating the potential for significant risk to life. In turn, flooding does not constitute an extreme problem, average annual losses from flooding are estimated to amount to £650 million (Penning-Rowsell 2013) or 0.04% of national income. As in other countries, historically, flooding was framed in terms of the risk to agriculture and local flood risk management and hence the adoption of localised measures (Sheail 2002). Consequently, the traditional term for what is now called ‘flood risk management’ was ‘land drainage’. This changed only with the report of a Royal Commission in 1927 (culminating in the Land Drainage Act 1930) which established catchment boards and some sharing of the costs of works by central government. This was the start of the transformation of flood risk management onto a catchment basis.

With the decline in the strategic significance of agriculture and food security, priorities shifted in the 1970s onwards to urban flood protection. Simultaneously, the rise of environmental concerns acted against further drainage of agricultural land and the consequent loss of biodiversity. Those environmental concerns also promoted the adoption of newer approaches, including floodplain rehabilitation as well as the continuation of traditional, environmentally friendly options such as flood storage areas. Simultaneously, the influence from the USA of non-structural options promoted the increased use of flood warnings, a move enabled by technological advances such as the early forms of weather radars, faster computers and telemetry for gauging. There was also a new concern with development on flood plains, what was then termed ‘flood plain encroachment’, again influenced by the non-structural movement in the USA.

What was a long-standing trend in the UK towards integrated catchment management resulted in a more holistic approach to flood risk management being adopted (Nye 2011) and a shift away from simply a concern with direct flood losses to a wider framework of appraisal, notably to include the social consequences of flooding. Central government became increasingly involved in funding flood risk management and also for setting an overall strategy such as the *Strategy for flood and coastal defence in England and Wales* produced by the then Ministry of Agriculture, Fisheries and Food (MAFF 1993). The changing emphasis

in FRM is exemplified by re-titling of that ministry as the Department for Environment, Food and Rural Affairs (Defra) in 2001.

### *English policy instruments and principles*

Limiting development on flood plains increasingly became to be seen as a key issue. Government therefore set out to restrict the conditions under which new development would take place. First, guidance to planning authorities was issued in the form of a Planning Policy Guidance note *Development and Flood Risk*. Guidance notes were subsequently replaced by Planning Policy Statements. This guidance included a sequential test in the form of flow chart which limits what forms of development should be permitted in flood plains except in the absence of any alternative sites.

Flood risk management also followed the wider shifts in water management policy towards a sustainable approach, including integrated water management. This included an emphasis on working with the natural system and also that we should learn to live with floods through non-structural measures. These approaches were formalised in a policy consultation ‘Making space for water’ undertaken by Defra in 2004. This consultation and the subsequent response by Defra to the consultation responses, resulted in a number of pilot studies of innovative options for FRM. These were quite specifically intended to try alternative approaches and included rural runoff control, flood plain forests and resilient reconstruction (Halcrow 2008; Defra 2008). ‘Making space for water’ also anticipated a much greater degree of stakeholder engagement but there is limited evidence of this in practice. Perhaps the Civil Contingencies Act 2004 provides for more involvement through the creation of local Resilience Forums to promote a co-ordinated preparation for emergencies and recovery, and response in emergencies.

A major flood event occurred in England in 2007 and led to some significant changes in flood risk management resulting from an independent Government review (Pitt 2008). In that flood, a large fraction of the properties involved were flooded by pluvial waters and this directed attention to the control of runoff both in rural and urban areas. The Flood and Water Management Act 2010 (FWMA) was passed primarily to implement the remaining recommendations of the Pitt review, but also to transpose the EU Floods Directive into English Law. The Directive itself requires no more than previous practice in England. Adaptation to climate change has been part of UK government policy since the then prime minister, Margaret Thatcher, made a defining speech in 1989. A major consequence of

climate change is on rainfall amounts and patterns. FRM has therefore been able to ride on the back of the policy drive for climate change adaptation and the broader resilience debates.

One important determining principle in England is that there is no statutory duty on any branch of government to protect land or property from flooding: all powers are permissive. The shift to central government involvement in decision-making and funding in flood risk management only started in 1930, but both decision-making and funding have become progressively more centralised. At the same time, flood risk management was increasingly included as part of the shift to integrated catchment management. This culminated in the creation of the Environment Agency (EA) in 1996. The 'Making Space for Water' strategy (Defra 2005) also established the first steps towards giving the EA a more overarching strategic role for flooding and coastal erosion risks, rather than purely operational responsibilities and it progressively sought to further centralise FRM decision-making.

From 1930 onwards, central government contributed part of the costs of agreed schemes, the proportion depending upon assessments of local need. Following the establishment of the EA, although defences continued to be prioritised at a regional level, ultimately, decisions about which should receive funding was increasingly taken at a national level. The proportion of the costs of FRM works which is contributed by the general taxpayer has progressively risen (Parker & Penning-Rowse 1980), until now effectively the entire costs of the works are borne by the general taxpayer. However, there have been some efforts to shift risk responsibility back towards local communities and away from state-funded defences. In particular, following the election of the Cameron government in 2010, the new *National Flood and Coastal Erosion Risk Management Strategy* (Environment Agency 2011) incorporated the Coalition government's localism philosophy in the form of the adoption of a partnership approach to flood management funding. Projects which do not qualify for full funding may now qualify for partial central funding, the balance being raised from local sources, the proportion of central funding being determined by a series of criteria (Defra 2011). How this will influence where defences are built in the future is as yet unclear.

