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Varieties of flood risk governance in Europe: How do countries respond to driving forces and what explains institutional change?

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ABSTRACT

Floods are challenging the resilience of societies all over the world. In many countries there are discussions on diversifying the strategies for flood risk management, which implies some sort of policy change. To understand the possibilities of such change, a thorough understanding of the forces of stability and change of underlying governance arrangements is required. It follows from the path dependency literature that countries which rely strongly on flood infrastructures, as part of flood defense strategies, would be more path dependent. Consequently there is a higher chance to find more incremental change in these countries than in countries that have a more diversified set of strategies. However, comparative and detailed empirical studies that may help scrutinize this assumption are lacking.

To address this knowledge gap, this paper investigates how six European countries (Belgium, England, France, The Netherlands, Poland and Sweden) essentially differ with regard to their governance of flood risks. To analyze stability and change, we focus on how countries are responding to certain societal and ecological driving forces (ecological turn; climate change discourses; European policies; and the increasing prevalence of economic rationalizations) that potentially affect the institutional arrangements for flood risk governance. Taking both the variety of flood risk governance in countries and their responses to driving forces into account, we can clarify the conditions of stability or change of flood risk governance arrangements more generally. The analysis shows that the national-level impact of driving forces is strongly influenced by the flood risk governance arrangements in the six countries. Path dependencies are indeed visible in countries with high investments in flood infrastructure accompanied by strongly institutionalized governance arrangements (Poland, the Netherlands) but not only there. Also more diversified countries that are less dependent on flood infrastructure and flood defense only (England) show path dependencies and mostly incremental change. More substantial changes are visible in countries that show moderate diversification of strategies (Belgium, France) or countries that 'have no strong path yet' in comprehensive flood risk governance (Sweden). This suggests that policy change can be expected when there is both the internal need and will to change and a barrage of (external) driving forces pushing for change.

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1. Introduction

"Failed flood defenses cast doubt on UK readiness for new weather era" reported the Guardian at the end of December 2015. England was struck again by flood events and thousands of people had to be evacuated (The Guardian, 2015). These events were framed as 'unprecedented flood crises'. Next to the exceptional

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circumstances, the discussion also concerned the reduced governmental budgets for addressing flood risks over the past years and the need for another, more comprehensive approach. This was followed by a desperate call to finally take phrases like adaptation and climate change seriously. At the same time, in October 2015, violent storms and flooding hit southern France and 20 people died (BBC, 2015). These events are in line with the increasing number of studies pointing out that flood risk is increasing, due to climate change projections and increasing development in flood-prone areas (Alfieri et al., 2015; Jongman et al., 2012; Kundzewicz et al., 2010; Winsemius et al., 2015).

The governance of flood risks is greatly challenged by both global environmental and socio-economic changes. Flood risks are also increasingly part of the global and European (environmental) agendas, with European Directives trying to stimulate flood risk awareness and preparedness for the consequences of climate change, e.g. the Floods Directive (Directive 2007/60/EC). Although climatic and supranational triggers affect all countries, the regional consequences vary and responses are very different in terms of the governance of flood risks. Flood risk governance encompasses the arrangements of actors, discourses, rules and resources through which flood risk management strategies are delivered and put into practice (Hegger et al., 2014). These arrangements involve divergent policy domains dealing with flood risks, including water management, spatial planning and disaster management. Some countries put full responsibility on the shoulders of government (The Netherlands), while others trust on community, societal resilience and insurance markets (Engeland) (Meijerink and Dicke, 2008; Wiering et al., 2015).

In the literature on resilience, there is often a call for a variety of governance approaches leading, in the case of flood risks, to a diversification of management strategies in order to create resilient societies (e.g. Folke, 2006; Olsson et al., 2004; Pahl-Wostl, 2009; see also Bakker and Morinville, 2013). The term resilience can be understood in various ways, as resistance of systems (Holling, 1996), as the capacity to absorb disturbances and learn from them (Walker et al., 2004), or as the adaptive and transformative capacity of societies (Folke et al., 2010). In the above literature on variety, resilience is mostly seen as the adaptivity and flexibility of societies. Several authors argue that diversification of strategies indeed creates resilience (e.g. Aerts et al., 2008). Hegger et al. (2016) show that diversification may lead to a more holistic approach to flood management, provided that actors related to different strategies collaborate and exchange information.

If it is deemed necessary to change flood risk strategies and institutional arrangements in light of climate change or socio-economic developments, we need more detailed knowledge of the *conditions* in which policy change is possible at all. Is it feasible to think of diversification in a realm of both stabilizing (e.g. path dependency) and changing forces that influence flood risk governance arrangements? Can we change these arrangements (with consequences for the roles of state, market and civil society) easily? And what role do specific societal driving forces play in this? To understand the possibilities of such change, a thorough understanding of the forces of stability and change of underlying governance arrangements is required. It follows from the path dependency literature that countries which rely strongly on flood infrastructures, as part of flood defense strategies, would be more path dependent (Mahoney, 2000; Pierson, 2000; Torfing, 2009). Consequently there is a higher chance to find more incremental change in these countries than in countries that have a more diversified set of strategies.

While there is a large literature attempting to explain stability and change in flood risk governance in single cases or under single driving forces, there is still a knowledge gap regarding systematic empirical insights in the key factors explaining overall stability and change in flood risk governance. For one, empirical studies that do attempt to make explanations are fragmented in what they try to explain: the role of public and private parties in Flood Risk Management (FRM) (Mees et al., 2014); different flood management approaches (Lange and Garrelts, 2007); stakeholder engagement and cooperation in FRM (Geaves and Penning-Rowsell, 2016; Greiving et al., 2012), amongst others. Studies that actually focus on the reasons why countries have adopted a certain portfolio of FRM measures are even more rare. Bubeck et al.'s (2015) study is one of the rare studies focusing on complete flood risk management portfolios (or in their terms: the flood risk management system, a term which was not explicitly defined) and making the effort to explain differences between the USA, Germany, The Netherlands and The UK in the overarching approaches to FRM. With others (Bubeck et al., 2015; Meijerink, 2005) we consider it worthwhile to further contribute to efforts to arrive at such integrated analyses and explanations of stability and change in FRM.

To address the observed knowledge gap of a lack of systematic comparative studies of flood risk governance, we try to answer the following questions: 1) how do countries essentially differ in their approaches to flood risk governance; 2) how do countries respond to specific driving forces that affect FRG more generally; 3) what explains, taken the answers to these two questions into consideration, the stability or change of these flood risk governance arrangements (FRGAs)? These questions will be answered on the basis of an intensive research project, named STAR-FLOOD, in which six European countries were investigated. Our work is the first to give a comprehensive and conceptually integrated overview of both the varieties of flood risk governance and the influence of a series of external and internal forces on policy change in six countries.

