Earth System Governance 3 (2020) 100048

Contents lists available at ScienceDirect

Earth System Governance

journal homepage: www.journals.elsevier.com/earth-system-governance

Research article

Towards explanations for stability and change in modes of environmental governance: A systematic approach with illustrations from the Netherlands

Dries L.T. Hegger [a, *], Hens A.C. Runhaar [a, b], Frank Van Laerhoven [a], Peter P.J. Driessen [a]

[a] Environmental Governance, Copernicus Institute of Sustainable Development, Utrecht University, the Netherlands
[b] Forest and Nature Conservation Policy Group, Wageningen University and Research, the Netherlands

ARTICLE INFO

Article history:
Received 9 September 2019
Received in revised form
3 April 2020
Accepted 10 April 2020
Available online 2 June 2020

Keywords:
Modes of environmental governance
Policy analysis
Comparative research
Explanatory factors
Flood risk governance
The Netherlands

ABSTRACT

Studies on stability and change in modes of environmental governance often remain implicit regarding the conceptualisation, nature and causes of stability and change. Moreover, they are selective in the addressed explanatory factors. Theorising of stability and change in modes of environmental governance could be brought to the next level by enhancing the comparability and alignment of explanatory studies. This paper aims to contribute to this effort using insights regarding the definition and explanation of change processes gained in the policy and political sciences. Based on these insights, we provide a systematic approach for conceptualising "stability" and "change" in modes of governance and introduce six categories of explanatory factors: physical circumstances, infrastructures, institutional settings, discourse, characteristics of agency and shock events. The case of Dutch flood risk governance shows the usefulness of the proposed approach. We conclude by reflecting on the approach's potential for providing richer and more nuanced explanations.

1. Introduction

There is growing debate about understanding stability and change in modes of environmental governance, being different forms of steering developments in society such as hierarchical, interactive or self-governance (Arnouts et al., 2012; Bell and Morrison, 2015; Driessen et al., 2012; Edelenbos et al., 2011; Hoppe et al., 2016; Sevä and Sandström, 2017; Smedby and Quitzau, 2016). Many scholars point to the fact that traditional hierarchical modes of governance have been replaced with more participative, interactive and deliberative modes and hypothesise that these 'new' modes are better able to deal with the complex, multi-scale, cross-sectoral and long-term aspects of environmental problem-solving (Hysing, 2009). An emerging strand of environmental governance scholarship adheres to an empirical analytical approach (e.g. Driessen et al., 2012; Lange et al., 2013) arguing that normative statements about the desirability of certain modes of governance should be informed by systematic empirical analyses of stability and change in modes of governance – but also by explanations thereof. Providing such explanations is necessary before addressing more normative questions about the ability of specific modes to reach certain aims (Ostrom, 2007). However, papers that adequately capture how modes of governance should be characterised; how they relate to and co-exist with other modes of governance in an empirical domain and how stability and change can be explained are more rare than studies taking a normative standpoint (Arnouts et al., 2012; Driessen et al., 2012; Hysing, 2009; Lange et al., 2013; Treib et al., 2007).

Hence, we see two problems in current explanatory studies of modes of governance that have been widely discussed by scholars in the policy and political sciences but less so by scholars in environmental governance. The first one is the so-called "dependent variable problem", by which policy change scholars refer to a too implicit and sometimes poor definition of what should be explained (Capano and Howlett, 2009; Dupuis and Biesbroek, 2013; Howlett and Cashore, 2009). This problem makes it difficult to judge whether explanations for stability and/or change in modes of environmental governance are correct and may even allow different studies to unjustifiably arrive at similar findings. Second,

* Corresponding author.
E-mail addresses: d.l.t.hegger@uu.nl (D.L.T. Hegger), h.a.c.runhaar@uu.nl, hens.runhaar@wur.nl (H.A.C. Runhaar), f.s.j.vanlaerhoven@uu.nl (F. Van Laerhoven), p.driessen@uu.nl (P.P.J. Driessen).

https://doi.org/10.1016/j.esg.2020.100048

there is a large diversity in the explanatory factors used, and underlying theoretical and conceptual frameworks (Capano and Howlett, 2009). While this diversity arguably contributes to the richness and depth of explanatory studies, it complicates their comparability and alignment. We face the challenge that academic resources are limited. Hence, a case can be made for enabling a pooling of these resources through complementary and cumulative research aimed at developing theory on stability and change (Treib et al., 2007; Cairney, 2013; Schmidt, 2008).

The current paper aims to contribute to the development of approaches and guidelines to facilitate cumulative and comparative explanatory studies in the field of environmental governance. To do so, we draw on scholarly debates and theories from within the policy and political sciences in which thinking about sound explanatory approaches seems to have progressed further (e.g. Sabatier, 2007; Howlett and Cashore, 2009) and translate these into lessons and building blocks for empirical-analytical studies of modes of environmental governance. 'Policy' has been defined as 'Political agreement on a course of action (or inaction) designed to resolve or mitigate problems in the political agenda' (Fischer, 2003: 69). According to some authors (e.g. Lange et al., 2013), therewith (public) policy studies have a predominant focus on policy content. As opposed to that, it is claimed that a 'governance' perspective is inherently broader in that it can be disentangled into a policy, polity and politics dimension (Treib et al., 2007) focusing on content, institutional organisation and power relations respectively. Furthermore, 'governance' incorporates a broader actor perspective attaching a larger role to the societal domains of the market and civil society, while 'public policy' has a more narrow focus on the policy goals of governmental actors (although these goals are often pursued with other societal actors) (Driessen et al., 2012).

To achieve the research goal, this paper takes the following steps. Section 2 develops a systematic approach for analysing stability and change in modes of environmental governance. Next, section 3 identifies a set of six categories of explanatory factors derived from the policy and political sciences. To show the analytical added value of our proposed approach, but also the challenges that scholars will encounter in applying it, section 4 turns to the case of pluvial and fluvial flood risk governance in the Netherlands. Flood risk governance is focused on preventing, reducing and/or mitigating the effects of floods on humans, the environment, the economy and cultural heritage (Hegger et al., 2014). Section 5 concludes on the paper's contribution to enhancing the comparability of studies and to theory development. In addition, the section provides a discussion and outlines further research steps.

2. A systematic approach for the analysis of stability and change in modes of environmental governance

To address a lack of clarity on what should be explained, an approach is needed that enables a transparent and nuanced analysis of stability and change. Several good practices in this regard can be derived from existing studies. We attempt to synthesise these good practices into four steps. First, scholars should be explicit about the phenomenon they want to explain by stating which empirical domain is studied and which aspects of this domain are in- and excluded (Treib et al., 2007:16).