Governments have no statutory duty to provide compensation of flood victims in England, but may contribute to charitable disaster relief funds. Since flood insurance is included as a standard peril in household insurance policies available on the private market, this gives homeowners a mechanism to recover flood losses. The insurance industry has now agreed a new basis for the provision of insurance against flooding with the UK government

(Defra 2013; Water Bill 2014). This involves a pooled approach to cross-subsidy of insurance premiums by those not at risk of flooding.

Historically, UK governments have sought to base decisions on a determination of what is in the national or public interest. Defining management decisions in terms of the public interest implies that these are technical questions, which do not involve political judgement. What course of action delivers the national interest is then assumed to be objectively determinable. In contrast to the Netherlands, England *does not have a minimum standard of defence*; so, *benefit–cost analysis* has been adopted as a means of determining whether flood mitigation measures should be adopted in some areas, what standard of protection is the local optimum, and to set priorities. This is therefore used both to determine the most appropriate form of intervention in individual projects and which projects should be funded within the available budget. The National Audit Office, which is responsible to Parliament to determine whether public monies are being properly and efficiently used, in reviewing the EA’s performance has pushed the EA to improve the efficiency of spending (NAO 2007). Therefore, England has always perforce to employ a multi-layered strategy.

In sum, the basic principles of flood risk governance are both state *centralisation* with an important role for *local spatial planning*. Flood risk management measures are determined according to the *utilitarian* principle and are weighted through a process of balancing the costs and benefits, thus permitting more diverse and tailored local strategies. There is also an increased responsibility on individuals, formerly through riparian duties and latterly through property-level protection, as well as through the widespread uptake of insurance.

## **CRITICAL ISSUES AT THE FRONTIERS OF FLOOD RISK MANAGEMENT**

In both the Netherlands and England, there are discussions on how to proceed with flood risk safety against the backdrop of increasing risks, climate change as well as changing ideas on governance. In the Netherlands, this was fuelled by the Second Delta Committee ([www.deltacommissie.com](http://www.deltacommissie.com)) and in England this was mostly a response to increasing costly flood events that had great public impact. We will focus here on two critical issues that are illustrating both the dominant approach in each country and the (im)possibilities of changing strategies and underlying institutional change: water management and spatial planning, (including discussions of ‘multi-layered safety’) and insurance systems.

### **Water management and spatial planning**

A universal problem is how to coordinate spatial and water management planning. Historically, it is fair to say that water management was the servant of spatial planning.

Making the 'best' use of land determined how water was managed, with water in an environment being heavily modified for this purpose and being sacrificed to the perceived needs of land use. In addition, spatial and water planning developed into different regimes: spatial planning generally being the responsibility of local municipalities with direct democratic accountability, whose decisions were typically subject to review and challenge. Local authorities both have to prepare a spatial plan and to provide development consent for major developments where refusal of consent can be appealed. Water management increasingly became seen as a scientific and technical problem and so responsibility has resided with engineering bureaucracies: the Environment Agency in England and *Rijkswaterstaat* (together with the water boards) in the Netherlands. Since the way land is used influences the flood risk on that area, such a division of responsibilities is no longer seen as viable. The problem is then, how to integrate water and spatial planning and how to include the implications for water management into land use planning decisions.

The approach in England has been regulatory from the start; an early example being the Act promoted by the metropolitan authority for London in 1896. These were building controls rather than development controls and they limited the physical form of development rather than where development could take place. What developed recently are central government initiatives to impose systems of development controls starting with Planning Policy Guidance (PPG) 25 in 2001. This approach depended upon the progressive development of flood plain mapping as both hydrological and hydraulic modelling improved, together with the data to populate the models as well as the increasing availability of reasonably precise Digital Terrain Models. PPG25, and its replacement Planning Policy Statement (PPS) 25 (DCLG 2006), included riparian flooding and now, there is a duty on local flood authorities also to identify and take account of pluvial flooding. Mapping the latter areas stretches the capabilities of hydrological and hydraulic modelling. Land is now placed in one of three flood risk categories (flood zone 3: greater than 1 in 100 years (or 200 years for coastal); zone 2: between 1 in 100 years (or 200) and 1 in 1,000 years; and zone 1: less than 1 in 1,000 years), with the development potential for different land uses being designated for each. But PPS25 also includes a sequential test: a high risk site may be acceptable for susceptible developments only if there are no alternative sites. Although PPS25 was superseded in 2012 by web-based guidance

[\(http://planningguidance.planningportal.gov.uk/blog/guidance/flood-risk-and-coastal-change/\)](http://planningguidance.planningportal.gov.uk/blog/guidance/flood-risk-and-coastal-change/)

associated with the new National Planning Policy Framework (NPPF), the conceptual framework for the consideration of flood risk remains unaltered.