We will first explain our methods (Section 2) and conceptual model (Section 3), drawing on policy analysis and theories of institutional change. We will distinguish between *country characteristics* that provide a background of initial policy choices made in countries (Section 4) and *driving forces* that push or pull institutional configurations. We make an important analytical distinction between flood risk governance *arrangements* as the institutional configurations designed to tackle flood risk problems and the flood risk management *strategies* (FRMSs) as practical outcomes of those arrangements. We follow the concept of the safety chain in risk literature to define the core flood risk strategies (prevention as in pro-active planning, flood defense, preparation, mitigation and recovery). Section 5 brings these core factors together in order to explain stability and change in FRGAs. Section 6 concludes this paper and reflects on our approach.

2. Research approach and methods

The empirical data used in this paper have been collected within the four-year research project STAR-FLOOD, funded by the European Commission (www.starflood.eu). Within this project, more than 40 policy analysts and legal scholars from Belgium, England, France, The Netherlands, Poland and Sweden conducted empirical analyses and evaluations of FRG in their country. Our core unit of analysis was the (overarching) national *flood risk governance arrangement*, which we researched empirically by combining findings from an analysis at national level with findings at the level of three local case studies per country. Both the six countries and the eighteen case studies have been selected out of the overall ambition of the STAR-FLOOD project to understand, explain and evaluate the processes of diversification of flood risk management strategies. We looked for variety in terms of the countries' physical circumstances and administrative structures

(the role of state, market and civil society) and we looked for countries and case studies for which there was preliminary evidence that efforts at such a diversification of strategies were actually ongoing (although in some case studies we found that diversification in practice was lacking). To select the three case studies in each country, we carefully looked for examples that would illustrate, on the ground, how the national flood risk governance system works in practice. More information can be found in Hegger et al. (2016).

Data collection methods applied in all countries comprised of a) desk research b) interviews with key informants and c) national and international workshops. The desk research concerned parliamentary acts, case law, codes of practice, policy documents, reports and scientific literature. With the significant involvement of legal scholars in the research teams, documents were sampled purposively with the intention to collect information on flood risk governance systems and their institutional evolution in the six analyzed countries.

Regarding the interviews, 313 semi-structured interviews, purposively sampled, were realized in total. The interviewees were key informants on the flood risk management systems in their countries: scientific experts, policymakers, consultants and practitioners from both national and (case study-related) local level governance (Table 1).

Results of the studies in each country were also discussed with stakeholders and experts at one to three national workshops per country. In order to discuss and validate the comparative conclusions of the study, four international workshops were also held in different parts of Europe, engaging a wide range of researchers, practitioners, stakeholders, and policy and decision makers from around the continent.

These efforts resulted in six publicly available country reports with detailed analyses (Alexander et al., 2016; Ek et al., 2016; Kaufmann et al., 2016a; Larrue et al., 2016; Matczak et al., 2016a; Mees et al., 2016a) that form the core of our empirical research data – and a comparative report (Matczak et al., 2016b) that laid the groundwork for this article. The conceptual framework that was developed in the comparative report has been improved and adjusted, and is now published for the first time in the present article.

In order to keep the data collection biases (related to different academic backgrounds of researchers as well as to domestic biases of academic scholars and policy makers) to a minimum, the national research teams, frequently discussed and reviewed each other's work, internally and in cross-country comparisons. Moreover, to enable overview and comparison an *analytical matrix* was designed to synthetize the rich descriptions of the country reports into a single comparable Excel-based format (this matrix is available on request to the lead author). The matrix was completed by the country teams and validated by an independent researcher using the country reports as input.

Table 1
Data collection: number of interviews per country.

Country	Number of interviews
Belgium	70
England	61
France	64
The Netherlands	45
Poland	54
Sweden	19

3. Theory

The countries in our comparison differ quite substantially from one another in terms of physical conditions, actual flood experience, their point of departure in terms of the strategies and arrangements in place, and their economic, social, administrative and legal context (Hegger et al., 2016). The main conceptual steps in our research are shown in Fig. 1 below.

As Fig. 1 shows, when explaining stability and change of FRG we take a stepwise approach. From left to right, we first see (1) general *country characteristics* that explain initial choices of FRG in countries and are still important to explain contemporary dynamics of FRG. Then, we consider the selection of (2) *driving forces* as 'pushing or pulling' the institutions of the FRGA with its sub-arrangements (sub-FRGAs). Both the country characteristics and driving forces affect features of (3) the FRG *arrangement* in a country (either stabilizing or changing sub-arrangements) and may, in a next step, influence (4) the *order* or *importance* of *strategies* (FRMSs). This last category (strategies) is considered the visible, final outcome of arrangements in terms of the implementation of flood risk measures in practice (dams, dikes, land use plans, evacuation strategies, insurance systems, etc.). Whether a driving force (2) leads to real changes in flood risk strategies (4) depends on the changes in FRGAs, which next to general country characteristics are also influenced by both *internal stabilizing and change factors* (5 and 6). The FRGA with its sub-arrangements (3) is therefore the variable under scrutiny, and can be seen as an *intermediary variable* mediating the influence of driving forces (2) on final outcomes in terms of strategies (4). Each of these four categories of variables will now be discussed in turn, in reverse order.

3.1. Dependent variable: flood risk management strategies

The visible 'on the ground' implementation of Flood Risk Management Strategies (FRMSs), including the relative *importance* of specific strategies in a country, is seen as the dependent or outcome variable. Literature presents various categorizations of FRMSs (Djordjevic et al., 2011; Hegger et al., 2014; Klijn et al., 2009; Oosterberg et al., 2005). A comprehensive categorization is the one developed by Hegger et al. (2014) who distinguish between flood risk prevention through pro-active spatial planning and flood defense (both focused on reducing the *probability* of flooding in urban areas) and flood mitigation, flood preparation and flood recovery (all three focused on reducing the *consequences* of floods) (see Fig. 2). A number of FRM measures can be grouped into these strategies. The main focus will be on the possibilities to diversify these strategies and the change in dominance of specific strategies. We assume our outcome variable to be directly caused by features of and dynamics in governance arrangements, which will be our intermediary variable in this study.