Second, a nuanced statement is needed on the presence and co-existence of modes of governance. Driessen et al., (2012) distinguish between five modes of governance: centralised, decentralised, public-private, interactive and self-governance. The primary distinction between these modes lies in the roles and relations of actors belonging to the domains of state, market and civil society. In the case of centralised and decentralised governance, central and regional/local actors are in the lead. Public-private governance entails a joint effort by governmental and market actors. In interactive governance also civil society actors are involved. Self-governance means that primarily actors from market and civil society participate, albeit always within the boundaries set by public actors. Driessen et al. have shown that modes of governance can coexist, including that 'newer' modes may be added to 'older' ones (accumulation of modes of governance). Often, one mode is more clearly present than others so that there can be said to be a dominant mode. If present, such a dominant mode needs to be characterised by explicitly separating "modes of governance" into measurable sub-aspects that may include (i) institutional properties (polity), including but not limited to rules, procedures that apply to public–private relationships, and governing styles; (ii) actor constellations (politics), including e.g. actor features, power and relationships between actors; and (iii) policy instruments (policy) (Lange et al., 2013; Treib et al., 2007). It is unnecessary and undesirable that all authors conceptualise modes of governance in a similar way but: "… constructive and cumulative research would be vastly facilitated if researchers specified clearly on which dimension(s) they are focusing and which of the dimensions are excluded" (Treib et al., 2007).

Third, besides a dominant mode of governance, different "co-existing" modes of governance can exist, also called an "accumulation of modes of governance" (Driessen et al., 2012). Hence, a characterisation of the number and types of modes of governance present, and the degree of alignment between these is called for.

Fourth, the degree of stability and change in the identified modes of governance needs to be characterised. These can be as diverse as a change in only one sub–aspect (e.g. rules, governing styles, relationships between actors); the changing of various sub–aspects simultaneously; but also the rise of additional modes of governance complementary to the dominant one (accumulation). Longitudinal research over a period of at least ten years with a clearly demarcated baseline (change compared to what) is suggested to be able to get a clear picture (Sabatier and Jenkins-Smith, 1993).

There are studies that have come a long way in using parts of the proposed approach, albeit not explicitly (Driessen et al., 2012; Wiering and Arts, 2006; Brouwer and Biermann, 2011; Huntjens et al., 2011). These studies are explicit about the aspects that are distinguished and considered in their papers and nuanced about the degree of stability and change in modes of environmental governance. Nevertheless, in environmental governance literature more generally, much could still be gained if authors applied the lessons listed above more consistently and explicitly. This way, scholars can prevent a misrepresentation of findings, for instance being too quick in labelling certain changes 'a shift'. At the very least, the proposed approach will add greatly to transparency. Table 1 summarises the procedure and attempts to add specific guidance for its operationalisation.

3. Six categories of explanatory factors

The policy and political sciences present a rich and well-validated set of theories and frameworks for studying public policy change with a focus on the policy (as opposed to the polity and politics) dimension. Section 3.1 presents seven existing conceptual frameworks from policy and political science: the Multiple Streams Framework (MSF), Punctuated Equilibrium Theory (PET), the Advocacy Coalitions Framework (ACF), the Institutional Analysis and Development Framework (IAD), change agency/policy entrepreneur literature and several theories with an explicit focus on discourse. These are the most mainstream and prominent bodies of literature contained in the policy studies field (Capano and Howlett,

Table 1
Suggested approach for analysing stability and change in modes of environmental governance.

Step	Approach	Operationalisation (if possible through indicators)
1	Specifying the empirical domain studied	- What is the nature of the empirical domain (e.g. policy domain; specific suite of strategies; concrete phenomenon; specific trend)? - Is the domain studied as a whole? If not, what is the scope of 'the part' that is studied and how does this relate to 'the whole'? - What is the geographical scope?
2	Characterising the dominant mode of governance in the empirical domain	Address at least all three main dimensions of modes of governance: - content of policies (including a characterisation of the policy instruments present) - policy - actor constellations – politics - institutional features ¬– polity A detailed operationalisation of each dimension per mode of governance is proposed in Driessen et al. (2012:146–147).
3	Identifying and characterising modes of governance that co-exist with the dominant one	Assess whether there are examples in one or more of the three dimensions of modes of governance that run counter to the dominant mode, e.g. examples of … … classical legal policy instruments (bans, restrictions) based on governmental authority next to market-based instruments – policy … self-governing bottom-up initiatives in an otherwise highly centralised policy domain) – politics … intensive interaction and deliberation between state, market and civil society actors next to relative autonomy of local governments – polity
4	Assessing the degree of stability and change in modes of governance	- specify the time frame under consideration (at least 10 years) including a clearly demarcated baseline year - identify what changes/remains stable to what extent for each of the three dimensions of modes of governance

2009; Sabatier, 2007; Howlett and Cashore, 2009; Real-Dato, 2009). The subsequent sections provide a first sketch of the categories of explanatory factors contained in the frameworks: physical circumstances (3.2); physical and social infrastructure (3.3); institutional settings (3.4); discourse (3.5), agency (3.6) and shock events (3.7). We have chosen to look for broadly defined categories of explanatory factors in order to provide a starting point for the enhancement of comparability and alignment. We distinguished between material and non-material factors. The latter included both structure and agency-related elements that is factors that provide more or fewer possibilities for changing them at will (Giddens, 1984). Besides that, we added the factor of shock events which falls outside of the structure-agency dualism but is seen as an important factor in several of the frameworks considered (MSF, PET, ACF).

3.1. Seven existing frameworks from policy and political sciences: a brief overview

Table 2 provides an overview of the seven frameworks. The columns depict how the phenomenon to be explained is conceptualised and which factors causing stability and change (respectively) are distinguished. The final column identifies the main elements we derive from each framework for our set of explanatory factors.

The main characteristics of each framework can be summarised as follows. At the heart of the Multiple Streams Framework (MSF) is a distinction between three relatively independent "streams"; those of problems, policies and politics (Kingdon, 1984; Zahariadis, 2007). According to the MSF, these streams are often not connected and develop relatively independently. Once they become connected, more radical change may come about, often caused by policy entrepreneurs making use of policy windows that exist from time to time. The MSF's explanandum is the issue of agenda setting.

Punctuated Equilibrium Theory (PET) also focuses on agenda setting (True et al., 2007). It is assumed that the same policy domain may produce both stability and radical change. Most policy processes can be characterised by long periods of relative stability punctuated with short periods of major change. But in periods of relative stability change is also underway, but less apparent. Various developments, such as a change in policy images and policy venues, may lead to the visible manifestation of immanent change.