This development of flood plain mapping (a very early practice that preceded what the European Floods Directive now asks from Member States) and the making of development plans requires local authorities to prepare a Strategic Flood Risk Assessment of their area (DCLG 2012) and those proposing land development may be required to prepare an assessment of consequent flood risks. Two practical problems arise. First, once climate change projections of increases in river flows are taken into account, many existing urban core areas, which developed along a river frontage, now fall within the high risk flood zone: for example, 95% of the city of Hull lies on flood plains. More especially, the majority of the land which is available for redevelopment, land which was originally developed for industrial uses which have now ceased, is often on a flood plain. How to redevelop these urban centres, while simultaneously enabling socio-economic development and taking account of the increasing risk of flooding is a problem which has not yet been resolved.

Second, there are two contrasting approaches to planning. Spatial planning is participatory, ultimately political and responding to multiple objectives and constraints. On the other hand, water planning is technocratic and single issue; the two have yet to be reconciled. The sequential test requires that the absence of reasonably available alternative development sites with a lower probability of flood be demonstrated before planning consent is granted. This strict test for flood risks sits uncomfortably with the more general spatial planning balancing approach, which uses trade-offs to manage complex systems.

Similar to England, water management in the Netherlands served first agriculture and later other land use regulated by spatial planning as best as it could. But, parallel to England, water management evolved into a strongly sector-based policy, with a strict separation of water and land use functions. Only in the last decades has it become clear that spatial planning and building activities can have major implications for flood risk management. Starting with the coordination of plans in the field of water management and spatial planning a 'water assessment' or 'water test' has been developed. There is a mandatory duty for municipalities and provinces to ask the water board for advice on the consequences of spatial developments for water management and to motivate in their spatial plans how they have accounted for the effects on water management, including that of flood safety as well as water quality. Although the instrument of the water test led to a better understanding and more cooperation between water managers and spatial planners, the instrument is not yet fully effective. The main reason

for this is that spatial planners are not obliged to follow advice given by water managers and, in practice, we can see hardly any impact on the selection of planned development sites.

A long-held common tradition has been to have certain polders flooded on purpose, to protect densely populated regions. This also asks for strong cooperation between spatial planning and water management. In the Water Act this common practice was formalised by a new instrument: the Water Storage Area. Regional water authorities in cooperation with municipalities can designate ‘storage areas’ in which water can be stored in cases of extreme rainfall or high waters in rivers. The designation is required to take place both in spatial as in water management plans (more specific in the *leggers* which are maps and tables with specified safety standards, characteristics of water bodies, maintenance responsibilities, etc.). The Water Act provides for a legal obligation of the land owner to accept water on his land but also for full compensation of all damage caused by this storage of water.

Since 2009, with the coming into force of the Water Act, a stronger relationship between water plans and spatial planning is being established. Historically, the main problem in the relation between water management and spatial planning is that flood risk management trails after new developments and is required to enable those taking place. This leads to increasing responsibilities for water managers to ensure safety while higher economic and social risks are taken in flood-prone areas. This is what is called the safety paradox (Rommelzwaal & Vroon 2000; Wiering & Immink 2006). Although climate change and economic development are increasing the risks for land use, the costs of extra safety efforts are not paid by spatial planners (municipalities), urban developers or people that will live or work in these new developed areas, but continue to be borne by water authorities and in the end by all citizens living within the territory of a certain water board. In other words, all citizens (the collective) within the territory pay for the high risk vulnerability of additional land use.

### **Multi-layered safety**

At this moment we see shifts in the discussion on the classic flood risk management approach in the Netherlands. Although Dutch flood risk management has been adapting over the centuries due to societal and physical changes we can also see some recent shifts in (flood) risk governance. The concept of multi-layered safety (MLS), as introduced in the Dutch National Water Plan of 2009, is a central element in this discussion. In short, it is discussed that the Dutch approach should evolve from a flood probabilities approach to one that takes

into account both flood probabilities and consequences (for human health, the environment, cultural heritage and economic activity). It is proposed to start reasoning from three layers: flood defence is still key in water management, but should, in case additional measures are necessary, be supplemented by a second layer of mitigation measures in the field of spatial planning and building requirements and a third layer of disaster management – flood preparation and recovery (Delta decision to be taken by the Parliament in September 2014; Tromp & Ellen 2012). Possible spatial measures include the elevation or flood-proofing of houses, re-locating of houses and the compartmentalisation of the areas within a dyke ring. Disaster management asks for flood forecasting and warning systems, organisational measures such as evacuation plans and related training, as well as physical measures, such as sandbags, in cases where flood defences fail.

This new flood risk approach is in line with, and actually promoted by, the Floods Directive (Directive 2007/60/EC) (*Veiligheid in Kaart*, Delta programme). It is not wholly new; it simply renders explicit the previously very implicit societal determinants of the height and width of dykes. However, it opens the door to different responses to reduce flood risks. This may question the domination of public water management and existing expertise in flood risk management. Reducing adverse consequences requires cooperation with different actors, like municipalities, but also with non-governmental actors who own property in flood-prone areas. Taking multi-layered safety one step further means that we might shift responsibility in the first layer to the other layers, that is, from Dutch water authorities to a broader range of governmental authorities; provinces and municipalities responsible for spatial planning, civil protection, economic affairs and agriculture. It also might entail a shift from the predominantly public sphere to the public *and* private sphere when measures are to be taken. Third, we might see the underpinning normative principles, from uniform ‘equal risks in water safety for all’ based on regional solidarity, move towards a more differentiated, nuanced approach where there is more room for regional differentiation of safety norms and private responsibilities (Van Rijswijk & Havekes 2012).