3.2. Intermediary variable: arrangements and sub-arrangements

Flood Risk Governance Arrangements (FRGAs) can be defined as "institutional constellations resulting from an interplay between actors and actor coalitions involved in all policy domains relevant for flood risk management – including water management, spatial planning and disaster management; their dominant discourses; formal and informal rules of the game; and the power and resource base of the actors involved" (Hegger et al., 2014, p. 4131). This definition is inspired by the Policy Arrangements Approach (PAA) which studies the development of policy subsystems or domains in four dimensions (actors and coalitions, discourses, rules of the game and resources). By studying these dimensions over time, the degree of stability or change in these arrangements can be

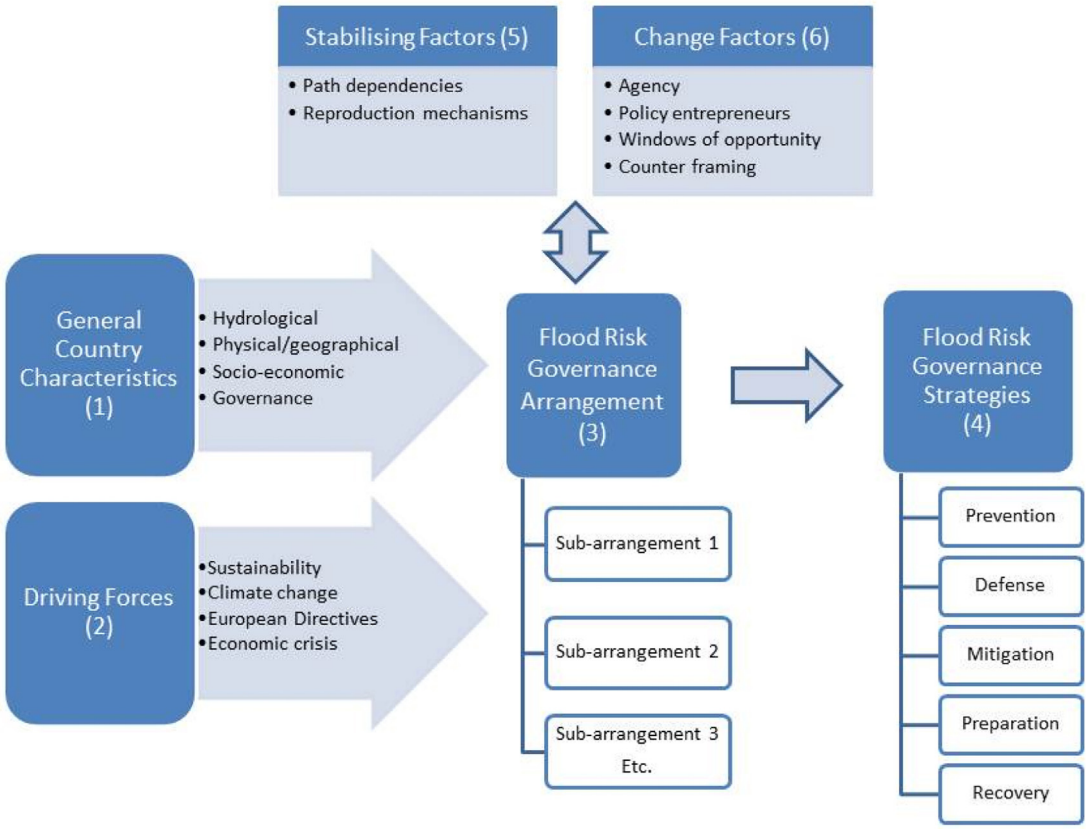

Fig. 1. Conceptual framework (adapted from Matczak et al., 2016b).

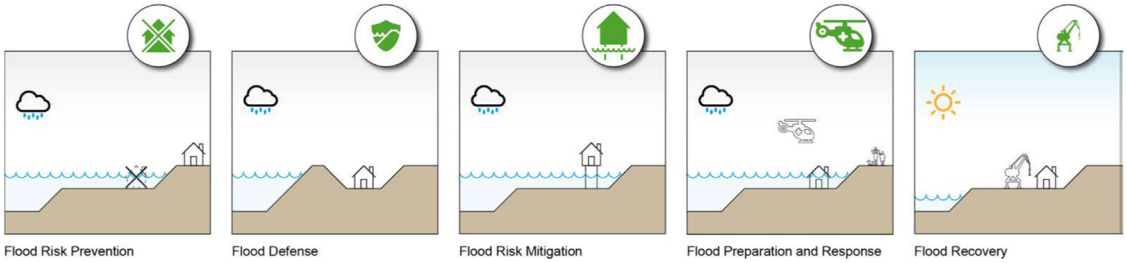

Fig. 2. The five core flood risk strategies (adapted from Raadgever et al., 2016).

analyzed (Arts and Van Tatenhove, 2006; Van Tatenhove and Leroy, 2000; Wiering and Arts, 2006). As detailed elsewhere (e.g. Hegger et al., 2014), the PAA can be used to give both a comprehensive and quite detailed account of changes in FRG or policies, by systematically looking at stability and change of the four dimensions of arrangements.

However, often there is not one coherent and overarching governance arrangement to be found in flood risk management, but many different and sometimes fragmented institutional constellations. In these cases, we speak of sub-FRGAs with their own actors, discourses, rules and resources, for instance related to water (sector) management, spatial planning and disaster management, which are to some extent separated from each other (Hegger et al., 2016). As will be further explored in section 5.1, specific sub-FRGAs may dominate others, and fragmentation between sub-FRGAs may lead to specific multi-sector, multi-level and multi-actor governance challenges and responses.

3.3. Internal forces of stability and change

Next to the Policy Arrangement Approach, public policy scholars have produced other comprehensive theories and models for explaining stability and change in public policies (Capano, 2009; Capano and Howlett, 2009; Howlett and Cashore, 2009; Kingdon, 1984; Ostrom, 2007; Sabatier and Jenkins-Smith, 1993; Zahariadis, 2007). Most of these analytical frameworks distinguish between policy-internal factors (often called "factors inside a policy sub-system") versus external factors (Sabatier and Jenkins-Smith, 1993; Sabatier and Weible, 2014; Zahariadis, 2007). We have included this notion in our conceptual framework (Fig. 1).

Remarkably, the policy analysis literature often focuses on either stability or change. We identified internal forces that predominantly seem to contribute to stability in FRGAs and those that seem to contribute mostly to change. These have been identified in a combined deductive-inductive process. Insights

from literature on public policy change were combined with insights from topical studies that attempt to explain changes in FRG portfolios (e.g. Bubeck et al., 2015; Huitema et al., 2011; Nye et al., 2011). Factors addressed in literature include the influence of climate change; pressures to integrate FRM in sustainable development agendas and a broader trend towards a civic model in environmental policy making and delivery (Nye et al., 2011), and geographical boundary conditions and the occurrence of disasters (Bubeck et al., 2015). While geographical boundary conditions may straightforwardly explain intra-country differences in the degree of structural flood protection present, they can less straightforwardly explain inter-country differences (ibid). Disasters were also found to have different effects in different countries. Depending on differences in governance dynamics different directions for change were taken – with more focus on flood defense in the Netherlands, but more focus on non-structural measures in e.g. UK and Germany.