The Advocacy Coalitions Framework (ACF) assumes that in each policy domain (referred to as policy sub-system) we may find multiple competing advocacy coalitions. Within the coalitions, actors converge in their ideas. Actors within these coalitions have certain policy beliefs and a specific power base derived from sources as diverse as formal legal authority; public opinion; information; mobilisable troops; finances and skilful leadership (Sabatier and Weible, 2007). Factors inside and outside the policy domain can both be cause and consequence of belief change.

The Institutional Analysis and Development framework (IAD) is a general language for analysing and testing hypotheses about behaviour in diverse situations at multiple levels of analysis, and concerns analyses of how rules, physical and material conditions, and attributes of community affect the structure of action arenas, the incentives that individuals face, and the resulting outcomes (Ostrom, 2007). Inspired by Ostrom's work, Pahl-Wostl (2009), has studied social and societal learning as an important mechanism for change in modes of governance. More profound change is hereby associated with triple loop learning, which implies that existing actor and institutional features change in a more transformative way.

Change agency theories focus on how (groups of) individuals strive to bring about institutional change. Prominent insights from management studies are that different types of actors or actor groups can be change agents: leaders, managers, consultants and teams (Caldwell, 2003). The roles of change agents in achieving organisational change was shown to be multifaceted and complex (ibid). Policy entrepreneurs are a specific type of change agent, pursuing public policy change (Huitema et al., 2011).

Various discursive theories exist (Hajer and Versteeg, 2005; Jorgensen and Phillips, 2002; Schmidt, 2011). Notwithstanding existing diversity, these theories converge in that they see language not as a neutral medium mirroring worldviews, but as an important force shaping these worldviews. Therewith, discursive theories place comparatively more emphasis on post-positivist and social-constructivist explanations, as compared to the other theoretical traditions discussed in this paper.

Policy arrangements have been defined as a temporary

Table 2
Sketch of seven frameworks from the public policy sciences: phenomena they explain, factors causing stability, factors causing change and elements derived for the list of explanatory factors.

Conceptual framework	Phenomena to be explained	Factors causing stability	Factors causing change	Elements for the list of explanatory factors
Multiple Streams Framework (MSF) (Kingdon, 1984; Zahariadis, 2007)	How issues enter/leave policy/political agendas (politics/policy)	A lack of connection between solutions (policies), problems and politics (absence of policy windows)	Connection between solutions (policies), problems and politics which may be established by policy entrepreneurs, but also by chance	- structure (e.g. configuration of streams) - Agency (e.g. policy entrepreneurs) - shock events (policy windows)
Punctuated Equilibrium Theory (PET) (True et al. 2007)	Stability and change in policy content, specifically policy agendas (policy)	Parallel processing through the creation of policy sub−systems that are institutionalised and populated by vested interests	The strategic reconstruction of policy problems (images change), resulting in a shift from sub −systems to macro−politics (venue change) that are characterized by serial processing	- structure (e.g. institutionalised policy sub−fields) - agency (e.g. active reconstruction of problem frames) - shock events (e.g. punctuations)
Advocacy Coalitions Framework (ACF) (Sabatier and Jenkins-Smith, 1993; Sabatier and Weible, 2007)	Policy change over long periods (policy)	Broader physical and societal context; relative stability of deep core beliefs, including those about preferred modes of governance	External/internal shocks, policy −oriented learning and negotiated agreements (all these factors can be both cause and consequence of belief change); Policy brokers (agency)	- physical circumstances (e.g. parameters that constitute the context) - Infrastructure (e.g. parameters that constitute the context) - structure (e.g. advocacy coalitions); - discourse (e.g. how shock events materialise in changes in dominant paradigms and assumptions) - agency (negotiation, learning; facilitated by policy brokers) - shock events (internal and external shocks)
Institutional Analysis and Development Framework (IAD) (Ostrom, 2007)	Behaviour of individuals in collective action settings and the outcomes (in terms of resource availability) resulting thereof	Factors included in the framework without pre−specified theoretical relationships are: physical/material conditions, attributes of the community and rules in use. These are thought to influence features of action situations and actors: their positions, the outcomes of participants' decisions, the payoffs or costs and benefits associated with outcomes, the linkages between actions and outcomes, the participants' control in the situation and information		- physical circumstances (e.g. biophysical attributes) - physical and social infrastructure (e.g. material attributes, rules in use) - structure (e.g. institutions influencing action arenas) - agency (e.g. boundedly rational actors attempting to maximise utility)
Change agency theories (Brouwer and Biermann, 2011; Caldwell, 2003; Huitema et al. 2011)	Changes in content and institutional organisation of policies (politics/polity)	Institutionalisation of policy processes, vested interests	Strategies of change agents (who can be leaders, managers, consultants and teams)/policy entrepreneurs	- characteristics of agency (e.g. the strategies and leverage points of policy entrepreneurs)
Theories focusing on discourses/the discursive dimension of stability and change (Hajer and Versteeg, 2005; Jorgensen and Phillips, 2002; Schmidt, 2011).	Change and stability both in discourses and institutions (politics, polity, policy)	Hegemony/ dominance of specific discourses determining which policy options and actions are seen as legitimate and/or desirable; and what is seen as true/untrue	- Discursive struggle, struggle for hegemony. - How cognitive and normative ideas are enacted; the substantive content of ideas but also how, why, by whom, to whom and where in the process of policy construction they are brought forward	- physical and social infrastructure (e.g. knowledge infrastructures, but also educational systems, including handbooks and training facilities - Structure (e.g. ideas at the level of specific policies and policy solutions; the more general programs that underpin the policy ideas; and at the more basic level of the underlying core worldviews). - Discourse discursive change can be a driver of change on its own. - Agency − coordination and communication of ideas by agents
Policy Arrangement Approach (PAA) (Wiering and Arts, 2006; Liefferink, 2006).	Temporary stabilisation of content (discourses) and institutional organisation (actors, rules, resources) of a policy domain (politics, polity, policy)	Consistency and congruence amongst the four dimensions of the PAA	- External factors originating in the policy arrangement's social, economic, political or cultural context impacting the policy arrangement; - Internal changes which may originate in one or more dimensions of the PAA and impact all other dimensions	- Structure, as implicated in the rules and resources dimension of the PAA and in the form of external changes in the social, economic, political or cultural context - Discourse, which is a separate dimension of the PAA - Agency, as implicated in the actors dimension of the PAA

Table 2 (*continued*)

Conceptual framework	Phenomena to be explained	Factors causing stability	Factors causing change	Elements for the list of explanatory factors
				- Shock events in the sense of changes in the discursive dimension.

stabilisation of the content and organisation of a policy domain (Wiering and Arts, 2006; Liefferink, 2006). By studying the development of these policy arrangements over time, the degree of stability or change in these arrangements can be analysed. The Policy Arrangements Approach (PAA) claims to link up all relevant dimensions of a policy domain (actors, discourses, rules and resources) enabling a study of the policy arrangement as a whole. The PAA conceptualises stability and change both in the content (discursive dimension) and institutional organisation (actors, rules and resources dimensions) of a policy domain.