If multi-layered safety would become the new dominant discourse in water management, we could witness an important change in thinking in the domain of Dutch flood safety. Although at this moment there already exist a responsibility for municipalities to take care of ‘good spatial planning’ which comprises taking care of flood safety by not building in flood-prone areas or by prescribing specific building requirements that improve the safety of citizens, municipalities have failed to take this responsibility seriously. Many building

developments have occurred in flood-prone areas, thus increasing flood risks for thousands of people. The same goes for evacuation plans and training for calamities. Municipalities and provinces cooperate in so-called safety regions, because they are formally responsible for disaster risk management. However, this cooperation is not extended to the water authorities. This is a serious omission, in view of the water authorities' legal responsibility to develop and test flood calamity plans.

In England there is a different conceptualisation of multi-layered safety which includes both interventions before, during and after a flood and also in terms of control of runoff, flood storage and flood conveyancing. While this continues to evolve, it has existed in some form in England for decades and this multi-facet approach to flood management is commonplace. Although this approach shares some commonalities with the Netherlands, the holistic approach adopted in England is broader. This is, in part, a reflection both of the difference in the nature of the flood risk in the two countries and England's lower prioritisation of defence.

### **Insurance systems: Financial resilience from flooding**

Flood insurance has long provided a mechanism for recovery for flood losses in England (Arnell *et al.* 1984), and since the 1960s, the system has been resilient to change both in terms of flood management dynamics and to other external pressures. From its inception, flood insurance has been part of the private market and responsibility for recovery from damages has rested primarily with the individual. Johnson & Priest (2008) describe the role of insurers and the provision of insurance as being adjunct to that of other aspects of flood management policy in the UK as responsibility is removed from the state. The long-term role of the private market in England is reinforced by the traditional stance by UK Government not to pay compensation for flood losses. The division of labour between the private market, the government agencies and those at risk in this area is complex as although the financial risk falls squarely on the private companies (and to some extent those purchasing insurance) ultimately insurers would be less able to provide (affordable) insurance without government (and taxpayer) intervention in providing measures for flood risk management.

The refusal of the insurance industry to continue with the previous system due to concerns about its future viability has resulted in the introduction of the so-called 'Flood-Re system' (Defra 2013). This has a number of potential consequences for the balance between the roles of the individual, the private market and the state in the provision of flood recovery. Essentially, the new approach retains flood insurance within a private market by formalising

the existing cross-subsidisation of flood insurance premiums between low and high risk properties. It does so for the medium term, but only for low and middle income households. The new approach reinforces the reliance on, and acceptance of, a private market recovery mechanism from flooding and although the UK Government will have increased roles (as a regulator monitoring and enforcing compliance and as arbiter in times of high loss) (Defra 2013) they ultimately are still removed from the direct provision of recovery.

The system of *Financial Resilience* from flooding in England is fundamentally dichotomous. Responsibility for purchasing cover and having individual resilience is at the household level; however, the viability of the market is maintained through the spreading of the burden spatially and ultimately therefore resilience is achieved through the collective capacity of policyholders. Private market insurance requires heterogeneity of flood risk within the insured population so that these risks can be spread. This situation is present in England, with its high variability of flood risk, but not in the Netherlands. However, this system of *resilience to financial recovery*, is fundamentally inhibiting the development of household-level *resilience to flood risk*, with Johnson & Priest (2008) describing the inherent conflicts present. The current system has not succeeded in increasing the uptake of household flood management measures nor incentivised individual-scale risk reduction and there is little evidence to suggest that the new system will improve on this. Furthermore, the system of cross-subsidisation is impacting on the distributional consequences of flood management and is potentially promoting socially inequitable flood management as those at lower risk are directly subsidising the costs of those who live at high risk (Penning-Rowsell & Pardoe 2012). Despite these associated problems flood insurance is still considered to be fundamental to providing societal resilience to flood damages at all scales.

Following the 1953 coastal storm surge flood, insurers declared the Netherlands uninsurable for flood events. As a consequence, the government may provide disaster relief by paying on an incidental base parts of extraordinary damages. This arrangement is established under the 2010 Security Regions Act: government may award state funds to those suffering damage caused by a disaster, of which a serious flood would certainly qualify (Van Rijswick & Havekes 2012). This possibility for partial compensation of damage caused by floods should not be compared to the no-fault compensation regime based on the Water Act in case damage has been caused by measures employed to prevent flooding (van Doorn-Hoekveld 2014). Additionally, no-fault liability compensation based on the Water Act is not routinely provided for all losses, only burdens which are considered to be abnormal (i.e., disproportionately large in comparison to others) are offered compensation (van Doorn-

Hoekveld 2014) and even then the amounts provided are limited. Compensation of damage by water authorities is also possible within the fault liability regime. The latter could lead to the liability of water authorities in those cases where damage is caused because water authorities did not fulfil their obligations to take care that flood defence works met the required standards. Furthermore, in 1995, the Dutch government entered a covenant with the Dutch Association of Insurers to establish a calamities fund, however this agreement was not finalised as it was reasoned that the Dutch Constitution states the government is responsible for the 'habitability of the land'. Therefore, the degree to which any compensation fund assists or promotes societal resilience is questionable.