Stability is reinforced by path dependency, the tendency of "preceding steps in a particular direction [to] induce further movement in the same direction" (Pierson, 2000, p. 252). Originating in the field of economics and focusing on competing markets and technologies (Arthur, 1988, 1994; North, 1990), the notion that institutional developments can be characterized by strong self-reinforcing mechanisms has also been accepted by scholars in policy and political sciences (Mahoney, 2000; Pierson, 2000; Torfing, 2009). In line with North's (1990) characterization, who refers to Arthur (1988), important reproduction mechanisms relevant for flood risks are (i) the presence of fixed costs and increasing returns of existing (flood) infrastructures, which make reinforcement of existing infrastructures increasingly more efficient compared to other alternatives; (ii) learning effects, which result both in the possibility for specific epistemic communities to achieve dominance, and in a less favorable position of new options on the learning curve; (iii) development of highly institutionalized and often legally embedded divisions of responsibilities between actors and entrenched ways of working; (iv) expectations of the public for institutional actors to keep delivering the same type of FRG measures (public discourses). It follows from path dependency literature that countries which rely strongly on flood infrastructures, as part of flood defense strategies, would be more path dependent and show more incremental change than countries that have a diversified set of strategies. This assumption will be further explored in the empirical sections of this paper.

When it comes to factors inside the FRGA that may contribute to change, both water management literature (Brouwer and Biermann, 2011; Hegger et al., 2014; Huitema et al., 2011) as well as public policy change literature (Caldwell, 2003; Kingdon, 1984; True et al., 2007) suggest a crucial role for agency, in particular policy entrepreneurs and advocacy or discourse coalitions. A dominant message to be derived from various frameworks and theories in the policy sciences is that the margins for change agency are generally small, but that the actions of knowledgeable and capable agents are crucial for bringing together problem (framings) and solutions (e.g., Kingdon, 1984; Zahariadis, 2007).

3.4. External forces that contribute to stability and change

Important country characteristics are its *physical settings*, which have been shown to be a crucial explanatory factor for flood risks and for explaining the FRMSs that are applied (Bubeck et al., 2015). Next to this, the *economic situation* (GDP), the *specific history* and the associated dominant *governance styles* (e.g. consensus-based versus more authoritarian) and legal systems (Van Rijswick and Havekes, 2012) are considered important. Although we do not problematize these background factors here, we acknowledge that country characteristics have a significant influence on the general availability of resources, and on dominant governance styles in which flood risk management is embedded (Juuti and Katko, 2005). It is within these general country characteristics that specific driving forces/exogenous factors of importance for FRG play out.

Finally, we selected four societal and political challenges (*driving forces*) that flood risk management in Europe faces, zooming in on: (a) the ecological turn, which emerged in the 1970s as a response to environmental degradation and criticized technical flood risk management approaches (b) climate change as a global phenomenon, which is projected to increase the probability of flooding in certain areas, but is also connected to increased uncertainty (c) the EU Floods Directive (2007), which is being implemented by all the studied countries; and (d) an increased consideration for economic rationalizations reinforced by the financial crisis at the beginning of the 21st century. The ecological turn is discussed along with the Water Framework Directive (WFD), which is seen as a manifestation of this discourse. These so-called *driving forces* were identified both deductively, on the basis of relevant literature on comparisons of flood risk

Table 2
Flood risks, population density, governance and economic characteristics of the investigated countries (Source: Eurostat, 2015a, 2015b, 2015c).

Country	Flood risks	Inhabitants /km^2 (2014)	Governance characteristics	Average disposable household income (€, 2014)	GDP per capita (€, 2014)
England (UK)[a]	Vulnerable to coastal, fluvial and pluvial flooding, leading to serious material damage	413 (2013)	Liberal-pluralist, decentralization process, fragmented	20,584 (UK)	30,400 (UK)
Belgium	Minor fluvial and pluvial flooding on a regular basis, causing material damage	370	Strong public sector, federal structure, fragmented	21,705	33,800
France	Vulnerable to coastal, pluvial and fluvial flooding, leading to casualties and material damage	104	Strong public sector, strong tradition of centralization	21,199	31,100
Netherlands	High potential risk of flooding, 26% of land below sea level	500	Strong public sector, polder model	20,891	37,900
Poland	Vulnerable to coastal, pluvial and fluvial flooding, leading to casualties and material damage.	124	Strong public sector, transition from communism to market-based democracy	5,336	10,500
Sweden	Relatively low flood risks, but increasing pluvial flood risks as result of climate change. Potential of flooding caused by dam failure	24	Strong public sector, decentralized FRG	27,120	40,300

[a] Figures at country level are included for England's (UK) economic characteristics to enable the use of datasets with the same methodology.

management, and inductively during the extensive research in STAR-FLOOD (Alfieri et al., 2015; Bubeck et al., 2015; Kettl, 2000; Matczak et al., 2016a, p. 69; Osborne and Gaebler, 1992; Winsemius et al., 2015). This list of driving forces is, however, not meant to be exhaustive.

Wrapping up, in this paper we will focus on the influence of country characteristics and driving forces (independent variables) on governance arrangements (intermediary variable), – with consequences for the risk approach in terms of diversification (or not) of flood risk management strategies (dependent variable).

4. Country characteristics

The investigated countries differ significantly from one another in terms of hydro-physical setting, governance and economic characteristics. Table 2 below provides a broad overview.

All of the countries are susceptible to flooding but they display a different flood risk profile. In the UK, France and Poland, severe flooding has taken place in recent years which led to serious material damage and casualties (e.g. Poland in 2010, England in 2013/14 and 2015, France in 2015). The largest potential flood hazard, however, exists in the Netherlands, with 26% of its land below sea level. In Belgium, flood damage is relatively low but minor flooding happens frequently. Major differences exist in population densities, with the Netherlands, England and Belgium as the most densely populated countries in our selection. Together with changes caused by climate change, urbanization trends also increase flood risks (Kundzewicz et al., 2010).

In many countries, FRG is a policy domain which relies heavily on public spending and is thus state-oriented (Geaves and Penning-Rowsell, 2016; Meijerink and Dicke, 2008). Each of these countries, however, has specific general governance characteristics which influence FRG. England is a typical example of the liberal-pluralist society. Its authorities rely preferably on governance arrangements including market parties and communities themselves (Van Waarden, 1995). In the other countries, generally a more dominant role is attributed to the state. Divergent characteristics can also be noted when it comes to multi-level governance. Belgium is a federal country, with strong regional governments and high levels of fragmentation. France and Poland are strongly centralized, whereas England underwent a significant decentralization process and has a fragmented governance structure. Sweden and the Netherlands have a decentralized structure, although in the latter country the central government plays a crucial role in FRG as well. Poland's governance structure has been in transition towards a market-based democracy since 1989.

Finally, differences can be found in terms of economic development. GDP per capita and average disposable household income have been selected as indicators of economic welfare. The first gives an indication of the public spending power in the country, and the second of individual economic capacity. Poland's economic capacity is rated considerably lower than the other countries in our research, although its income levels and GDP have been rising significantly (Eurostat, 2015a, 2015b).