Each framework has a specific focus. Sometimes this focus is broad and includes all potentially relevant aspects of modes of governance (e.g. PAA) while other frameworks focus on e.g. actors or discourses. Also, some frameworks, such as the ACF, implicitly acknowledge several of the explanatory factors that we distinguish, whereas others have a more specific focus. But together, the seven frameworks introduced above provide a representative overview of elements relevant to the analysis of modes of governance that theories from the policy and political sciences have to offer.

3.2. Physical circumstances

Physical circumstances include issues like the seasonality of rainfall patterns, altitude and gradient of physical terrains, the degree of complexity of river systems, heat patterns, and availability of resources like water, timber, oil and natural gas. Physical circumstances are gradually developing physical constructs. In general, the physical point of departure of a country or region (e.g. downstream/upstream interactions, relative abundance/scarcity of resources) is an important part of the context of environmental governance. For instance, emergency services will be governed differently (actors, institutional settings, goals) in mountain areas compared to delta areas. The precise relevance of certain factors depends on the specifics of a certain empirical domain.

The IAD attaches a relatively large role to physical circumstances, since "physical/material conditions" are seen as one of the three main features that influence situations in action arenas. In the ACF, they are not explicitly addressed, but they will logically fit into the category of "relatively stable parameters" that constitute the context in which a policy subsystem has to operate (Sabatier and Weible, 2007). Change agency literature puts the actions of change agents centre stage and therefore puts less emphasis on these physical circumstances. Also MSF and PET, as well as more discursive theories and the PAA, do not conceptualise physical circumstances as such (Schmidt, 2008; True et al., 2007; Zahariadis, 2007).

3.3. Physical and social infrastructure

Infrastructures include dams, dikes, sewer systems, railways, ships, houses, energy installations, energy– and transport networks and knowledge infrastructures, but also educational systems, including handbooks and training facilities. They can be distinguished from physical circumstances since infrastructures are made by people, physical circumstances by nature. Existing infrastructures are the result of past investments that have materialised in physical artefacts and are sunk costs that give these infrastructures some degree of stability, but may also reinforce path–dependency and lock–in (Hughes, 1987; Van Staveren and Van Tatenhove, 2016). These features suggest that infrastructures will contribute more to stability than to change in modes of environmental governance. The IAD conceptualises infrastructures most explicitly, as it distinguishes material conditions as an important factor as well as the ACF that includes a category of "relatively stable parameters" that constitute the context in which a policy subsystem has to operate (Sabatier and Weible, 2007). Infrastructure is less explicitly conceptualised in the other frameworks, although it would in principle fit into the "resources" dimension of the PAA.

3.4. Institutional settings

With the term institutions we refer to the "rules norms and strategies adopted by individuals operating within and across organisations" (Ostrom, 2007). Institutional settings are recurrent patterned arrangements which limit the choices and opportunities available, as opposed to agency that is the capacity of individuals to act independently and to make their own free choices. There is an abundance of relevant institutional settings, including legislation, policy and legal principles, degree of integration of rules, constitutional procedural and substantive norms (Hegger et al., 2014) as well as the venues in which policies are made (True et al., 2007).

The more behaviours are institutionalised, the more institutional settings will contribute to stability, although in several cases (e.g. in countries with a decentralised legal system) formal rules could relatively easily be changed, or they leave room for flexibility. Other norms or rules are more resistant to change, especially if they relate to the way in which formal competences are distributed and which actors are expected to initiate change. Often, informal "normal" behaviours of actors may be very hard to change because of their high degree of institutionalisation, resulting in a "stickiness" of governance modes (Bell and Morrison, 2015).

All seven frameworks presuppose a "duality of structure" (Giddens, 1984): a mutual relationship between institutional settings and agency. MSF conceptualises structure as a configuration of streams; PET distinguishes institutionalised policy sub–fields; the advocacy coalitions within ACF are to be seen as structured entities; IAD focuses on institutions influencing action arenas; some discursive theories (e.g. discursive institutionalism) posit that ideas – at the level of specific policies and policy solutions; the more general programmes that underpin the policy ideas; and at the more basic level of the underlying core worldviews – are also institutional settings in the sense that they are the medium and outcome of the actions of actors. The PAA has adopted Giddens' distinction between softer, less tangible "structures" (rules dimension) and "systems" (resources dimension) (ibid).

3.5. Discourse

As mentioned before, we refer to the term discourse when we point at 'the views and narratives of the actors involved (norms, values, definitions of problems and approaches to solutions)' (Liefferink, 2006: 47). The factor discourse acknowledges the importance of more social-constructivist interpretations of the

mechanisms through which write or speech acts may influence governance dynamics. Obviously, this factor relates most strongly with the aforementioned discursive theories, which have discourse as their prime focus. Also the PAA conceptualises the role of discourse, being one of the four dimensions of policy arrangements. To a lesser extent, the ACF can be said to leave room for the discursive dimension, albeit more implicitly. When writing about external and internal shocks, the ACF focuses predominantly on the discursive dimension of these shocks, that is how shocks are discussed and interpreted.

3.6. Agency

Knowledgeable and capable agents (which can be individuals or organisations) (Giddens, 1984) may contribute both to stability and change in modes of governance as they may use their agency both to achieve and to resist change. All seven frameworks posit that the margins for change agency are small, although some studies nuance this point (Brouwer and Biermann, 2011). The MSF provides space for agency as it postulates that the coming together of policy, problem and political streams is primarily attributable to chance and to the actions of policy entrepreneurs. ACF addresses agency in that it attaches much importance to the beliefs of actors (as opposed to their interests) in determining which actor groups form advocacy coalitions (Sabatier and Weible, 2007). ACF also attaches much attention to negotiation and learning. IAD addresses the roles of actors in action situations, whereby these actors are conceptualised as boundedly rational actors attempting to maximise utility. PET provides room for agency in the periods of relative stability preceding major change through the active reconstruction of problem frames. Discursive theories posit that it is agents who bring forward ideas and decide how, why, when and where to do so (Hajer and Versteeg, 2005; Schmidt, 2011). Change agency literature has agency as its prime focus, focusing on the types of change agents to be found (Caldwell, 2003) and their strategies (Brouwer and Biermann, 2011; Huitema et al., 2011). Discursive theories presuppose that actors have discursive power and in that sense are employing discursive strategies.