Over the last few years, the discussion on introducing insurance was revived in the light of future climate changes in order to create a back-up system for disastrous events with the advantages, limitations and difficulties in implementation being widely discussed (e.g., Botzen & van den Bergh 2008; Aerts & Botzen 2011). To date, in the Netherlands there is the possibility to insure crop damage caused by heavy rainfall (Van Rijswijk & Havekes 2012). In addition, since September 2012, a company has been offering the first flood insurance project in the Netherlands covering a damage of up to €75,000 (<http://www.lloyds.com/news-and-insight/news-and-features/environment/environment-2013/lloyds-supports-unique-flood-solution-in-the-netherlands>); however, uptake has been very low. This new provision, and other debates, reintroduced the notion of introducing compulsory flood insurance. Discussions concerning a flood insurance system of this nature in the Netherlands are difficult due to the special situation of the country: a tendency for low probability and high impact flood events which greatly hinder the spreading of the risk. The subject seems to be highly political, including several opposing positions, and, most recently, the EU (an advocate of the use of insurance schemes for flood resilience) has joined national government political parties, NGOs, commerce, agriculture and citizens in the debate about these issues.

Mandatory flood insurance does not appear to be a good option for Dutch society for several reasons. First, the introduction of a mandatory private flood insurance scheme does not fit with the Dutch conceptualisation of resilience: one that focuses on prevention of the whole society accomplished by hydraulic systems combined with more natural flood risk management in recent years. Second, it was argued that mandatory insurance is not fair for those who chose to live in safe areas as they would not require cover and provides a disincentive to residing in those safe areas. Third, the viability of a private market insurance is uncertain as by excluding those not at risk would mean that risk could not be spread

sufficiently broadly. Finally, there are also concerns about whether a mandatory system would satisfy competition regulations.

## **SIMILARITIES AND DIFFERENCES IN STRATEGIES AND RATIONALES IN THE NETHERLANDS AND ENGLAND**

As was explained in the Introduction, domestic governance of flood risks reflects both a specific ‘division of labour’ of state, market and communities, and specific principles that guide societal opinion and political decision-making. Governance approaches thereby reveal certain conceptions of resilience. Below we try to summarise typical characteristics of the approaches in the two countries.

First and foremost, England and the Netherlands differ in their physical environment and in the nature of flood risks. This obviously leads to dissimilarities in approaches; England is positioned on an island, has smaller rivers and only a small part of the country is at risk of serious flooding. Floods are generally expected to be annoying and damaging events rather than as life-threatening. Historically, there was neither a duty to provide flood alleviation nor to provide financial compensation for the British government. England, as well as other parts of the UK, had adopted the principle of catchment management and of integrated water resources management already in an early stage. Subsequently, flood risk management has been embedded in the wider context of sustainable development and of climate change adaptation.

By contrast, the Netherlands is known for its high vulnerability to flood risks: about 25% lies below sea level and more than 60% would be flooded without technical measures (dams, sea and river dykes and embankments). A long history of large river and sea floods has created a national narrative of ‘the battle against water’. Reproduced in state documents, public communication and even in commercials, flood events are viewed as life-threatening. Flood policy belongs therefore to the realm of high politics and should be positioned ‘above all other stakeholders’, and away from daily politics. This is reflected in Dutch water and flood risk governance: it has a specific, functional institutional layer consisting of regional water boards and the national agency *Rijkswaterstaat*. The problem of adaptation to climate change is incorporated by these strong and prevailing water managers too.

When we turn to the governance approaches in the two countries in more detail, England shows a gradually increasing role for central government, although it is very cautious in inviting too much state responsibility. There is a high degree of centralisation, but most of

the work still has to be done by the local authorities, especially when it comes down to the balancing of flood risks against other spatial claims. Although government has an important role in creating (legal) conditions for catchment planning and integrated management and in supervising these tasks, it is expected that market and communities bear their own responsibilities in flood risk management; the insurance market is an important – also political – player in the field and as the state has no financial obligations in flood recovery, people are expected to protect and prepare themselves for flood events. Because of this, flood risk management is part of general cost–benefit considerations and all parties seek the most efficient solution to shared problems.

On the Netherlands we can be brief. Generally, there is hardly any formal role, nor formal responsibility, for the market and communities, except for in un-embanked areas and for urban flooding; with those exceptions, flood governance is firmly in the hands of the state institutions, although recent policy concepts are challenging the predominant role of state water management. Dutch public authorities have (potentially) strong powers and resources although the instrument of the expropriation of land is rarely used. The government prefers less far-reaching instruments such as regulation and duties to tolerate water or public works, monitoring and maintenance on one's land (*'gedoogplichten'*).

In England, the option of acquiring properties and land to take flood risk measures simply because they are at high risk of flooding is not an option. As with the idea that governments should provide compensation to victims of natural or other disasters, the Finance Ministry, HM Treasury, does not accept that this is an appropriate use of public money (Defra 2003) and will consequently not authorise the relevant government department to make such payments (HM Treasury 2013). These payments seldom occur in the Netherlands either, because damages are preferably prevented instead of recovered afterwards. Table 1 gives an overview of the analysis of approaches in flood risks management and the related conception of resilience.