5. Results

This section will answer the three research questions by first presenting the varieties of FRG in six countries, then discussing the responses to driving forces, and finally connecting the two questions and reflecting on stability and change. The main focus of this analysis is on the *arrangements* underlying the policy choices that are rendered visible in strategies (FRMSs). For the sake of this comparison we adopt a 'bird's eye view' on features of and developments in these countries.

5.1. Varieties of arrangements

Table 3 below provides an overview of arrangement characteristics in the six countries. It presents a very condensed summary of the detailed country reports (Alexander et al., 2016; Ek et al., 2016; Kaufmann et al., 2016a; Larrue et al., 2016; Matczak et al., 2016a; Mees et al., 2016a) and is included in the comparative report (Matczak et al., 2016b). In the Appendix we provide an overview of all FRGAs.

Table 3 outlines a typology of FRGAs, characterized by a tension between dominance of certain sub-arrangements, sector policies, public actors and central levels (The Netherlands, Poland, France) *versus* diversification of sub arrangements, multiple sectors, involvement of public and private actors and an important role for the local level (Belgium, England, Sweden).

5.1.1. Diversification and dominance of sub-FRGA

Analyzing the balance of a FRGA, and dominance of sub-arrangements within a FRGA, gives a direct view of what policy choices have been made in a country and what policies are prioritized. Dominant sub-arrangements show a high degree of institutionalization (e.g. legal standards) and prioritization. A balanced FRGA, on the other hand, reflects an evenly spread institutionalization of sub-arrangements wherein no single one has priority over the others, and which can 'produce' a variety of FRMSs as an outcome.

England and the Netherlands differ significantly. In comparison to the other five countries, FRM in England is characterized by a relatively (analytically) balanced arrangement with eight more or less evenly prioritized and institutionalized sub-arrangements

Table 3
Approaches to flood risks and governance in six countries (adapted from Matczak et al., 2016b).

Characteristics of (sub-)FRGAs	The Netherlands	Poland	France	Belgium	England	Sweden
Diversification & Dominance	Low diversification, *defense* dominant	Low diversification, *defense* dominant	Moderately diversified, *prevention* dominant but defense still important	Moderately diversified, *defense* still important	Highly diversified, quite balanced	No specific FRGA, focus on *preparation* and *recovery*
Multi-Sector	Water sector dominant	Water sector dominant	Water sector and spatial planning equally important	Water sector and spatial planning gaining equal importance; water sector still important	Multi-sector involvement & integrated by spatial planning	Multi-sector involvement, but not integrated
Multi-Actor	Public (state dominant)	Public (state dominant)	Public (state dominant)	Public (state dominant)	Public & private	Public & private
Multi-Level	Both central and regional level (water boards)	Central, towards the regional level	Central, towards decentralization	Decentralized, tendency towards centralization	Central and local level	Decentralized, local level

(Alexander et al., 2016). In the Netherlands, on the other hand, the sub-arrangement for 'water system management' (e.g. the Delta Programme) dominates all others in all four dimensions and at both national and regional levels of governance. We can consider this a relatively unbalanced arrangement.

The other countries represent in-between positions (Table 3). The FRGA of Poland is also rather unbalanced, with the historically developed sub-arrangement for defense having much more influence on FRG than the new emergency management arrangement (Matczak et al., 2016a). This is reflected in general Polish policy, which is mainly based on defense infrastructures, centralized public actors, general tax incomes and strong public law. Compared to the Netherlands and Poland, the French FRGA is more balanced. However, the sub-arrangement for prevention is most strongly prioritized and institutionalized (e.g. flood risk prevention through spatial planning), as it is based on central authorities with strong legal powers that are legitimized by stable and widely accepted discourses on public management. The Belgium FRGA is somewhat closer to the English one, being relatively balanced between prevention, defense, mitigation (e.g. Decree on Integrated Water Policy, Plan PLUIES) and, to a lesser extent, recovery measures. Compared to the other strategies, flood preparation appears to be less strongly developed. Whereas these countries are characterized by distinguishable FRGAs, this is not the case in Sweden. Swedish FRM is characterized by the integration of FRM concerns in other policy domains. However, emphasis seems to be on the preparation and recovery strategies.

5.1.2. Links between policy sectors (multi-sector governance)

Depending on the administrative traditions and local conditions in particular countries we can identify FRG as a separate, relatively independent sector-based policy (e.g. water management or natural disaster management) or as part of (various) other policy domains. In the Netherlands, the flood issue constitutes a specific water policy sector together with other water management issues. The water system sub-arrangement generally covers most of the important FRMSs. In The Netherlands there is a discourse of integrated water management, trying to combine flood risk measures with improving ecological quality (via the WFD), though flood risk management is also an independent and strong public interest in the Netherlands.

In France, the organizational setting is different as floods are part of natural disaster management as an integrated policy on its own. The Flood Risk Prevention Plan (PPRI) is dedicated to flooding, while the Natural Disaster Compensation Scheme ("CAT-NAT" system) covers the management of natural disasters as a whole. Defense measures are related to water management, but flood warning and forecasting are independent from the other policy fields. The only sub-arrangement which is not fully part of the flood policy domain is crisis management, which is embedded in civil security policy.

Poland, Belgium and England have sub-arrangements that are partially related to flood policy domains but also to other policy fields. Poland has a specific policy domain dedicated to floods, but ever since the major flood events of 1997 and 2010 flood management policy has been influenced by crisis management, a multi-hazard policy. In Belgium, the relevant federal policies do not only address flood risks but also other societal risks. The three regional sub-arrangements, on the other hand, are focused on water issues (Mees et al., 2016a). England can be located somewhere in between Poland and Belgium: it has a distinct FRG policy domain, but with many overlaps with climate change, civil contingencies and water management policies. The Swedish case is distinct, as the flood policy domain as such does not exist. Instead, flooding remains entirely related to other policy fields, e.g. policies on the environment or hydroelectric power.

5.1.3. Links between actors (multi-actor governance)

The role of public and private actors in FRG can vary between countries. In the Netherlands, a country strongly relying on governmental responsibilities for FRG, no important shift took place with regard to increasing responsibilities of private actors, except for urban flooding, where pluvial nuisance was always partly a private responsibility (Kaufmann et al., 2016a). The dominance of a single governance arrangement seems to limit the scope of other actors. Similarly, in Poland the sub-arrangement for defense is clearly dominated by public water engineers, and no shifts towards multi-actor governance can be witnessed.

