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Introducing Adaptive Flood Risk Management in England, New Zealand, and the Netherlands: The Impact of Administrative Traditions

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Abstract

Climate change adaptation creates significant challenges for decision makers in the flood risk-management policy domain. Given the complex characteristics of climate change, adaptive approaches (which can be adjusted as circumstances evolve) are deemed necessary to deal with a range of uncertainties around flood hazard and its impacts and associated risks. The question whether implementing adaptive approaches is successful highly depends upon how the administrative tradition of a country enable or hinder applying a more adaptive approach. In this article, we discern how the administrative tradition in the Netherlands, England, and New Zealand impact upon the introduction of adaptive flood risk management approaches. Using the concept of administrative traditions, we aim to explain the similarities and/or differences in how adaptive strategies are shaped and implemented in the three different state flood management regimes and furthermore, which aspects related to administrative traditions are enablers or barriers to innovation in these processes.

KEY WORDS: climate change adaptation, administrative traditions, adaptive flood risk management, policy change, implementation

在英国、新西兰和荷兰引入适应性洪水风险管理：行政传统的影响

气候变化适应为洪水风险管理政策领域的决策者创造了重要挑战。考虑到气候变化的复杂特征，适应性措施（可随情况的发展进行相应调整）被视为处理一系列关于洪水灾害不确定性、灾害影响以及相关风险的必要手段。适应性措施的实施是否是成功的？这高度取决于一个国家的行政传统如何帮助或阻碍应用更具适应性的方法。笔者在本文中识别了荷兰、英国和新西兰地区的行政传统如何影响适应性洪水风险管理措施的引入。通过应用行政传统概念，笔者致力阐述适应性策略在三个不同国家的洪水管理制度下是如何形成和实施的，以及这一过程出现的相似点和不同点，并解释了与行政传统相关的哪些方面促进或阻碍了这些过程的创新。

关键词： 气候变化适应, 行政传统, 适应性洪水风险管理, 政策变化, 实施

Introduciendo la gestión adaptativa de riesgos de inundación en Inglaterra, Nueva Zelanda y Países Bajos: El impacto de las tradiciones administrativas

La adaptación al cambio climático crea cambios significativos para los que toman decisiones en el sector de política de gestión de riesgos. Dadas las características complejas del cambio climático, los acercamientos adaptativos (que pueden ser ajustados según la evolución de las circunstancias) se consideran necesarios para lidiar con el rango de incertidumbre en el tema de los peligros de inundación y sus impactos y riesgos asociados. La pregunta de si el implementar acercamientos adaptativos es exitoso

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depende de cómo la tradición administrativa de un país habilita o dificulta el utilizar un acercamiento más adaptativo. En este artículo discernimos cómo la tradición administrativa en países bajos, Inglaterra y Nueva Zelanda tienen un impacto en el uso de aproximaciones adaptativas de gestión de riesgos de inundación. Al utilizar el concepto de las tradiciones administrativas, buscamos explicar las similitudes y/o diferencias en cómo las estrategias adaptativas obtienen su forma y son implementadas en tres diferentes regímenes de manejo de inundaciones estatales y asimismo, qué aspectos relacionados a las tradiciones administrativas son habilitadores o barreras para la innovación en estos procesos.

PALABRAS CLAVE: adaptación al cambio climático, tradiciones administrativas, gestión adaptativa de riesgos de inundación, cambio político, implementación

Introduction

Climate change adaptation creates significant challenges for decision makers in the flood risk-management policy domain. Climate change and its consequences are characterized by many uncertainties. While it is understood, sea level will continue to rise and frequency of flooding will increase; by exactly how much and the rate of change is less certain (IPCC, 2014). Importantly, there is also normative uncertainty or ambiguity regarding such questions as: Who is responsible to take the lead to adapt to climate change and how to distribute costs and benefits across generations? Climate change adaptation can thus be defined as a “wicked issue” or an unstructured policy problem (Termeer et al., 2011).

Climate change consequences can be cumulative and mutually reinforcing (Levin, Cashore, & Bernstein, 2009). The complexity of climate change and its consequences arises from impacts that can be nonlinear and dynamic, and from the manifold interactions between different social and natural systems and scales, compounding with economic and spatial developments and demographic trends that change over time and space. This brings challenges to policy making and implementation related to institutional “fit” (Young, 2002) which is affected by the design of regime governance and epistemic traditions, and their practice.

Given these characteristics of climate change impacts, adaptive approaches (which can be adjusted as circumstances evolve) are deemed necessary to deal with a range of uncertainties around flood hazard and its impacts and associated risks. Implementing adaptive approaches, however, can be difficult; for example, the existing institutional context, and use of static planning measures that have become entrenched in water management practice based on assumptions of system stationarity (Gersonius, van Buuren, Zethof, & Kelder, 2016; van Buuren, Ellen, & Warner, 2016). The relatively autonomous position of water authorities, the dominant epistemic community of civil engineers in this policy domain, and institutional barriers such as a demand for legal certainty in the planning system interacting with expectations of protection by communities at risk (Lawrence, Reisinger, Mullan, & Jackson, 2013), afford powerful clues for understanding why adaptive approaches for managing flood risk have been slow to be adopted.

Climate change literature has had a tendency to see the political process as a black box, or sometimes an irritating barrier to urgently needed adaptive action.

The focus to date has been “more on ‘which’ barriers (sic adaptation), rather than ‘how’ and ‘why’ barriers have emerged, or how to overcome them” (Biesbroek, Klostermann, Termeer, & Kabat, 2013, p. 1127). There is a growing interest in the role of administrative traditions in shaping national responses to climate change and on how these different incumbent behavioral routines might shape different adaptation trajectories (see Biesbroek, Peters, & Tosun, in press). Nation states respond to climate change differently, not only because climate change impacts differ across countries, but also due to their different institutional frameworks and administrative traditions, which thereafter influence bureaucratic agency within these policy regimes and often lead to path dependent responses (Vink et al., 2015). The administrative traditions are in turn influenced by political and cultural traditions, for example; dominant processes such as state-society relationships, how and to what extent science is embedded in the policy domain, what is measured and evaluated to ensure implementation of policies, and how dominant economic efficiency assessment focuses attention on the short-term value of adaptations.