As the table shows, the two countries differ in their interpretation of resilience. In England, the focus is first of all on the resilience of households, local communities and firms. This is exemplified by the creation of local Resilience Forums whose members include the public utilities and local industry as well as the local authorities and emergency services (Cabinet Office 2013). The Dutch conception of resilience is centred more on maintaining the resilience of the collective, secured by an existing system of flood defences, thus enabling society to live in economically important, densely populated but also vulnerable areas of the

country. Dutch resilience is thus seen more in the light of ‘high vulnerability’ of society as a whole – in need of collective – state protection.

## **CONCLUSIONS**

In the Introduction we discussed how challenges of climate change and related adaptation are putting pressure on existing governance arrangements and their underlying normative principles. We first gave an overview of the existing governance arrangements while asking such basic questions as ‘who decides’, ‘who should act’ and ‘who is responsible for flood damage’ (see Table 1). The answers are fundamentally different. As we have seen, in England, the focus is on the resilience of households, communities or firms in light of the economy as a whole. The Dutch conception of resilience is centred more around maintaining the resilience of the collective, secured by the existing system of flood defences which assures robustness as part of resilience thinking, coupled with state liability in case the water authorities do not fulfil their obligations and the possibility that the state declares a flood event a disaster and pays part of the damage and recovery costs.

However, any comparison will have a tendency to accentuate the differences and overlook the similarities. One of the interesting surprises of our analysis is that in both countries, there is a centralised state, and flood risk management is treated as a technical problem that is appropriately addressed through a technocratic bureaucracy. But while this is so, the operating principle is again different: in the Netherlands there is a technocracy based on the merit of water expertise and legitimated by a strong idea of a collective public interest. In the terms of Alexander (2002) there is a ‘unitary’ conception of the public interest. This leads to a social contract of government being responsible for flood risks and the general public accepting and supporting this idea. In England there also is a technocracy, but this is more part of a general political decision-making process, with responsibilities spread over state, insurance companies, individuals and communities. Consequently, there is a stronger role for cost–benefit considerations, reflecting a more utilitarian conception of public interest, but also a stronger political debate – flood risk management is a matter of ‘between stakeholders’ instead of ‘above all stakeholders’. In other words, in England a cost–benefit, economic rationale is hegemonous, while in the Netherlands a water-expertise and nation-wide collective, ‘unitary’ rationale dominates. The use of benefit–cost analysis in England may, however, be argued to have promoted a search for alternative means of intervening, interventions that would in an individual case pass the benefit–cost ratio test, and differentiated responsibilities. Conversely, to some extent, the Dutch requirement to meet

legislative fixed standards of protection might be argued to have limited both diversification in practice and, to some extent, diversification in research in the Netherlands.

The main theoretical question was whether we could conclude on ‘adaptability and persistence’ or transformation of governance regimes and their rationales. We therefore discussed lower scale practices to see if they reflect larger scale system adaptability and resilience. We looked at the role of water management and spatial planning, including multi-layered safety, and the role of insurance in both countries. For the Netherlands the discourse of ‘multi-layered safety’ is relatively new. It would potentially lead to a regime shift from predominantly flood defence to strategies that deal with flood consequences: flood mitigation, preparation and recovery. An important side effect might be a shift from clear and legally regulated responsibilities of the water authorities, to more blurred shared responsibilities of a whole range of public authorities. Discussion is about the responsibility, accountability and finally even liability in cases floods do occur and cause damage. The approach shows changes in the role of current principles in flood risk management, as for example solidarity and prevention. From both a legal perspective and a general societal point of view (do people expect changes) *a real regime shift is not desirable*: the first layer of flood defence is simply considered indispensable in Dutch society. In recent political debates this is reflected: the second layer of spatial mitigation measures and the third layer of disaster management are actually not considered to be *replacing* the first layer, but are considered to be (only) additional. This is actually evidence of the strong path dependencies that surround the first layer; the Dutch can simply not imagine not to be protected by their safety infrastructure and technology.

In England there is a debate about flood risks in highly vulnerable areas such as those cities built in flood plains or near the coast (e.g., Hull). Both countries are perhaps even evolving towards each other. As we have seen, there are ideas of a more spatially oriented flood risk policy in the Netherlands, which would then create responsibilities for other governmental authorities than the water authorities, but at the same time the Dutch stick to the ‘first layer’ preventive approach as we have seen above. Also, the Dutch are becoming more cost-aware. In England, the increased reliance on general taxpayer funding of all mitigation works has created an inflationary pressure for central government action: as demonstrated in the flood victims’ reaction to the winter 2013/2014 floods. Furthermore, given the inheritance of 5.2 million properties at risk (EA 2009), there has been increased focus on property-level measures to reduce individual and community vulnerability. But, again, this is more reflecting

path dependencies and confirming existing decision-making than transformational regime shifts.

As a final concluding remark, we can see that flood risk management is, in fact, under pressure in both countries. The dominant role of the state but also the general principles of solidarity and prevention are not abandoned, but now more critically discussed in the Netherlands and the state, market and community -relationships are heavily debated in England too. In both cases, climate change leads to adaptation as fine-tuning of existing regimes in light of regime persistence rather than regime transformation.