3.6. Shock events

Shock events are unexpected events which may come from inside and from outside a policy domain (True et al., 2007; Sabatier and Weible, 2007; Schattschneider, 1960). These shock events can both be physical and non-physical in nature. Conflict expansion between actors in the domain forms an example of an internal shock (Real-Dato, 2009). Examples of external shocks include focusing events (e.g. floods) and contextual changes such as economic crises and sudden changes in public opinion. While physical circumstances are gradually developing physical constructs, shock events are rapidly developing social constructs, i.e. people should see something as a shock event in order for it to be a shock event. They may be the main cause for changes in modes of governance, the trigger of immanent changes (True et al., 2007) but also "close policy windows and inhibit change rather than the reverse" (Real-Dato, 2009).

MSF explicitly addresses shock events as part of the problem stream (Zahariadis, 2007). These shock events may open policy windows, enabling change. PET conceptualises shock events by arguing that, although large punctuations can be preceded by shock events, it is still an open question of whether it concerns the only or most important reason for the occurrence of large changes (True et al., 2007). ACF includes external shock events (Sabatier and Weible, 2007). Furthermore, ACF distinguishes "internal shocks" as a potential factor explaining policy change. Discursive theories focus on how actors make sense of what happens around them, which will include those social processes that make actors see events as "shock events". IAD and change agency literature do not explicitly discuss shock events. Table 3 summarises the five categories of explanatory factors and provides suggestions for their operationalisation.

4. Assessing the approach's analytical added value: the case of flood risk governance in the Netherlands

4.1. Aim and method of the case study

To show the analytical added value of our approach, we analysed and explained a concrete empirical case being pluvial and fluvial flood risk governance in the Netherlands. The case serves to illustrate the challenges in demarcating the explanandum and explores the relevance of each of the five types of explanatory factors. We used two key criteria for choosing the empirical case. One, we sought for a case that contains elements of stability and change Kaufmann (2018); Liefferink et al., (2018). Two, since the scope of this paper does not allow for in-depth discussion of primary data, we sought for a well-documented case study. We studied recent literature providing analyses and explanations of Dutch flood risk governance (Hegger et al., 2014; Wiering and Arts, 2006; Kaufmann et al., 2016; Van Buuren et al., 2014; Van der Brugge et al., 2005; Liefferink et al., 2018) to critically review to what extent these existing materials already provide the necessary data to analyse and explain stability and change in modes of governance. We applied the approach for analysing stability and change in modes of governance and explored each of the six categories of explanatory factors making use of the available data.

4.2. Analysing stability and change in Dutch flood risk governance

The Netherlands are situated in a densely populated low lying delta area. Throughout the centuries, flood defence through dikes, dams and embankments has developed as the default option for flood risk governance (Hegger et al., 2014; Tennekes et al., 2013). Other strategies, including flood prevention through pro−active spatial planning, flood mitigation, flood preparation and flood recovery are all present to some extent, but less prominently (ibid).

In 1993, 1995, an emergency situation arose because of the threat of dike breaks due to extremely high water levels in some major rivers. As a response to this, new flood defence measures were implemented and changes in legislation, which had already been prepared by water managers, were made while also emergency legislation was implemented. While the main thrust of the change was acceleration along existing paths and trajectories (flood defence), new types of measures (flood mitigation measures, Room for the River Measures that are part of the national policy programme Room for the River, focused at accommodating water through various measures) also entered policy agendas (Driessen and De Gier, 1999; Van Herk et al., 2015).

More recently, a national policy programme called the Delta Programme (2009−2014) was established, which led to five so−called Delta decisions, outlining strategies for the coming decades. This programme was established after the Second Delta Committee (Delta Committee, 2008) issued a report dealing with the question of how The Netherlands should deal with the long−term consequences of climate change. Based on the Committee's advice, a Delta Fund was established and a Delta Commissioner appointed.

The empirical domain studied has been demarcated as pluvial and fluvial flood risk governance in the Netherlands. This is the domain that is focused on preventing, reducing and/or mitigating

Table 3
Overview of five categories of explanatory factors with guidance for their operationalisation.

#	Explanatory factor	Indicators (operationalisation)
1	Physical circumstances	Depending on the empirical domain studied, relevant indicators might be: - seasonality of rainfall patterns - altitude and gradient of physical terrain - degree of complexity of river systems - heat patterns - availability of resources A careful assessment of to what extent they enable or constrain certain governance modes is in order.
2	Physical and social infrastructure	Depending on the empirical domain studied, relevant indicators might be: - dams - dykes - sewer systems - railways - ships - houses - energy installations - energy and transport networks - knowledge infrastructures
3	Existing institutional settings	Address at least all three main dimensions of modes of governance: - content of policies (including a characterisation of the policy instruments present) - policy - actor constellations – politics - institutional features ¬– polity Elements of existing institutional settings that may influence stability and change in these settings are existing norms, rules and strategies adopted by individuals within and across organisations.
4	Discourse	To address the discursive dimension, explicitly address the views and narratives of the actors involved: - norms - values - definitions of problems - approaches to solutions
5	Characteristics of agency	Presence of individuals and organisations that use specific strategies to invoke or resist change (e.g. network building; (re)framing policy issues; promoting specific policy options).
6	Shock events	Relevant elements include: - physical shocks - non-physical shocks - internal shocks (e.g. conflict expansion) - external shocks (e.g. focusing events such as floods)

the effects of pluvial and fluvial floods on humans, the environment, the economy and cultural heritage. We have chosen this domain to allow for a focused analysis. That is why we left the closely-related domain of coastal flood risk governance out of consideration. Several policy fields are part of this domain, in particular water management, spatial planning and disaster management.

As Table 4 shows, the water system management domain in charge of the flood defence strategy is the dominant domain. It is characterised by combined centralised/decentralised governance. In all other policy domains, decentralised governance can be witnessed. Each of these domains involves slightly different actors but all are decentralised public authorities. This notwithstanding, increased involvement of insurance companies in the domains of pluvial flooding and compensation is becoming apparent (interactive governance) (Kaufmann et al., 2016; Kaufmann, 2018).