In this article, we focus on how country-specific administrative traditions affect the extent to which, as well as the way in which, more adaptive approaches are adopted in flood risk management. By comparing the introduction of adaptive flood risk management approaches across England, New Zealand, and the Netherlands (three jurisdictions where innovative adaptive practices have been taking place), we explore how administrative traditions shape the adoption and implementation of adaptive strategies and identify which aspects of administrative traditions enable or hinder these processes. Our analysis shows that the constitutional tradition in general explains how flood risk management is conducted in the public domain. The question of whether the flood risk management regime has a strong and independent position within the broader administrative context explains more directly whether innovations like the introduction of adaptive flood risk management (FRM) will be adopted. Furthermore, the strength of the “engineering community” within the epistemic tradition is a relevant factor: the stronger the dominance is of engineering practice traditions, or the administrative separation of engineering from planning professions, the application of more adaptive, non-structural measures is more difficult or are slower to be adopted. Where multidisciplinary teams have developed in catchments or nationally, practice traditions can evolve to embody adaptive practices.

Methodology: A Comparative Case Study

To understand better how administrative traditions can hinder climate change adaptation entering the policy arena and its implementation, Biesbroek and others (2013) call for increased methodological variety, including longitudinal studies and comparing barriers across different contexts. For this article, we deliberately selected England, the Netherlands, and New Zealand to analyze the impact of different administrative traditions upon the implementation of adaptive flood risk management. These countries were chosen for their similarity in the perceived need and drive for adoption of adaptive flood risk management approaches, but especially because of their differences in forms of administrative tradition and

context. To note “England” was chosen for analysis, rather than the United Kingdom, due to the complexities of devolved administrations in Scotland, Northern Ireland, and Wales. Different government departments and agencies operate, and flood risk management and climate change policies and strategies are set and implemented independently from the national (United Kingdom) level. To date, England and the Netherlands are both members of the European Union and therefore have shared common EU policy drivers. New Zealand and England both have a “Westminster” administrative system. Both have carried out vigorous public management reforms (Pollitt & Bouckaert, 2004). These similarities enable us to tease out the significance of differences in their traditions but also to be more nuanced in our analysis.

The three countries’ traditions were used to undertake a comparative analysis across the three jurisdictions: constitutional tradition, regime governance tradition, and epistemic tradition. This analysis was based on extensive empirical research undertaken individually by the authors over the past ten years in the three countries. We also performed secondary analyses of data and evidence from previous research by other key authors (see references in the case descriptions), combining our knowledge about the general flood risk policy and its practice in the three jurisdictions. Specific policy programs were drawn from to show where the transition toward a more adaptive mode becomes visible, for example, the Dutch Delta Program, the implementation of the National Programme for Adaptation in England, and the integration of the Dynamic Adaptive Policy Pathways (DAPP) into New Zealand national guidance following the use of simulation games to catalyze its uptake and test its relevance in real life for flood risk management decision-making processes (Lawrence & Haasnoot, 2017). We discussed and reviewed each others’ case analyses several times in order to guarantee intercoder reliability.

Implementing Adaptive Flood Risk Management Within Different Administrative Traditions

The Quest for Adaptive Flood Risk Management and Its Building Blocks

There has been an evolution in thinking about flood management, from flood protection to flood risk management, due to the concern that structural flood protection measures employed have “created (sic) flood disasters” (Burton, Kates, & White, 1994). The focus has shifted from a “protect and react” regime (managing the flood) which results in a “safe development paradox” (Burby, 2006) by continuing the exposure of communities to the changing residual risk (that which is not protected), toward a regime in which the changing nature of the risk is managed proactively (managing the risk). Many authors have stressed that adaptation to climate change for flood safety reasons necessitates more robust or resilient socioecological systems to deal with “unexpected” shocks. Others (e.g., Haasnoot, Kwakkel, Walker, & ter Maat, 2013; IPCC, 2014) have suggested adaptations that anticipate change and enhance resilience. This implies that systems, communities, or regions need to be adaptive: able to anticipate ahead of flood damage and thus respond more easily to changing circumstances. Such an approach suggests selecting “no-

Table 1. Building Blocks of Adaptive Flood Risk Management

Building Block	Description	Key References
Accepting future uncertainty	Working with different scenarios to assess the robustness of policy strategies and keeping options open	Walker, Lempert, and Kwakkel (2012); Stephens, Bell, and Lawrence (2017)
Focus on learning-by-doing	Approaching policies as hypotheses/assumptions. Room for experimentation and reflection during implementation of strategies. Systematic monitoring and policy adjustment using new insights.	Pahl-Wostl (2007); Sendzimir, Magnuszewski, Balogh, and Vari (2006)
Reversible and flexible options	Stepwise implementation of policy strategies, ability to change pathways as the future unfolds, able to make near-term decisions without creating lock-in	Haasnoot et al. (2013); Walters (1997); Lee (1999)
Capitalizing no-regret options	Increasing system robustness by taking easy-to-take measures that reduce risk or increase adaptive capacity and do not harm other public interests	Lempert and Collins (2007); Merz, Hall, Disse, and Schumann (2010)
Acknowledging possibility of future shocks	Anticipatory policy action by investing in resilience and buying safety margins	Kwakkel, Walker, and Haasnoot (2016); Reisinger and Lawrence (2016); Folke et al. (2002)
Soft measures in addition to structural ones	Nonstructural (e.g., nature-based, behavioral, financial, communicative) measures are considered in addition to or as an alternative for structural measures	Pahl-Wostl (2008); Wesselink et al. (2015)

regret” strategies that yield benefits even in the absence of climate change in order to enhance system robustness; and favoring reversible and flexible policy options to allow for uncertainty; buying “safety margins” in new infrastructures or designing new urban and infrastructure systems. Such an approach can lead to adoption of portfolios of options in adaptation strategies, including dune buffers at the coastal margins to buy time for selecting and implementing measures for the long term thus addressing short- and longer-term decision-making needs (Hallegatte, 2009). This has led (among other things) to the uptake of DAPP planning approaches in the Netherlands and in New Zealand (Haasnoot et al., 2013; Lawrence & Haasnoot, 2017; Reeder & Ranger, 2010).