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## **REFERENCES**

- Adger, W. N. 2000 Social and ecological resilience: are they related? *Prog. Hum. Geog.* **24**(3), 347–364.
- Adger, W. N., Quinn, T., Lorenzoni, I., Murphy, C. & Sweeney, J. 2013 Changing social contracts in climate-change adaptation. *Nat. Climate Change* **3**(4), 330–333.
- Aerts, J. C. J. H. & Botzen, W. J. W. 2011 Climate change impacts on pricing long-term flood insurance: A comprehensive study for the Netherlands. *Global Environ. Change* **21**(3), 1045–1060.
- Alexander, E. R. 2002 The public interest in planning: From legitimation to substantive plan evaluation. *Plann. Theory* **1**(3), 226–249.
- Arato, A. & Cohen, J. 1988 Civil society and social theory. *Thesis Eleven* **21**(1), 40–64.
- Arnell, N. W., Clark, M. J. & Gurnell, A. M. 1984 Flood insurance and extreme events: the role of crisis in prompting changes in British institutional response to flood hazard. *Appl. Geogr.* **4**, 167–181.
- Bakker, K. & Morinville, C. 2013 The governance dimensions of water security: a review. *Phil. Trans. Roy. Soc. A* **371**(2002), 20130116.

Berkhout, F. 2005 Rationales for adaptation in EU climate change policies. *Clim. Policy* **5**(3), 377–391.

Botzen, W. J. W. & Van den Bergh, J. C. J. M. 2008 Insurance against climate change and flooding in the Netherlands: present, future and comparison with other countries. *Risk Anal.* **28**(2), 413–426.

Carpenter, S., Walker, B., Anderies, J. M. & Abel, N. 2001 From metaphor to measurement: resilience of what to what? *Ecosystems* **4**(8), 765–781.

DCLG 2006 *Planning Policy Statement 25. Development and Flood Risk*. Report of the Department for Communities and Local Government, Department for Communities and Local Government, London.

DCLG 2012 *Technical Guidance to the National Planning Policy Framework*. Report of the Department for Communities and Local Government. Department for Communities and Local Government, London.

DEFRA 2003 *Managed Realignment: Land Purchase, Compensation and Payment for Alternative Beneficial Land Use*. Report of the Department for Environment, Food and Rural Affairs. Department for Environment, Food and Rural Affairs, London.

DEFRA 2005 *Making space for water: taking forward a new government strategy for flood and coastal erosion risk management*. Report of the Department for Environment, Food and Rural Affairs. Department for Environment, Food and Rural Affairs, London.

DEFRA 2008 *Resilience grants pilot projects executive summary*. Report of the Department for Environment, Food and Rural Affairs. Department for Environment, Food and Rural Affairs, London.

DEFRA 2011 *Flood and Coastal Resilience Partnership Funding: Defra policy statement on an outcome-focused partnership approach to funding and coastal erosion risk management*. Report of the Department for Environment, Food and Rural Affairs. Department for Environment, Food and Rural Affairs, London.

DEFRA 2013 *Securing the future availability and affordability of home insurance in areas of flood risk*. Report of the Department for Environment, Food and Rural Affairs. Department for Environment, Food and Rural Affairs, London.

Edwards, M. 2009 *Civil Society*. Policy Press, Cambridge.

Environment Agency 2009 *Flooding in England: A National Assessment of Flood Risk*. Environment Agency, Bristol.

Environment Agency 2011 *National Flood and Coastal Erosion Risk Management Strategy for England*. Environment Agency, Bristol.

Folke, C. 2006 Resilience: The emergence of a perspective for social-ecological systems analyses. *Global Environ. Change* **16**, 253.

Folke, C., Hahn, T., Olsson, P. & Norberg, J. 2005 Adaptive governance of social-ecological systems. *Annu. Rev. Environ. Resour.* **30**, 441–473.

Halcrow (2008) DEFRA 2008 *Making Space for Water Urban flood risk & integrated drainage (HA2)*. Report of the Department for Environment, Food and Rural Affairs, Department for Environment, Food and Rural Affairs, London.

Haug, C., Rayner, T., Jordan, A., Hildingsson, R., Stripple, J., Monni, S., Huitema, D., Massey, E., van Asselt, H. & Berkhout, F. 2010 Navigating the dilemmas of climate policy in Europe: evidence from policy evaluation studies. *Climatic Change* **101**(3–4), 427–445.

HM Treasury 2013 *Managing public money*. HM Treasury, London.

Holling, C. S. 1973 Resilience and stability of ecological systems. *Annu. Rev. Ecol. Systemat.* **1**, 1–23.

Johnson, C. & Priest, S. J. 2008 Flood risk management in England: a changing landscape of risk responsibility? *Int. J. Water Resour. Dev.* **24**, 513–525.

Keessen, A. M., Hamer, J. M., Van Rijswijk, H. F. M. W. & Wiering M. 2013 The concept of resilience from a normative perspective: Examples from Dutch adaptation strategies. *Ecol. Society* **18**(2), 500–501.

Levin, K., Cashore, B., Bernstein, S. & Auld, G. 2012 Overcoming the tragedy of super wicked problems: constraining our future selves to ameliorate global climate change. *Policy Sci.* **45**(2), 123–152.

MAFF 1993 *The strategy for flood and coastal defence in England and Wales*. Report of the Ministry of Agriculture, Fisheries and Food. Ministry of Agriculture, Fisheries and Food, London.

NAO 2001 *Inland flood defence*. Report of the Comptroller and Auditor General. National Audit Office, London.

NAO 2007 *Environment agency building and maintaining river and coastal flood defences in England*. Report of the Controller and Auditor General. National Audit Office, London.