French FRG is characterized by the dominance of the sub-arrangement for prevention, with an important role for preventative spatial planning tools (PPRI). Public actors related to this arrangement tend to dominate. However, this arrangement is closely linked to the recovery arrangement, and also to some extent to the sub-arrangement for flood defense (Larrue et al., 2016). Because of the links between these three, the dominance of a sub-arrangement (prevention) does not necessarily mean the dominance of the policy actors of this sub-arrangement. For example, insurers (recovery arrangement) show substantial interaction with actors from the prevention arrangement; we thus see involvement of both public and private actors.

In the English case, where there is a variety of sub-arrangements dealing with flood risks, this diversity largely reflects the piecemeal nature of its development with specific roles for state actors on different levels, the private insurance market, and self-help through communities. Nonetheless, there are still some dominant actors involved in multiple sub-arrangements. The involvement of the same actors (e.g. the Environment Agency) in several sub-FRGAs results in a mode of governance where sub-arrangements are closely interlinked. In Sweden, private actors (e.g. landowners and hydro-power companies) are involved alongside public actors.

Although public actors are dominant in all the analyzed countries, the role of private actors and public-private partnerships is increasing. In all these countries property owners are important actors, legally required to use their property in a way that does not increase the risk of flooding of a neighboring property. In England, France and Sweden, developers hold a relatively strong position and local planning is largely adapted to market demands (e.g. Ek et al., 2016). In addition, several public-private partnerships have been identified for financing defense or mitigation projects, such as first experiences with 'Partnership Funding' within the Lower Thames (Alexander et al., 2016).

However, important differences can be observed between the investigated countries in terms of private flood risk responsibilities. While flood protection is a specific governmental competence by law in the Netherlands and Poland, this is not the case in England, France and Belgium. In these countries, governmental flood risk responsibilities are not legally defined and policymakers increasingly stress that citizens should share this responsibility. Particularly in England, this has led to the emergence of new governance structures whereby citizens are actively involved (see Mees et al., 2016b).

5.1.4. Links between levels of governance (multi-level governance)

Centralization of flood risk arrangements differs among countries. We can observe that in countries where one sub-arrangement is dominant (with predominantly public actors in charge of water or risk management), a rather centralized and state-centered approach is present. These sub-FRGAs can be focused on flood defense (Netherlands, Poland) or flood prevention (France), with ties to other strategies.

In countries that have a balanced set of sub-FRGAs, the powers of FRG actors tend to be distributed at multiple levels, in particular

at the local level. In England, Sweden and Belgium, although central actors play a significant supervisory role, the importance of decentralized authorities is significant: FRG becomes a multi-level governance game.

5.2. Responses to driving forces

In the previous section, we described how FRGAs differ between countries. We now turn to the influence of driving forces on the FRGAs. As we have stated in section 2, these driving forces are present in all the studied countries, yet the reactions to these forces differ greatly: some trigger change in one country and stability in another. In this section, we discuss how country-specific internal stabilizing and change factors led to different implications of the observed driving forces for the FRGAs. For each driving force, we structure the analysis by discussing its impact on both the general risk approach, i.e. if we see an increase in diversification of strategies or not, and on the governance approach, i.e. if we see shifts in multi-actor, multi-sector and multi-level governance. Table 4 gives an overview of the observed dynamics per driving force and country.

5.2.1. Ecological turn and the Water Framework Directive

Since the beginning of the 1990s, nature conservation and sustainability discourses have been a force of change in all six countries (Warner et al., 2013), though to varying degrees. This driving force, which we refer to as the 'ecological turn' (Disco, 2002), tends to stimulate diversification in risk approaches by emphasizing the detrimental environmental effects of structural defense works and promoting a more comprehensive, ecosystem-based approach (sometimes as part of a larger societal discussion on sustainability). In Poland the impact of this driving force was limited (Matczak et al., 2016a), whereas in England, France, the Netherlands and Sweden modest change can be observed (Alexander et al., 2016; Ek et al., 2016; Kaufmann et al., 2016a; Larrue et al., 2016), while especially in Belgium sustainability and nature-based discourses played a major role in triggering diversification in risk strategies by fostered a joint consideration of both water quality and quantity (Mees et al., 2016a).

Regarding governance approaches, this change mostly manifests itself in a multi-sector shift: discourses on nature-based approaches to FRG tend to stimulate the inclusion of new sectors in the flood domain, including spatial planning, nature conservation and rural policies. These policy sectors are in most countries characterized by a more regional/local management level, meaning we also see a shift in multi-level governance. Environmental NGOs are important actors in nature conservation especially, and as such we witness a multi-actor shift as well.

What is especially notable regarding this driving force is the crucial role of agency and policy entrepreneurs in mobilizing it to inspire change in established structural approaches. In all six countries we witnessed a sustainability or environmental coalition acting strategically to promote concepts like integrated water resource management (IWRM). These change agents arose from different sectors of society, with nature-oriented NGOs and academics often of significant importance. Their success, however, seems to depend partly on the room for maneuver within the existing FRGA.

5.2.2. The impact of climate change

Increasingly, discourses on integrated or environmentally sustainable water management have been complemented by the emerging need for climate change (CC) adaptation. In five of the six STAR-FLOOD countries, discussions on CC show a fairly modest impact on risk approaches. In France and the Netherlands, the CC discourse stabilizes the existing arrangement, with its emphasis on prevention and defense respectively (Kaufmann et al., 2016a, 2016b; Larrue et al., 2016). For example, in the Netherlands, the Delta Committee, which was established to identify responses to CC, re-strengthened the focus on defense infrastructure by proclaiming that "The present flood protection levels of all diked areas must be raised by a factor of 10" (Delta Committee, 2008, p. 12). In Poland, the influence of CC is limited, both because CC projections are considered uncertain for Poland and because of lacking political and social support for policy changes (Matczak et al., 2016a). In England, flood risk is now more strongly embedded within a CC adaptation discourse through the 2008 Climate Change Act, and CC influences broader discussions on the financial sustainability and cost-efficiency of current FRG, yet the risk approach did not fundamentally alter (Alexander et al., 2016). Due to projected rising sea levels and other climatic changes, structural defenses alone are less likely to maintain a safe urban environment, leading to greater financial losses or requiring ever increasing investments in defense infrastructure. Especially in Belgium this has led to increased attention to cost-benefit concerns and the need to diversify flood risk strategies (Mees et al., 2016a).

An exception to the above pattern is Sweden. In this country CC has played a pivotal role in several (discussions on) shifts in governance. Specifically, the final report of the Swedish Commission on Climate and Vulnerability, which was initiated largely as a response to the IPCC's Fourth Assessment Report, placed the previously local issue of flood risk on the national policy agenda,

Table 4
Impact of driving forces per country.