Adaptive flood risk management thus tackles the dynamic and changing characteristics of flood frequency and magnitude associated with climate change. An approach of flood risk management that incorporates the principles of adaptive management has a number of distinct characteristics. In this article, we distinguish six building blocks (both more procedural and more substantial) of such an approach (see Table 1), based on key literature in the field of flood risk management, adaptive management/capacity, and resilience. These characteristics will be used to analyze how adaptive flood risk management is shaped in the context of different state traditions.

Administrative Traditions

Implementing adaptive flood risk management happens within country level institutional, cultural, and physical contexts. In this article, we are particularly interested to see how specific state traditions, with the accommodation of “societal frames and

vested interests” (Vink et al., 2015) impact upon the way in which flood risk governance evolves into a more adaptive mode. Taking the concept of administrative traditions from Biesbroek and others (in press), not only enables us to distinguish between multiple aspects of public bureaucracies and which routines they develop, but also how these routines become heuristics or logics that provide short cuts in (and thus guide) decision making.

We unpack the concept of administrative tradition to distinguish between three levels: constitutional tradition, policy regime tradition, and epistemic tradition.

Constitutional Traditions—Constitutional traditions can be typified in three ways. First, the internal organization of the government and the degree to which this is centralized and top-down, or more decentralized and bottom-up; the organization which may be more federal (Switzerland), more unitary (United Kingdom), or a dual system, in which the authority is divided between federal and state governments (Hague, Harrop, & Breslin, 2004) and more fragmented, or coordinated (Pollitt & Bouckaert, 2004).

Second, this tradition has to do with the way in which interest intermediation is organized (Knull, 1998). The way in which different interests are represented and can be more pluralist (Anglo-Saxon model) or more corporatist (Rhineland model based on economic tripartite partnering among strong labor unions, employers’ unions, and governments) (Vink et al., 2015).

Finally, the constitutional tradition is about the dominant administrative culture (the normal beliefs of administration) within a country; more Anglo-Saxon models of the “public interest” or more legalistic “*Rechtsstaat*” models where laws limit governmental power based on what is “just” (Pollitt & Bouckaert, 2004).

Regime Characteristics—With regard to the policy regime tradition, we distinguish between the position of responsible water authorities and their resources in relation to other relevant authorities; a tradition in which there is a strong and autonomous position for water authorities, or a more subordinate position of devolved powers. Second, the dominant planning approach is relevant. We can distinguish between a more technocratic and sectoral approach, versus a more inclusive, democratic approach.

Epistemic Tradition—The epistemic component of a state tradition describes the main characteristics of the knowledge field for flood management and the way in which the science-policy interface is institutionalized. What are the preferred bodies of knowledge and scientific schools of thought within a specific policy domain (mono-disciplinary vs. interdisciplinary, see also Bergsma, 2016a, 2016b)? Are experts and policy makers part of the same epistemic community? What is the relative position of experts and their access to the policy arena? To what extent is their relation to policy makers institutionalized? Epistemic traditions are embodied in professional group traditions and reflected in how flood management planning is executed.

Table 2 summarizes these features for the three case study countries.

Table 2. Comparison of Administrative Traditions

	New Zealand	England	The Netherlands
<i>Constitutional tradition</i>	Unitary state with devolved powers through Parliament Statutory provision, but eroded over last decade	Centralized and hierarchical (under minister control), unitary, increasingly fragmented, devolved agencies Pluralist/neo-pluralist, decision making characterized by conflict, disproportionate influence from business interests	Decentralized, unitary state Mainly corporatist
<i>Regime governance tradition</i>	Public interest and “free” market based Autonomous regional councils (flood protection) and district councils (land use planning) with devolved powers. Rely on rating bases of local community	Public interest, market based Quasi independence from state, EA strategic lead, and operational lead for main rivers, lead local flood authorities for local flood risks. Part state funded, under “localism”, agenda increasing reliance on partnership funding and collaborative approaches	Predominantly <i>Rechtsstaat</i> Strong, autonomous position with nearly all necessary resources available
<i>Epistemic tradition</i>	Enabling statute driven by high level objectives. Practice is largely static and inflexible to change over time Engineering dominates in flood management. Planners and lawyers dominate in planning. Neither systems are well integrated. Both use static responses to create “certainty.” Embedded in policy and practice networks and statutory processes	Rather closed, NPM approach (arguably) promotes greater public accountability and collaboration Civil engineering dominates, growing “supporting” role for other disciplines. Not integrated with largely housing delivery/economically driven planning system. Embedded in policy and practice networks	Rather closed and focused on sectoral implementation Strong focus on civil engineering, growing role for other disciplines Strongly embedded in policy networks

Shaping Adaptive Flood Risk Strategies: The Expected Impact of Administrative Traditions

It is plausible to expect that the way in which adaptive FRM is implemented differs among different countries due to different traditions. Administrative traditions can hamper or enable the uptake of ideas like learning-by-doing, reversibility, and the ability to anticipate risk through actions today for tomorrow. In other words: the way in which the key principles of adaptive FRM are applied depends upon the specific characteristics of the state tradition. We expect that different administrative traditions result in different enablers and barriers to making the transition from traditional to more adaptive FRM. However, it is difficult to formulate specific hypotheses about this relationship. Therefore, we opt for a more inductive approach to study this. There are a number of interesting elements to study. For example, whether a more legalistic tradition makes it difficult to legitimize a learning-by-doing approach, or a more public-interest dominated tradition, allows for the interests of a wider range of groups to be accommodated and thus possibly more receptive to trial-and-error. It is also interesting to see whether a strong and autonomous position for water authorities can hamper the uptake of adaptive approaches because of a strong power bias toward the existing policy path (van Buuren et al., 2016), or the presence of a more loosely organized, pluralistic network of actors can make it easier to explore novel ideas. We are interested in the impact of a rather closed, engineering-oriented epistemic tradition that has close relations with the policy community: does this hamper the uptake of adaptive approaches, and does a more multidisciplinary community, at a distance from the policy regime, enable the uptake of such approaches?