- Nye, M., Tapsell, S. & Twigger-Ross, C. 2011 New social directions in UK flood risk management: moving towards flood risk citizenship. *J. Flood Risk Manage.* **4**, 288–297.
- OECD 2014 OECD Policy Dialogue: *Water Governance in the Netherlands: Fit for the Future*, OECD, Studies on Water, OECD Publishing, Paris.
- Parker, D. J. & Penning-Rowsell, E. C. 1980 *Water Planning in Britain*, George Allen and Unwin, London.
- Penning-Rowsell, E. C. 2013 A ‘realist’ approach to the extent of the flood risk in England and Wales. In: *Comprehensive Flood Risk Management: Research for Policy and Practice* (Klijn, F. & Schweckendiek, T. eds.), CRC Press, London.
- Penning-Rowsell, E. C. & Pardoe, J. L. 2012 Who benefits and who loses from flood risk reduction? *Environ. Plann. C* **30**, 448–466.
- Pitt, M. 2008 *The Pitt Review: Learning lessons from the 2007 floods*. Central Office of Information. Cabinet Office, London.
- Rommelzwaal, A. J. & Vroon, J. H. 2000 *Werken met water: Veerkracht als strategie*. Rapport van het Ministerie van Verkeer en Waterstaat, Directoraat-Generaal Rijkswaterstaat, Rijksinstituut voor Integraal Zoetwaterbeheer en Afvalwaterbehandeling (RIZA report nr. 2000.021).
- Sheail, J. 2002 Arterial drainage in inter-war England: the legislative perspective. *Agr. Hist. Rev.* **50**(II), 253–270.
- Termeer, C., Dewulf, A., van Rijswick, H., van Buuren, A., Huitema, D., Meijerink, S., Rayner, T. & Wiering, M. 2011 The regional governance of climate adaptation: a framework for developing legitimate, effective, and resilient governance arrangements. *Climate Law* **2**(2), 159–179.
- Tromp, E. & Ellen, G. J. 2012 An analysis of institutional and economic barriers to multi-layered safety in The Netherlands. *Comprehensive Flood Risk Management: Research for Policy and Practice*, (F. Klijn & T. Schweckendiek, eds). Taylor and Francis Group, London, pp. 320–321.
- Van der Ven, G. P. 1996 *Man-made Lowlands: History of Water Management and Land Reclamation in the Netherlands*, Uitgeverijj Matrijs, Utrecht.
- Van Doorn-Hoekveld, W. 2014 Compensation in flood risk management in the Netherlands. *Utrecht Law Rev.* **May**, 216–238.

Van Rijswick, H. F. M. W. & Havekes, H. J. M. 2012 *European and Dutch Water Law*. Europa Law Publishing, Groningen.

Walker, B., Holling, C. S., Carpenter, S. R. & Kinzig, A. 2004 Resilience, adaptability and transformability in social–ecological systems. *Ecol. Society* **9**(2), 5.

Wiering, M. & Immink, I. 2006 When water management meets spatial planning: a policy-arrangements perspective. *Environ. Plann. C* **24**(3), 423–438.

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1 **Table 1** | Characteristics of flood risk approaches and conceptions of resilience

<b>Flood risk approaches</b>	<b>England</b>	<b>Netherlands</b>	<b>Similar/Different?</b>
<i>Contemporary governance regime for flood risk management</i>	Strong role of state in creating conditions and setting rules; but also substantial role of market (insurance) and the individual	Strong role of state, weak role of market, communities or individuals	Different
<i>Who decides on flood risk management and protection?</i>	A combination of central government, local authorities (spatial planning) and residents/ individuals (flood proofing, insurance, etc.)	Mainly the functional layers of water management (national and regional), but people can vote and participate in formal procedures of water institutions especially the regional water authorities	Different = Diverging conception of resilience
<i>Leading flood risk management principles</i>	Both centralisation and local spatial planning, utilitarian conception of public interest; diversity and tailor-made measures	Decentralisation, prevention and solidarity within dyke rings, more unitary, collective measures	Commonalities in both central responsibilities and decentralisation. Generally diverging in type of measures
<i>Dominant flood risk strategies (diversification)</i>	Multi-layered approach: proactive spatial planning, flood defence, flood warnings to enable those at risk to take action to reduce flood	Flood defence by building a reliable technical system, combined with more natural flood defence and better spatial planning, which	Different = Diverging conception of resilience

	losses, and recovery system	government should take of. However, now discussing multi-layered safety	
<i>Who should be resilient?</i>	Society, communities and individuals	Society as a whole because large floods will affect the whole of society	Different = Diverging addressee of resilience
<i>Responsibility for flood damages?</i>	No duty for government. In the end, individuals are responsible	In the end, within the system of dyke-ring protection, the collective (state) is responsible and taxpayers pay for the damages	Different = Diverging addressee of resilience
<i>Main rationales in approach to flood risk management and related rationale of resilience</i>	A rational analysis to determine what is in the national interest e.g., the use of benefit–cost analysis to determine what standard of protection should be provided where. Economic rationale	Flood risk is an overarching ‘unitary public interest’ therefore a ‘technical matter’ of water experts that secure the system; the state is responsible. Water-technical rationale	Different = Diverging underpinnings of resilience