Authors have found a combination of relative stability complemented with gradual change. Stability, amongst other things through an on-going focus on flood defence, is reinforced by the dominance of public actors involved in water management, with the role of the public actors in other policy domains only slightly increasing (Wiering and Arts, 2006). Gradual change within modes of governance as documented for the floods domain (Van Buuren et al., 2014) pertain mainly to an increased multi–level character of flood risk governance and an increased discursive focus on other FRM strategies such as prevention, mitigation and preparedness, leading to a combined centralised and decentralised governance, which to some extent has been stimulated within the Delta Programme, but less to the involvement of other types of actors (public–private governance) (Kaufmann, 2018; Kaufmann et al., 2016; Van Buuren et al., 2014). Finally, some degree of alignment between different sub-domains is present. There is a dedicated policy instrument (the water test) to oblige consideration of flood risk in spatial planning and there is information exchange and cooperation between emergency managers, spatial planners and water managers. Table 4 examines the degree of stability and change in modes of fluvial and pluvial flood risk governance in the Netherlands in the past 25 years.

4.3. Exploring the potential contributions of each explanatory factor

Authors have found a combination of relative stability complemented with gradual change. Stability, amongst other things through an on-going focus on flood defence, is reinforced by the dominance of public actors involved in water management, with the role of the public actors in other policy domains only slightly increasing (Wiering and Arts, 2006; Kaufmann et al., 2016, 2018). Gradual change within modes of governance as documented for the floods domain (Van Buuren et al., 2014) pertain mainly to an increased multi–level character of flood risk governance and an increased discursive focus on other FRM strategies such as prevention, mitigation and preparedness, leading to a combined centralised and decentralised governance, which to some extent has been stimulated within the Delta Programme, but less to the involvement of other types of actors (public–private governance) (Kaufmann et al., 2016; Kaufmann, 2018; Van Buuren et al., 2014).

Table 4
Characterising the degree of stability and change in Dutch flood risk governance since 1995 using the approach proposed in section 2 (Hegger et al., 2014; Kaufmann et al., 2016; Kaufmann, 2018; Van der Brugge et al., 2005).

#	Step	Outcome
1	Demarcating the empirical domain	Prevention, reduction and mitigation of the effect of fluvial and pluvial floods in the Netherlands on humans, the environment, the economy and cultural heritage (leaving out coastal flooding for the sake of focus). -Nature of the empirical domain: scholars have identified four identifiable albeit related sub-policy domains relevant for Dutch pluvial and fluvial flood risk governance: the policy fields of inland water management (also called water system management); urban water management; spatial planning; emergency management and public compensation (Kaufmann et al., 2016). -Scope of the part that is studied vis-à-vis the whole: secondary study of relevant publications at the country level, addressing all types of flood risk management strategies (those focusing on probability reduction, consequence reduction and recovery). Coastal protection is excluded. -Geographical scope: the national level in the Netherlands. -Timespan: past 25 years.
2	Characterising the dominant mode of governance	The water system management domain is the dominant domain, characterised by a combined centralised/ decentralised mode of governance undertaken by public authorities. - Policy content is focused on flood protection through dikes, dams and embankments. - Institutional features: the dominant flood risk management strategy is highly institutionalised through legally anchored safety norms. - Main actors are centralised and decentralised public authorities relying on formal authority.
3	Identifying co-existing modes of governance	- Pluvial flooding is mainly dealt with through urban water management, carried out through decentralised governance by municipalities and regional water authorities - To some extent, flood risks are accounted for in spatial planning processes (decentralised governance with a large role for municipalities). This is partly enforced through the water assessment, a procedural instrument that mandates municipalities include water issues in planning processes. - Emergency management is carried out through decentralised governance by safety authorities (regional cooperation between municipalities) - Public compensation in case of disaster is carried out through centralised governance (disaster fund) with increasing involvement of insurance companies (interactive governance)
4	Characterising the degree of change and stability in modes of governance	In the past 20 years, an ongoing focus on flood defence can be witnessed, leading to a sustained dominant role for public actors in water system management => relative stability in the dominant mode of governance; with some increase in its multi- level character. - more discursive emphasis was put on the importance of the four other policy domains, but with limited institutional change. - overall: main role for public authorities rather than private actors.

Finally, some degree of alignment between different sub-domains is present. There is a dedicated policy instrument (the water test) to oblige consideration of flood risk in spatial planning and there is information exchange and cooperation between emergency managers, spatial planners and water managers.

4.3.1. *Physical circumstances*

Relevant physical circumstances for Dutch flood risk governance are that the Netherlands are situated in a densely populated low lying delta. A large part of the country lies below sea level and four international rivers flow to the North Sea through this country. At the same time, 66% of the country is flood-prone, while population density and economic prosperity are high (Kaufmann, 2018; Van Buuren et al., 2014). Due to climate change trends, various changes in physical circumstances are taking place or are foreseen in the Netherlands. These include more and higher discharge levels of the main rivers, an increase in extreme precipitation events, salinisation of some fresh water bodies, and sea level rise, as well as subsidence of peat−soils (Delta Programme, 2013), leading to challenges to, amongst other things, fresh water supply and flood protection.

It is still too early to establish a causal relationship between changes in physical circumstances and changes in Dutch flood risk governance. But we can say that these physical circumstances are to some extent inescapable. This reduces the possibilities for flood risk prevention by "keeping people away from water" through proactive spatial planning due to space limits, and increases the need for flood defence. Flood defence measures can most effectively and efficiently be implemented if they provide collective rather than individual protection. In addition, they can also be seen as collective goods. It is understandable that flood defence, through its collective character, has been organised in the form of combined centralised/ decentralised governance, whereby the Ministry of Infrastructure and the Environment (now Infrastructure and Water) and Rijkswaterstaat (the office of public works) are responsible for the main rivers, while Regional Water Authorities are responsible for more regional water bodies. Observing that these physical circumstances are becoming less favourable, the aforementioned Delta Programme has been established, which has been claimed to initiate and further stimulate a combination of centralised and decentralised governance hence contributing to some change (Kaufmann et al., 2016). But the dominant result of slow changes in physical circumstances seems to be stability in existing approaches.

4.3.2. *Physical and social infrastructure*

While the strengthening of dikes is the default option in the Netherlands, structural measures, besides their physical hardware, also include related "software" in terms of actors, rules and regulations. For instance, regional water authorities have their own powers regarding regulation, taxation, management and enforcement. Regulations for flood defences prescribe, amongst other things, that the zones near dikes are to be kept free of buildings and other artefacts so that they can be inspected, maintained and strengthened. Water authorities are also liable in cases of dike failure (Tennekes et al., 2013).