Case Descriptions

New Zealand

In response to widespread damaging floods last century which resulted from increased runoff, erosion, and sedimentation following land clearance for settlement and farming during the nineteenth and early twentieth century, New Zealand passed the Soil Conservation and Rivers Control Act 1941. This legislation governs flood risk management; there is on average a major flood every eight months in New Zealand (Ministry for the Environment, 2008). It was not until 1991 that New Zealand enacted an integrated natural resource management regime underpinned by sustainable management principles—the Resource Management Act 1991 (RMA), which governs land use planning, the effects of climate change (added in 2004) and the avoidance, reduction, and mitigation of natural hazards. This regime is supported by the Civil Defence and Emergency Act 2002 for responding to natural hazard and flood risk disasters. The flood risk management regime is devolved by statute from the national level to local government at two levels (regional and local territorial authorities).

Devolution originates from the constitutional and regime governance traditions that have evolved in New Zealand from its Westminster origins and the reforms that took place in the 1980s and 1990s, in response to a shift toward free

market policy approaches (Kerr, Claridge, & Milicich, 1998). This has resulted in a fragmented governance system, between functions and across levels of government (Lawrence, Sullivan, et al., 2013); each unit of local government developing its own approaches and measures, with weak links between each governance level.

An adaptive approach to flood risk management evolved from the epistemic traditions of engineering that have dominated flood control and natural hazards management. These had their origins in responses that were developed in the United States following the “dust bowl” in the 1930s and which were strongly supported by state institutions centrally in the Federal Administration (Ericksen, 1986, 2005a, 2005b). Such institutional arrangements were reflected in the New Zealand regime governance (e.g., the National Water and Soil Conservation Authority, which developed policy and provided funding and the Ministry of Works, which implemented policy through engineering “works”). Engineers building flood protection structures dominated these organizations, entrenching community expectations of safety and further protection. Links with land use planning and risk reduction came in the 1980s as questions were asked about whether the measures being used were creating future flood disasters (Ericksen, 1986, 2005a, 2005b). This gave rise to the adoption of flood risk management as part of integrated catchment management, which was reflected within a “living with the river” framing (Wellington Regional Council, 2001). This risk-based approach heralded an epistemic tradition shift, evidenced by the inclusion of risk-based approaches within government guidelines encouraging precautionary consideration of the effects of climate change on extreme rainfall, flood flows, and flood inundation (Woods et al., 2010), thus influencing the evolution of regime and epistemic traditions. As a result of more interdisciplinary connection between flood protection at a regional council level and land use planning at the local council level, a more multidisciplinary approach developed, with the role of anticipatory planning emphasized. This resulted from the adoption of new regime governance in law, based on the precautionary principle. Also, uncertainty and potentially high consequences of flooding were reflected in the planning regime under the RMA, enabling flexible and adaptive management over time to be adopted and measures adjusted, as its effectiveness was monitored.

Nevertheless, it has proven difficult to change existing land uses and for decision makers to withstand development pressures in flood risk areas, evidenced by the intensification of development in flood plains and at the coast where inundation risk is high (Blackett & Hume, 2011; Rouse et al., 2016). Flexible and adaptive tools are now beginning to be applied in disciplinary practice (Lawrence & Haasnoot, 2017) to match the changing administrative traditions. This is leading to a change in epistemic tradition; adaptive pathways planning is now embedded as an assessment tool in draft revised national coastal hazards guidance for local government (Ministry for the Environment, 2017) using an expanded set of emissions scenarios downscaled from those used by the IPCC and updated after each IPCC review and accounting for the possibility of extreme events. The focus is on learning by doing, which has developed between research and practitioners in real-life decision settings. While complementary “soft” measures have been adopted by some local

councils, there is still a perception by communities that structural measures provide safety. Despite these developments, the social contract between government and citizens has been detrimentally affected by the state tradition of “less government” at a national level that resulted from the free market emphasis of the 1990s and its ongoing legacy. To counter that, a new emphasis is emerging in recognition of the need for greater community engagement to help implement the evolving adaptive epistemic tradition. A good example equally relevant to FRM is the community process around the development of the Clifton-Tangoio Coastal Hazards Strategy 2120, an initiative of three Hawkes Bay councils at two levels of local government. Thus, regime governance is starting to shift.

England

After experiencing catastrophic flood events and associated economic costs in the 1990s and 2000s, with climate change expected to increase the frequency and severity of such events, the government was persuaded to increase the country’s resilience. The Climate Change Act (2008) requires a risk assessment (CCRA) every five years and a National Programme for Adaptation. The first CCRA evidenced flooding as the largest climate change threat (Defra, 2012). Scientific reviews (e.g., Evans et al., 2004) also indicated flooding would become a greater problem in the future, the risk expected to materialize through an increased frequency and magnitude of inland fluvial flooding, with sea level rise increasing both coastal flood events and rate of coastal erosion (Defra, 2012). For fluvial flooding, however, there was only limited scientific confidence as to what extent flood flows would be altered by climate change (Kuhlicke & Demeritt, 2016).

Flood risk management and adaptation is centralized, decisions and priorities set by the Ministerial Department for Environment, Food and Rural Affairs (Defra), under financial rules set by HM Treasury. The state frames the issue in terms of the public good and determines the course of action to achieve the best outcome. Defra has statutory duties to consult on development of policy and strategy, but does not have a strict legal duty to protect the public (Kuhlicke & Demeritt, 2016). Defra’s goal setting role is part of a wider cross government commitment to climate change, with land use and spatial planning in particular “viewed” as a key way to minimize the impacts of increased flood risk, adaptation responses to be developed and delivered at a local level (Defra, 2012; Wilson, 2006).