	Impact on risk approach/ Governance	Netherlands	Poland	Belgium	France	England	Sweden
Ecological turn (WFD)	*Risk approach*	Moderate change	Minor change	Major change	Moderate change	Moderate change	Moderate change
	Governance	Multi-sector Multi-level	Multi-actor	Multi-sector	Multi-sector Multi-level	Multi-actor	Multi-sector
Climate change	*Risk approach*	Stabilizing	Limited influence	Moderate change	Stabilizing	Limited influence	Moderate change
	Governance	Stabilizing	Limited influence	Multi-sector	Stabilizing	Limited influence	Multi-level
EU Floods Directive	*Risk approach*	Limited influence	Moderate change	Moderate change	Stabilizing	Limited influence	Moderate change
	Governance	Limited influence	Multi-sector	Multi-sector	Multi-level	Limited influence	Multi-level
Economic rationalization	*Risk approach*	Stabilizing	Stabilizing	Moderate change	Moderate change	Limited influence	Stabilizing
	Governance	Stabilizing	Stabilizing	Multi-level, Multi-sector	Multi-level	Limited influence	Limited influence

stimulating its consideration in other sectors (Ek et al., 2016). One country characteristic of significance here is that, in contrast to the other investigated countries, Sweden currently faces a low risk of flooding. Hence, CC has become the main driving force for initiating a debate on FRG at the national level.

5.2.3. The impact of the EU Floods Directive

As required by the Floods Directive (FD), the six countries examined have all developed flood risk maps, flood hazard maps and flood risk management plans. The latter contain structural measures, spatial planning regulations or emergency management measures. In this sense, the directive contributed to diversification in flood risk approaches. But these initiatives remain to a large extent limited to formal procedures. Whether the FD also led to substantial changes appears to be dependent on existing developments in the country at the time of its introduction. In countries where a broadening of strategies would ask for a governance shift regarding responsibilities and organizational structure, path dependency mechanisms within the FRGA tend to form a barrier for substantial change. Recurring stabilizing factors are fixed costs and increasing returns of flood defense infrastructure, strong epistemic communities (e.g. in France and the Netherlands engineering cooperation and research institutes a closely linked to the state), formally or informally institutionalized divisions of responsibilities, and expectations from the public for governmental authorities to deliver safety through structural measures (e.g. in the Netherlands a national official stated that "People in the Netherlands are sure that the dikes will offer sufficient protection" (Kaufmann et al., 2016a, page 47).

The impact of the FD appears particularly limited in England and the Netherlands, whereas in other countries it led to a certain amount of change. These different reactions can be explained with varieties in the stabilizing and changing factors within the respective FRGAs. The FRGA in England is comparatively diversified and central government is not statutory responsible for FRM (see Section 5.1), leaving more room for joint efforts between central and decentral public and private actors. Hence, the FD did not require significant shifts (Alexander et al., 2016). Conversely, in the Netherlands, the flood defense approach is highly developed and institutionalized, i.e. statutory responsibility of the state, water-specific governmental bodies, and binding legal safety standards for embankments. This approach results from the country's high flood vulnerability and its long tradition to 'fight' against the water. As such, the FD could have little impact on the existing FRGA (Kaufmann et al., 2016a).

However, in a number of countries the Directive supported governance shifts and changes in risk approaches through different internal processes. In Poland, a comprehensive FRG was lacking after the administrative reform in 1989/1990. During the preceding communist regime, flood risk was characterized by weak legislation and limited investments. Consequently, the FD initiated a systematic reorganization of flood risk management visible in a new integrated Water Act, strengthening the FRMS of prevention (Matczak et al., 2016a). In Belgium, the FD conjoined with an internally ongoing trend in Belgium towards multi-sector governance, which increased the role of spatial planning in FRG. Projections of climate change, in combination with a high degree of urbanization and shortcomings in spatial planning regulation, led water managers to the conclusion that they cannot handle flood risks on their own. The 3P-discourse (i.e. emphasis on prevention, protection and preparedness) of the FD supported them in these claims (Mees et al., 2016a; Kaufmann et al., 2016b). In France, although state responsibility is formally strengthened by the Directive, it did not hamper the existing trend towards decentralization: its implementation has contributed to supporting and legitimizing the establishment of more local initiatives in line with multi-level governance (Larrue et al., 2016). In Sweden, the Directive increased the coherence of management on the local level under national guidance (Ek et al., 2016).

5.2.4. Economic rationalizations

In nearly all the studied countries, an emerging focus on economic efficiency can be witnessed, with the exception of England, where cost-benefit concerns have long been prominent. This corresponds with England's liberal governance style that regards the task of the government as ensuring the most cost-effective outcome for taxpayers' money (Alexander et al., 2016). In the other countries, the influence of the driving force differs. Whereas in the Netherlands, Poland and Sweden it mainly furthers stability (Ek et al., 2016; Kaufmann et al., 2016a; Matczak et al., 2016a), it tends to be a driver of change in Belgium and France (Larrue et al., 2016; Mees et al., 2016a).

In the Netherlands, Poland and Sweden, the increased acknowledgement of more efficiency tends to contribute to stability of the existing risk approach. In the Netherlands this is due to the fixed costs created by investments in flood defense infrastructure, i.e. embankments. As a result, the strong lobby of water engineers can legitimize further investments in these infrastructures because they are most efficient in terms of cost-benefit analysis. In Poland, the increased consideration for efficiency increased the competition for already scarce financial resources between different governmental actors. Because Poland is still characterized by a rather technocratic and hierarchical governance structure, this prevents innovation and furthers stability. In Sweden, the emphasis on efficiency depends on the local situation. Because flooding used to be a minor issue in Sweden, national political awareness is low. In general, deficiencies in the municipal budget tend to further stability, i.e. prevent investments in new strategies. But due to climate change discourses, flood risk has become more acknowledged and problems arise regarding the financing of its management. As a result, increasing calls for support are made towards the central government, possible leading to a shift towards multi-level governance.

In France and Belgium efficiency tends to align more with change factors. In France, the increased attention paid to efficiency is tied to budget restrictions. It aligns with a trend towards decentralization and facilitates, therefore, a shift towards more multi-level governance, as seen in the strengthened role of local authorities in the cities of Nevers and Le Havre (Larrue et al., 2016). Similarly, in Belgium the increased attention to efficiency facilitated a shift towards more multi-level and multi-sector governance. Here, in contrast to the Netherlands, cost-benefit analyses reveal spatial planning measures as the most efficient. Efficiency arguments are thus used by the Flemish government to justify their aim to broaden flood risk approaches and governance shifts.

5.3. Explaining stability and change

This section links together the insights from sections 5.1 (on varieties of FRGAs) and 5.2 (on driving forces and internal forces for stability and change), in order to identify mechanisms through which external driving forces and characteristics of FRGAs may interact, thus explaining why identical driving forces can have widely differing consequences in different countries.