While existing infrastructure generally contributes to path dependency, there are also situations in which extending the logic behind existing infrastructures contributes to change in modes of governance. Innovations such as "Delta Dikes" which are currently being discussed in The Netherlands are a case in point (ibid). These dikes can be distinguished from "conventional" dikes by their size

and their multi−functional use. As well as water defence, they can be used for e.g. parks, parking space, and shopping malls. This is considered an advantage in densely populated places with a lack of space. This type of innovations arguably puts conventional relationships between actors up for debate. In the case of Delta dikes, Rijkswaterstaat (the Dutch department of public works) and the regional water authorities are no longer able to decide on their own how these delta dikes should be used as is the case now. Instead, they need to interact with municipalities and private actors (e.g. project developers or residents' organisations as stakeholders) responsible for some of the other functions in/on the dike. In the maintenance phase, cooperation between the water management authorities and other actors will be necessary. Hence, the accumulated knowledge, expertise and institutional frameworks related to existing infrastructures contribute to more public−private governance and to some extent interactive governance (through stakeholder involvement in design, building and maintenance).

4.3.3. Institutional settings

Laws are good examples of institutional settings reinforcing stability. For example, the Dutch water law (2009) denominates the roles and responsibilities of Rijkswaterstaat and the regional water authorities very precisely (Van Rijswick and Havekes, 2012). Unlike other countries The Netherlands also has explicit legally stipulated safety standards for dikes. Strategies other than flood defence have a lower degree of institutionalisation, to some extent reinforcing a focus on flood defence. Liability concerns related to legally stipulated safety standards are also an important factor explaining why public authorities have a tendency to keep flood protection in their own hands (Kaufmann et al., 2016).

Most flood-prone areas in The Netherlands are protected by dikes and hence fall within the scope of the highly regulated water system management arrangement. This explains how institutional settings in this case contribute to relative stability in modes of governance. Nevertheless, in some situations there is a search for new modes of governance (public-private governance and self−governance). These searches can mostly be found in so−called unembanked areas: these can be flooded but are not protected by dikes. These areas are less tightly regulated and residents living in them are themselves responsible for dealing with flood risks, although in many cases municipalities have chosen to help them, for instance by providing information on how they can take care of themselves (Hegger et al., 2014; Van Rijswick and Havekes, 2012). This provides scope for measures which are less conventional from a Dutch perspective (e.g. farms on tarps, floating buildings and the creation of flood−proof buildings). This seems to contribute to gradual change in modes of governance (more multi-level and multi-actor governance), but only at the local level.

3.4.4. Discourse

Clear changes and developments in terms of dominant norms, values, problem definitions and approaches to solutions related to the discursive dimension can be witnessed. Two key discursive turns are the move from full control of river systems to Room for the River based approaches (Wiering and Arts, 2006) and the rise of the multi-layered safety approach within the Delta Programme (Delta Committee, 2008). Scholars argue that, amongst other reasons because of this, notions of resilience are now more widely discussed within the Dutch flood risk governance domain (Liefferink et al., 2018). The question whether, to what extent this change in discourse has contributed to changes in modes of flood risk governance is more difficult to answer, though. At the time of writing, we can say that the overall mode of Dutch flood risk governance is still dominated by a focus on centralised/decentralised flood control. This makes it tempting to argue that this overall mode is relatively inert to discursive changes. Scholars have made arguments along these lines. Liefferink et al. (2018) observe that changes in practices and their institutionalisation are lagging way behind changes in discourse. Referring to the Dutch Room for the River programme, Wiering and Arts (2006) have posited that this should be seen more as a discursive strategy of Dutch water authorities to address external pressures than as a deep institutional change. But Liefferink et al. (2018) also point to the possibility that discursive changes play out only over long timeframes and that their influence on changes in modes of governance might be very indirect and non-linear, suggesting that more profound changes in modes of flood risk governance in the Netherlands are still lying ahead of us.

4.3.4. Agency

Following up on the report of the Second Delta Committee (2008), amongst other measures a Delta Fund was established and a Delta Commissioner appointed. This Delta Commissioner is a strong leader and change agent, because the commissioner's formal position that includes the responsibility to release an annual progress report and because the persons put in this position are high−level civil servants with acknowledged exceptional personal qualities in terms of management skills, facilitating the reaching of consensus (Van Buuren et al., 2014). It is argued that this has facilitated the loosening of entrenched interests, establishing connections between governments and other actors in water management as well as between water management and spatial planning.

The activities of the Delta Commissioner have contributed both to enhancing the relative dominance of the centralised/decentralised water system management arrangement and to the increasing involvement of decentralised actors from other policy domains. The commissioner also managed to establish and activate regional networks, and based upon these, existing forms of flood risk governance have been strengthened and new ones added, especially by promoting the cooperation of multiple public authorities related to the linking of water management and spatial planning (Kaufmann et al., 2016; Van Buuren et al., 2014).

Within the Delta Programme, the actors that have been involved in flood protection issues have hitherto had a relatively firm position: regional water authorities, the department of public works and established knowledge institutes. Logically, the establishment of a governmental commissioner guarding their core business will strengthen their position. At the same time, the Delta Commissioner does have an important role in stimulating changes in policy discourses and governance arrangements by putting the issues of flood protection and fresh water supply higher on policy and political agendas. Also with regard to policy content, various changes can be noticed, such as the rise of debates on "multi−layered safety" (combining flood protection, pro-active spatial planning and crisis management) and Delta dikes as well as the use of concepts like "tipping points" and "adaptive delta management" (introducing a long-term perspective and reflecting on the implications thereof for investments in flood risk management. In local pilot projects, discussions are being held about the necessary changes in rules in order to effectuate the new approaches (Hegger et al., 2014).

4.3.5. Shock events

The near floods in 1995 acted as a shock event. This shock event helped the implementation of flood defence measures and the necessary changes in legislation, including emergency legislation, which had been prepared by water managers. But the change focused on existing trajectories and less on flood mitigation and Room for the River Measures (Driessen and De Gier, 1999; Van Herk

et al., 2015). This shock event therefore contributed both to stability and to change in the content of flood risk governance through the aforementioned introduction of mitigation and Room for the River Measures. The centralised/decentralised mode in water system management was reinforced but also a first step towards the rise of forms of multi-level governance was provided.