Investment for flood risk management is through national taxation. A state regulatory body, the Environment Agency (EA), is operationally responsible for managing risks from main rivers and the sea, advising local authorities on planning decisions, and producing project appraisal guidance to prioritize investment from the national to local level through a framework of benefit–cost analysis. Local authorities are responsible, as “lead local flood authorities,” for managing local flood risk, as well as taking flood risk into account through land-use planning. From 2010, coupled with an increasing move to governance beyond the state, there has been increasing reliance on partnership with private and voluntary sector actors (Kuhlicke & Demeritt, 2016) and for the public to be risk aware and consider their individual role in adaptation.

From Victorian times, with the onset of industrialization, engineered flood defenses to control nature, protect people, and property has been the dominant approach to flood risk. The local level decision-making committees are dominated by civil engineers, the epistemic component of the English administrative tradition can be still be characterized as being dominated by traditional civil engineers with an over-reliance on structural flood defenses and “hard” engineering solutions (Challies, Newig, Thaler, Kochskämper, & Levin-Keitel, 2016; Potter, 2013a).

Successive reports, policy and legislative responses (e.g., Defra, 2005; Evans et al., 2004) have recommended a shift to an “integrative risk management paradigm” (Challies et al., 2016). Flood risk was to be managed through a portfolio of measures, accepting future uncertainty, and aiming to maintain “flexibility by avoiding technical lock-in” (Defra, 2012, p. 7). Authorities apply a 20% increase to estimates of river discharges post 2025 as a (somewhat crude) “precautionary allowance” (Kuhlicke & Demeritt, 2016). Natural flood management practices are advocated as complementary measures to structural defenses; thus also capitalizing on no-regret options. The “Catchment-Based Approach” (CaBA) piloted from 2011 onwards signaled the government’s belief that private, public, and third sector organizations should work more collaboratively. Although focused predominantly on water quality, CaBA brings ecologically inspired actors together with traditional flood risk actors, “learning by doing” in implementing softer solutions across the catchment such as increased tree planting in the higher reaches and restoring the natural function of floodplains (Defra, 2005). Spatial planning is still “regarded” as an important tool for reducing exposure of new build properties to floods, taking into account climate change in development control and strategic planning, thus avoiding lock in. Flood forecasting and warning remains a significant component of risk management. The encouragement of local responsibility (Butler & Pidgeon, 2011), for example, communities reducing their vulnerability through insurance, flood resistance, and resilience measures—acknowledges the possibility of future shocks.

The Netherlands

In the Netherlands, political worries over climate change are most immediately related to flood risk concerns: that sea level rise may imperil the coast, while increased snowmelt and rainfall are likely to increase river flood peaks. Recent extreme droughts have also put freshwater supply on the agenda. While global warming was a minority concern when it reached the agenda in the 1980s and 1990s, the issue gathered steam after two consecutive river floods, in late 1993 and early 1995.

Civil engineers have been tempted to see climate change as a “tamed” issue, to be tackled top down by infrastructural means, such as super-dikes. The 1995 Rivers Delta Plan and the Dutch Delta Plan presented in 2008 explicitly harked back to the world-famous Delta Plan of the 1950s. In addition to the existing set of four Dutch Meteorological Office (KNMI) scenarios for sea level rise, the Delta Commission used one extra scenario of extreme sea level rise of more than 1.30 m by 2100, as a kind of “stress test” under extreme conditions (Haasnoot & Middelkoop, 2012).

Uncertainty minimization is the core of the Dutch administrative tradition in water management. The “securitization” of floods (Buzan, Wæver, & de Wilde, 1999) means that any suggestion that safety is compromised gets water managers up in arms. This has presented obstacles to adaptive flood risk management strategies that accept and differentiate (manageable) residual risk. In the 1990s, the once-dominant national Public Works Department was decentralized and its remit curtailed. The national level, however, found it hard to let go and pulled the reins in (e.g., the Meuse protection program in 1997).

The 1995 flood shock event initially strengthened the customary safety-first flood management paradigm and emergency dikes were built on the Meuse and building in floodplains was curbed. Yet at the same time “reflexive modernization” was promoted in top circles of the Public Works Department, from a felt need to break through a perceived “control paradox” (Roth, Warner, & Winnubst, 2006). This was reflected in a program of interventions to “make space” for the river, rather than constrain it. The dominance of liberal agendas in national politics has eroded the previous emphasis on planning and control in land use, especially since the turn of the millennium; for example, there are few flood planning policy restrictions for building accompanied by “compensatory” measures. In the context of Making Space for the River, provincial and local authorities seized the initiative and used water plans as a lever to promote regional development. However, while “Making Space for the River” heralds a change in focus, some doubt that this change was fundamental and more than just discursive (van Buuren, Potter, Warner, & Fischer, 2015; Wiering & Arts, 2006).

While the national state advisory Delta Commission in 2008 sided against zoning policies and emphasized structural solutions, they left space for other options. Since then, regional pilot projects are moving away from a control paradigm, toward land-use and crisis planning, which are cautiously being carried out. This followed experiences in the Space for the River program (2000–16), which set non-negotiable safety standards at the national level, but left space for regional alternatives to attain these norms. Various lower-level authorities have proved more willing to “build the plane as you fly it” as an expression of adaptive management.

By introducing the concept of Adaptive Delta Management, the Dutch Delta Program lent practical meaning to the idea of stepwise implementation, which enables decisions to be made in the near-term that are robust and flexible over the long term. To do so, the Delta Program embraced the adaptation pathways method developed by the University of Delft and Deltares (see above) and applied it to refine the strategies developed by the various regional delta programs that functions as a way to choose and plan the necessary measures in the short and long run. Moreover, the Delta Program is more attentive to increasing system robustness, especially when it comes to risk reduction and water-robust planning measures. It developed a separate policy program to stimulate spatial adaptation based on soft policy measures. However, the most important innovation of the Delta Program is about setting new norms for flood protection, based on risk calculations. Risk estimations are calculated upon expected economic and demographic growth rates, so they can be said to have some built-in flexibility for future societal changes; yet this is more an issue of increasing system robustness, rather than creating adaptive capacity.

Table 3 summarizes the adoption of adaptive FRM in the three countries.