First, we found that change agents are important factors of change internal to the FRGA, especially when new discourses are identified as, or can be connected to, a driving force. Such discourses could have little effect on the existing FRGA by themselves unless mobilized by coalitions of change agents. For instance, the ecological turn and its discourse of nature-based FRG

would not have had the effect it did had the EU's Water Framework Directive not strengthened the position of policy entrepreneurs exhorting this new flood risk approach, thus facilitating institutionalization of this discourse. Broadening the risk approach this way also provides opportunities for other policy sectors and actors to enter the arrangement, as shown by the multi-sector shifts witnessed to some degree in all countries as a reaction to this driver.

Second, our research revealed that there seems to be a tendency for driving forces to strengthen already ongoing developments within the national FRGA and to interact with each other. Actors use driving forces to legitimize their (latent) agendas in the national FRGA. This is done both by incumbent actors aiming to stabilize the national policy domain, or by newcomers emerging in the flood domain (or frustrated actors in the existing arrangement) that aim to change it. For instance, the ongoing decentralization process in France was strengthened by both the Floods Directive and the increased consideration of economic rationalization, and in Belgium the negative consequences of spatial planning practices on flood risk initiated an initially modest trend towards multi-sector governance, which was eventually strengthened by the Floods Directive and increased attention to CC and economic rationalization. In the Netherlands, CC and economic rationalization stabilized the existing approach, thereby somewhat weakening the influence of the ecological turn by reinforcing the structural defense approach. In sum, in reality driving forces interact, and may either reinforce or weaken each other.

Regarding the influence of path dependency as an internal factor of stability, we must be careful not to equate a diversified risk approach with weaker path dependency. While it is true that path dependency can be very high in countries with a high dominance of certain risk approaches (e.g. flood defense in the Netherlands), we also witness path dependency in countries with a more diversified approach to FRG (e.g. England and France). While these countries might have relatively diverse arrangements, these arrangement have evolved over many years and as such still display significant path dependency. Similarly, Poland's path dependency of the defense approach and low level of diversification is not solely due to investments in flood infrastructure and related increasing returns, but is also connected to an overall lack in institutional capacity, i.e. resources, to develop and implement new strategies.

The FRG approaches in the Netherlands, France and England have developed over a long time, leading either to a limited room for maneuver (France and the Netherlands) or a history of largely incremental change (England). As such, it is of little surprise that a driving force like climate change has not significantly changed FRG in these three countries. Belgium appears much more responsive to the driving forces outlined, showing a higher level of institutional dynamics. This can be attributed both to a historical 'spatial planning backlog' increasing the need for change, and to the historical development of its organizational structure (e.g. its federalization process) which resulted in a highly fragmented and relatively dynamic structure, receptive to institutional reform. Sweden appears relatively responsive to the driving force of CC, and to a lesser extent the FD, which can be explained by the fact that it has so far faced little risk of flooding and consequently developed less ingrained institutional paths. As such, its (new) national FRGA is more future-oriented and still in its infancy, and thus more susceptible for current driving forces.

6. Conclusion and discussion

This paper has engaged with the question of how stability and change in flood risk governance arrangements can be explained in light of certain driving forces, and how this in turn affects diversification of risk strategies. Efforts to diversify strategies in order to increase the resilience of societies to floods are underway in many countries. Such efforts require a thorough understanding of the deeper forces of stability and change and the underlying governance arrangements.

The step taken in this contribution was to provide a general overview of the mechanisms through which FRGAs in six countries (The Netherlands, Belgium, England, France, Poland and Sweden) are responding to four driving forces that are 'external' from these countries' perspective: (a) the ecological turn and the WFD; (b) global climate change; (c) the EU Floods Directive (FD); and (d) the increasing prevalence of economic rationalizations in different policy domains (reinforced due to the financial crisis). To acquire this overview, we investigated how the six countries essentially differ in their FRG approaches, how they responded to the driving forces, and through which mechanisms these driving forces impacted the FRGAs.

All studied countries have, gradually or more rapidly, changed over the last decades because of the rise of ecological and sustainability concerns. All countries show sensitivity to more ecosystem-based approaches to water management and are affected by the strengthening of environmental concerns, in part because of the EU WFD. Regarding the other driving forces, we mainly saw modest but not unimportant changes. We highlight them below.

Our starting assumption (section 1) that institutionalization of defense-oriented approaches would lead to more path dependency was partly confirmed. For instance, in the Netherlands, Poland and England we found relative *stability* through a high degree of institutionalization of FRG approaches, but the mechanisms leading to this stability differ: in the Netherlands increasing returns have indeed been derived from past investments in flood defenses and knowledge infrastructures, while in England a long-term crystallization of a mix of responsibilities spread over market, state and civil society on different levels of government limits the room for maneuver. Stability in Poland is not caused by the apparent strength of the flood risk approach, but because it is difficult to change path when this is not accompanied by a shift in resources and public support for such changes. France also largely withstood major changes in response to driving forces, but gradual changes are visible, strengthening already existing institutional developments such as the decentralization trend, but not fundamentally altering the *status quo* of French FRG.

With regard to the *dynamics* found (mainly in Belgium and Sweden) there are again different explanations. In Sweden, changes were possible because an overall FRGA was nonexistent, so there was no 'path', while climate change pushes the Swedes to take flood risk more seriously. In Belgium there is also susceptibility to change because of more shallow path dependencies, and because institutional reform is a normality in Belgium. Here, we found that a call for more integrated water management, as well as the EU's wishes for river basin management and ecological concerns (the WFD), conjoined with the need to implement the FD and gain an integrated view on flood risks.

Although the effect of certain driving forces is difficult to predict and requires a nuanced country-specific analysis, we can provide some more *general reflections* on mechanisms for stability and change. First, we confirmed and further specified the thesis that bringing about changes in governance is difficult and complex. Substantial policy changes in FRG are seldom the result of only one exogenous factor or driving force. Sweden is very close to this situation, as climate change is considered a very important force of change, and change is possible in combination with the felt urgency of the problem and vulnerability of domestic policies. In most other countries a mix of driving forces can lead to stability or change. Such a mix was clearly present in Belgium, as noted above.

This suggests that real policy change can be expected from a barrage of driving forces pushing for change and internal status quo-forces too weak to resist it.

The mechanisms of our conceptual scheme are in our view important explanatory factors that need to be dealt with in more detail in future research, besides research into the 'usual suspects' when explaining stability and change in FRG (e.g. catastrophic floods). We recommend further application of our model, for instance by examining the reproduction and change mechanisms inventoried in this paper in more detail.

The complexity of the policy world needs to be better taken into account when analyzing change and stability and drafting policies. Well-intended recommendations for policy change run the risk of being empty and hollow if these are not accompanied with a thorough understanding of why policies in a country are how they are, what stabilizing forces keep FRG in its place, and which change agents might break through the status quo. We invite other scholars to join us in this intriguing endeavor.

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Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at http://dx.doi.org/10.1016/j.gloenvcha.2017.02.006.

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