Table 3. The Adoption of Adaptive FRM in the Three Countries

Building Block	New Zealand	England	The Netherlands
Accepting future uncertainty	Downscaled IPCC emissions scenarios are used and updated after each IPCC review. Use of several scenarios is becoming more routine.	Tension between highlighting uncertainty and the need for future proofing with clear answers for decision makers. Climate Change Act (2008) requires a five-yearly assessment of the current and predicted impacts of climate change.	Different scenarios are used to define the actual norms, and these norms will be actualized every 12 years. But structural defense paradigm and consequent commitment to long-term implementation schemes requires eliminating uncertainty. Yes, but only in the context of specific pilot projects.
Focus on learning-by-doing	Yes in a few locations with research partners and flood risk managers (e.g., simulation games).	Limited amount of funding for demonstration projects, for example, natural flood management and property level resilience.	Yes, but only in the context of specific pilot projects.
Reversible and flexible options	Trialed in FRM and coastal settings, and included in national guidance for coastal hazards decision making. Some new structural protection design has built-in ability to be raised, for example, roads, seawalls, and levees.	Main focus on deciding on an appropriate level of risk (and safety margins) to adopt. Flood defense schemes follow a six-year investment plan.	Not at all. The focus remains on solutions that are right first time. Dike enforcements have lifetimes of at least 50 years.
Capitalizing no-regret options	All risk reduction measures developed within legal service level standards. Budgets tied to statutory long-term plans. New approaches implemented by willing authorities within statutory directions.	Main focus on early warning and response systems. Seek a more integrated approach for co-benefits, but increasingly through partnerships led by voluntary sector, who must secure own long-term funding. Uptake of property-level flood protection seen as “no-regret” option. EA guidance documents and tools promote adaptation by businesses and householders, but with no explicit policy mechanism in place to facilitate this.	Yes: attention for adaptive planning but only on a voluntary basis. All measures that are taken with regard to prevention have to fit legal standards and are thus formally obliged (otherwise there is no budget available).
Acknowledging possibility of future shocks	Yes: extreme events to at least 100 years. Precautionary principle and needs of future generations institutionalized in statutes. Risk of flood hazard and sea level rise required to be publicly identified.	Outcomes outside the likely ranges provided are not ruled out, indicators of flood events caused by large-scale weather systems used for plausible changes to 2060. Twenty percentage increase to be added uniformly to estimates of river discharges as a “precautionary allowance” for climate change. Conjecture that households could “be helped to relocate away from high risk areas,” with no mechanisms in place.	Yes: flood risk norms use climate scenarios till 2100. Flood safety norms are based upon future economic growth and thus in some sense anticipatory. With a program on Spatial Adaptation buying safety margins is stimulated, but only at a voluntary basis.
Soft measures in addition to structural ones	Yes: floor levels and some avoidance of flood risk.	Policy rhetoric moving increasingly to the delivery of more “natural flood management” for co-benefits, “encouragement” of sustainable drainage systems, with growing evidence of on the ground delivery—but structural measures dominate.	In exceptional cases, this type of measure is considered and applied but the default options are structural measures.

Table 4. Barriers and Enablers Related to Different Administrative Traditions

Country	Barriers/Enablers
<i>New Zealand</i>	<i>Barriers</i>
Constitutional tradition	Market-based ideology and public-interest focused tradition Reactive political culture Short-term political cycle
Regime characteristics	High level of devolution to local authorities Fragmentation of decision making across local authorities Time-inconsistency of statutory functions Fragmentation between water and planning domain
Epistemic tradition	Strong engineering epistemic community Practice culture can be slow to change
	<i>Enablers</i>
Constitutional tradition	Treaty of Waitangi partnership and collaborative traditions
Regime characteristics	Strong network of change agents Tradition of rapid shifts in governing perspectives
Epistemic tradition	Room for experimentation
<i>England</i>	<i>Barriers</i>
Constitutional tradition	Responsibility for adaptation is framed as a private issue, FRM devolved to local level lacking steady, long-term political (or legal) commitment, and adequate state resources
Regime characteristics	Strong and autonomous position of water authority, dominated by engineers. Fragmentation between planning and flood management, market pressure for housing inappropriately adapted. Responsibility for resilience shifted to individuals
Epistemic tradition	Traditional focus on cost-benefit analyses, with dominance of civil engineers who prefer structural measures and to close down uncertainty
	<i>Enablers</i>
Constitutional tradition	Less funding paradoxically fuels innovation and collaborative approaches
Regime characteristics	Localism agenda increases stakeholder diversity, including ecologically inspired voluntary sector
Epistemic tradition	Innovative and strong cross-disciplinary, cross sector networks
<i>Netherlands</i>	<i>Barriers</i>
Constitutional tradition	Traditional idea of Rechtstaat: government has to safeguard safety. Low risk awareness and acceptance among citizens.
Regime characteristics	Focus on prevention and robustness is legally anchored Fragmentation between water and planning domain Strong, autonomous position water authorities within government
Epistemic tradition	Dominant and technocratic epistemic community focusing on civic engineering
	<i>Enablers</i>
Constitutional tradition	The presence of a strong and unitary state enables the adoption and implementation of new policies (such as risk-based norms)
Regime characteristics	As part of the Delta Program: instalment of regional platforms including provinces and water boards for more alignment between water and planning
Epistemic tradition	Gradual broadening of the epistemic community: inclusion of other disciplines Focus on long-term, use of scenarios, attention for uncertainty

Comparative Analysis

Traditions differ in a number of important respects across New Zealand, England, and the Netherlands, as shown in Table 2, and how they impact upon the adoption of adaptive FRM in each jurisdiction. We summarize the barriers and enablers stemming from the different traditions on the adoption of adaptive FRM in Table 4.

In this section, we analyze this impact in more detail.

Constitutional Tradition

It is especially the element of *administrative cultures* and the way (economic) interests are represented that influences the way in which adaptive FRM is adopted. Both New Zealand and England can be characterized by a neo-liberal political ideology reflected in market-based and laissez-faire policies. This ideology has had an

important hampering effect on the implementation of climate adaptation action in general. This effect is reinforced by the *internal organization* in both countries: much decision-making power is devolved, leaving regionally based special purpose public agencies and local government to address complex policy implementation with minimal support from the government, other than limited statutory and non-statutory guidance and insufficient funding. This together with ambiguous signals from government as to its importance as a policy alongside the centrally developed and implemented climate change mitigation policy (e.g., for New Zealand, see Rive & Weeks, 2011) and in England, the passing off of climate change adaptation to individuals and business, linked to the seizing of business opportunities (Pollitt, 2015). Where the economy and cost-effectiveness prevail, it is difficult to justify and legitimize public spending on climate change responses, thus also on adaptive actions. In general, pro-environmental policy in England is characterized by a legal system with a strong emphasis on procedural regulation, with a strong tradition of informal regulation through consensus rather than coercion (Moss & Monstadt, 2008). Consistent with an associated liberal governing tradition, there is a reluctance to interfere in the assumed effectiveness of market mechanisms (Loughlin & Peters, 1997). The English state has maintained an underdeveloped tradition of taking care of the public interest, although promises for increased flood defense funding from politicians under the post-shock event media spotlight continue to be made in a *déjà vu* sequence of cut and promise. In such a situation, it is difficult for local authorities and property developers to take “system robustness and flexibility” into account as this is not seen as discharging their legal public interest responsibility, a tilt to constitutional tradition. “Protection” currently dominates over the impact of legal liability for known risks to communities.

While similar tensions exist in New Zealand, it is the tension between public and private interests within a more *laissez-faire* context that results in contestation, and governance fragmentation that hamper adaptive approaches to flood risk reduction. A reluctance to fetter private interests in their use of land by the decision makers has dominated within the short-term focus of electoral interests. However, in New Zealand a gradual shift is underway from responsibility to protect, to greater precaution where liability is held for known risks in the face of climate change.

At the other hand, the constitutional tradition in the Dutch context, with a strong emphasis upon the idea of a strong unitary (although decentralized) state that guarantees basic rights (*Rechtsstaat*) with regard to protection and welfare—do not leave much room for a strongly risk-based mode of flood risk management and steers much more toward a protection-oriented approach with a strong public-sector responsibility (Keessen, Hamer, Van Rijswijk, & Wiering, 2013). Another important principle—about national solidarity—also hampers the adoption of an adaptive logic, because it is interpreted in favor of traditional flood protection-oriented measures and risk minimization.

Regime Governance Tradition

In all countries, fragmentation between flood management and spatial planning has hindered the implementation of a more adaptive flood strategy. However, in the Netherlands this fragmentation helps to sustain the current focus on flood

protection (cf. Biesbroek, Termeer, Klostermann, & Kabat, 2014), while in England and New Zealand a lack of coordination enables private actors to pressure decision makers about spatial developments that increase the risk and hence vulnerability. In England and New Zealand, the regime governance tradition was fundamentally changed as a result of political ideology shifts during the late 1980s and early 1990s. Free markets place English local councils under considerable pressure to meet housing and other development needs on the floodplain (Potter, Ludwig, & Beattie, 2016). Increasingly, the ideology of a liberal state in England and a shift to “localism” by devolution of responsibilities to the local or community level, seeks to “empower” individuals, or to shift the responsibility for FRM to individuals (Butler & Pidgeon, 2011), yet it is questionable how, and to what extent, the public are able to resource this at a householder and small business level. Other forces are at work in New Zealand contributing to the power of private interests. There was a shift from a centrally planned to an enabling regime based on the environmental effects of land use development. This has given rein to risk transfer between private and public interests, and between and within generations, resulting in pressures on decision makers to use land that has increased hazard risk and vulnerability. This was amply demonstrated as a result of the 2011/2012 Canterbury earthquakes (Canterbury Earthquakes Royal Commission, 2012) where flooding was exacerbated by land subsidence.

The Dutch case shows that a strongly, centralized, and relatively autonomous flood management regime is both a barrier and an enabler for the adoption of an adaptive logic where stakes are perceived to be high. The Dutch Delta Program is a good example of this where the idea of multilayer safety and adaptive delta management was adopted on the one hand; on the other hand, the autonomy of the regional water boards has enabled the system to stay on its current path and resist attempts to adopt more flexible approaches. Until now, we cannot conclude whether the current system will adapt and survive or change gradually (van Buuren et al., 2015).

Epistemic Tradition

An evolving expert community within the flood risk domain is starting to use more adaptive approaches for flood risk management. In all three cases, this evolution has begun, closely linked to decisions on the ground, rather than within policy making. In New Zealand, in part because of the small and well-networked multidisciplinary characteristics of the actors, there are stronger links between the different epistemic traditions. A catalyst for the emerging change in epistemic tradition in New Zealand was the interdisciplinary collaboration between Dutch and New Zealand researchers, who “tested” and facilitated the DAPP planning approach within the multidisciplinary networks across the regime governance supported by knowledge broking. The outcome was also facilitated by New Zealand’s small and well-connected policy and technical expert communities with high level regional management and political support. Historically, the New Zealand regime governance and epistemic traditions have demonstrated the ability to be quick adopters of new ideas and tools (Lawrence et al., 2013), in this case adopted through peer support and demonstration (Lawrence & Haasnoot, 2017).

It was the strong economic case, based on the market-driven administrative tradition that led to strategic moves for increasing “resilience” in England, the lack of resources for protective measures enable alternative “natural” and thereby adaptive approaches to be advanced in England, where cost-benefit analyses do not stack up for the communities concerned (Owusu, Wright, & Arthur, 2015).

In the Netherlands, for a long time, the epistemic community was focused on “hydraulic engineering” and dominated by engineers (Meijerink, 2005). At the same time, the strong orientation on the long term and the tradition to use scenarios to set norms for flood risk management, provides a fertile ground for developing long-term policy strategies and for introducing the idea of adaptation pathways that are robust for different climate scenarios. This is supported by strong relationships between experts and policy makers, along with an openness to “new knowledge” (e.g., the adoption of “living with water”). These traditions have enabled knowledge to be adopted in the policy arena, for example, adaptive delta management and adaptation pathways in the Delta Program.

However, the power of existing routines and dominant belief systems pervade both the policy and practice communities and act as hampering mechanisms. In each country, engineers are expected to reduce uncertainty in conducting rational and consistent cost-benefit analysis for multimillion-dollar structural defense schemes. They hold a strong position in the policy networks around flood risk management, but there is a growing trend to widen the disciplinary scope of experts who are involved in these networks and to allow for alternative opinions and ideas.

Within all three cases, pilot projects are used to experiment with a more adaptive approach. In England, the CaBA has gained traction through the government’s localism agenda in “passing power to communities and individuals,” thereby opening up delivery of river basin management planning in a “collaborative” approach. Ecologically motivated voluntary organizations (Rivers Trusts/Wildlife Trusts) dominate the leadership of the new CaBA partnerships and have taken this policy window to innovate with natural flood management techniques, in conjunction with other “alternative” government actors, such as the Forestry Commission. In New Zealand, adaptive management experimentation is being embedded in national approaches to hazard management and to other domains of interest, such as the embodiment of the Treaty of Waitangi principles in resource management and local government law, reflecting partnership and co-governance in practice and representing a change in constitutional tradition. In the Netherlands, multiple pilots are used to experiment with ideas of multilayered safety, building with nature, and spatial adaptation, but the question remains whether these pilots are powerful enough to result into durable change (van Popering-Verkerk & van Buuren 2017).

Conclusions

Although it sounds quite obvious, we conclude that administrative traditions *do* matter when it comes to the adoption of adaptive FRM in our three countries, because they permeate the decision space in which policy is prepared, the actor

configuration and distribution of responsibilities and how planning is done, decisions made, and implemented. They drive preferred sources of knowledge and the relationship between policy and science.

First of all, the constitutional tradition explains whether there is political attention to the issue of adaptation at all. In more neoliberal traditions, adaptation is more often framed as a private responsibility and thus it is difficult to implement adaptive FRM, especially when it comes to measures that are meant to build in safety margins and robustness. However, in a country like the Netherlands, with the strong emphasis on governmental responsibility for public safety, it is as difficult to legitimize the implementation of more adaptive approaches, as it can be perceived as a concession to high standards of protection. Implementing adaptive FRM thus necessitates in highly dissimilar contexts a more fundamental political debate about the question of how governments perceive their responsibility when it comes to dealing with the consequences of climate change.

There are two more specific characteristics of the flood policy domain that hamper the uptake of policy innovation more generally. The quite autonomous position of the flood risk management domain, either through devolution (New Zealand) or centrality of function (England and Netherlands) is an important constraint on the uptake of adaptive strategies. This is exacerbated by a distinct and wide boundary between the domains of planning and water, which hampers the uptake of more integrated and holistic approaches in the different administrative traditions.

And third, the strong engineering tradition in flood risk management has to date hampered the uptake of adaptive approaches because it favors a focus on system robustness and infrastructural measures. At the same time, there are also signs of the transformative power of a broadening of expert networks in which other disciplines become involved. This results in an increasing role for other experts to work with civil engineers, notably environmental engineers, economists, land-use planners, and engagement facilitators, with more sustainability-focused ideas and adaptive management tools that are forward-looking. This has the potential to enable adaptive management approaches to be applied that anticipate risk in wider domains than flood risk management, especially where there is an appetite for constitutional governance reform that links multilevels of governance with nascent epistemic experimentation, and with the developing experience of collaborative governance.

In all three countries, the administrative traditions resulted in governance gaps that hamper the uptake of more adaptive approaches. In the New Zealand case, the regime devolved to the local governance level with limited central direction or funding, has reduced the ability to fund anticipatory adaptation measures. Operating at the local level has also led to contestation and capability deficits for conducting community engagement processes that can build legitimacy for adaptive action. These characteristics have hampered the uptake of adaptive measures. As noted by Jordan and Huitema (2014), states have access to “uniquely important steering capacities” (p. 388), seen as the only actor with the legitimacy and the resources to develop and provide the crucial support for local implementation of flood risk management, and to scale up best practices arising from experimentation with planning innovations. England reveals a state “governance gap” (Massey, Biesbroek, Huitema, & Jordan, 2014), into which the state needs to step, to support its

policy entrepreneurs experimenting with novel approaches and supporting equity considerations of the public interest. New Zealand exhibits a different kind of governance gap; a coordination one that could better align flood risk management statutes at the national level to strengthen risk reduction at the regional level through land use planning and disaster recovery carried out at the local level. The latter also constitutes the governance gap in the Netherlands, where it has proven very difficult to connect flood risk management to the fields of land use planning and disaster management.

Ultimately, implementing adaptive FRM asks for a synchronized governance system that is—independent of the administrative tradition—internally coherent and well linked across scales as a supportive system. Organizing alignment and coherence in a (horizontally and vertically) fragmented governance system requires consideration of roles and responsibilities that “fit” the level of governance and the problem type. Moreover, we can conclude that implementation of adaptive FRM cannot happen without developing room for experimentation as a way to build epistemic capacity and community legitimacy as a basis for developing adaptive FRM.

Our comparative work in the opening up of the “administrative traditions” black box (Biesbroek et al., 2015) has two wider implications that we can see. There is an active internationalized network that advocates the adoption of adaptive FRM and thus supports transferring or diffusing best practices, concepts, and instruments. We encourage the opening up of the “administrative traditions” black box of the receiving country, to enable an increased understanding as to whether proposed transfers and diffusions are realistic, given that the administrative context plays such a crucial role in the actual adoption and translation.

Also, there is much attention to the notion of path-dependency or institutionalism when studying changes in flood risk (e.g., Lawrence & Haasnoot, 2017; Potter, 2013b; van Buuren et al., 2016). Our analysis shows that it is helpful to unpack the black box of the institutional context that can explain this policy stability or inertia. By doing so, it becomes possible to be more specific or targeted regarding the question of *which* elements of this context matter and in what way.

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