5. Conclusion and discussion

Existing explanatory studies in environmental governance are selective in and often also implicit about causes, mechanisms and effects. This hampers comparability of explanatory studies. To contribute to approaches that help improve the comparability of explanatory studies, we developed guidelines for conceptualising the phenomenon to be explained, being stability and change in modes of governance, and presented a broad-brushed overview of types of explanatory factors, inspired by literature from the policy and political sciences.

The paper's paradigmatic starting point is that complementary and cumulative research is necessary to arrive at thorough and nuanced explanations for stability and change in modes of environmental governance. Rather than synthesising existing theories or have these theories compete, we argue in favour of achieving a broad theoretical coverage as well as empirical depth (Cairney, 2013). Since single researchers and projects may often lack the resources to achieve both, approaches to make one's work comparable to efforts of others are needed (see also: Driessen et al., 2012; Pahl-Wostl, 2009).

Application of the integrated approach to the empirical domain of Dutch flood risk governance has shown its potential added value but also highlighted the challenges to be encountered in applying the approach. First, by applying the six categories of explanatory factors (physical circumstances, infrastructures, institutional settings, discourse, change agency and shock events) to the floods domain, we were able to provide for richness in the explanation. Each factor was shown to provide insights complementary to the five others and also to be linked to different aspects of the phenomenon to be explained. For instance, physical circumstances and infrastructures grosso modo seem to contribute to stability in the overall mode of governance and in the dominance of the water system management arrangement, but also to some gradual change within this overall mode. Institutional settings were also found to contribute mostly to stability, but with gradual changes within the overarching mode of governance. Agency, discourse and shock events were shown to work in two ways, reinforcing the stability of the overarching mode of governance but contributing to change within this overarching mode.

Second, despite the necessarily brief scope of the case study and its predominant reliance on published literature, we were able to provide a more nuanced account of developments in Dutch flood risk governance than contained in most existing studies. The case analysis showed the multi-faceted nature of Dutch flood risk governance. A dominant focus on centralised/decentralised governance can be witnessed, which is gradually being complemented with the increased involvement of other decentralised public actors, while private parties are getting involved only to a limited extent. But these developments are taking place in five co-existing governance arrangements, one of which, the water system management arrangement, is clearly still dominating the others.

The case study has shown the potential results of better explicating the mechanisms, causes and effects of changes in modes of governance. When doing this, it becomes clear that the three are closely interlinked and that a distinction between dependent and independent variables can structure the approach, but of course not reduce empirical complexity. Not only the phenomenon to be explained but also the different types of explanatory factors have shown stability and change in that their relative importance and the mechanisms through which they work change over time. This may point to non-linear relationships between variables and feedbacks in the system that is studied. Our analysis therefore shows how daunting a task explaining stability and change in modes of governance can be. But at the very least, explicating things will add greatly to the transparency of explanatory studies.

Regarding the external validity of our findings, we expect our core finding that there is significant scope for richer, more nuanced and more transparent explanatory studies will be relevant across several empirical domains and geographical contexts. The domain of flood risk governance is a core topic of environmental governance. Reducing flood risks to people and the environment can be seen as a form of climate adaptation, a salient and timely topic of study. A key driver of increasing flood risks worldwide, apart from ongoing urbanization, is climate change with its resulting effects in terms of sea level rise, increased frequency of extreme rainfall events etc. Both the causes of climate change and the actions to address increasing flood risks may and do suffer from less than optimal anthropogenic interventions in the physical environment. In addition, this empirical domain has links to various other domains. Flood risk governance decisions have implications for, amongst other domains, nature protection and development and water quality. Core governance challenges related to flood risk governance can be found in other empirical domains: amongst other challenges, these include value pluralities; the wicked character of environmental issues; and uncertainties. But the more specific findings about the types of stability and change identified and the relative importance and mechanisms of explanatory factors will arguably be different in other empirical domains and geographical contexts. For example, the observation that legal systems have contributed much to stability in flood risk governance holds for the Dutch context, but would have been different if another geographical scope was chosen (e.g. in Poland an important role for the EU Floods Directive as driver of change has been documented, see Liefferink et al., 2018).

In terms of practical recommendations, application of the research approach proposed in this study implies that, rather than an evaluative study, the researcher chooses to do an explanatory study aimed at unravelling the mechanisms of stability and change. In conceptual terms, the researcher will have to apply the analytical steps suggested in section 2 and 3 to demarcate and nuance the description of the phenomenon to be explained, consider different types of explanatory factors and make a transparent choice for what to in- and exclude. What this implies in technical terms will differ depending on the nature and state-of-the-art of knowledge in an empirical domain. In general, technical/methodological implications will be that the analyst has to search for multiple sources of data/evidence, which includes: existing explanations, preferably ones that arrive at complementary or conflicting findings; relying on multiple sources of data (triangulation) and, more in general, a skeptical attitude to explanations, provided in literature or practice, that are too certain about mechanisms of stability and change.

In conclusion, the proposed integrated approach has the potential to fuel more nuanced, richer and more transparent explanations of stability and change in modes of environmental governance. In our view, the approach's added value lies in connecting and accumulating insights arising in different bodies of literature. The approach should be seen as a meta-framework for explanatory studies, as a complement to and follow-up of Lange et al's (2013) meta-framework for systematic analysis, that can connect different theories. Our aim is not to integrate or replace existing theories, but to facilitate that progress in each body of literature contributes to an ‘accumulated knowledge base’ (p. 7)

which is still in development in several sub-domains of environmental governance, such as urban climate governance (Van der Heijden, 2019).

The development of the approach and its application to the domain of Dutch flood risk governance does suggest that theorising in modes of environmental governance, as opposed to theorising in the policy and political sciences, is still in a relatively early stage. There is still a way to go before we have cumulative insights in the value and direction that should be given to the different categories of explanatory factors across different empirical domains.

We ask other environmental governance scholars to critically assess our approach and, if needed, complement it with insights from frameworks other than the ones considered by us. Issues to be addressed include the relative importance of the distinguished factors and the need for additional factors, ideally specified per policy sub−domain. While some sub−domains are dominated by stability in modes of governance (Weber et al., 2013); others show more changes (e.g. sustainable production and consumption (Driessen et al., 2012).

Second, scholars need to look for what can be termed “the explanation behind explanations”. Potentially relevant interactions between the explanatory factors include those between action and structure (duality of structure); and between more “material” (physical circumstances, infrastructure) vs. more “social” factors (institutional settings and characteristics of agency). Another route towards interpreting empirical findings would be to try to bridge the gap between studies that interpret findings in terms of “learning” or knowledge development (Sabatier and Jenkins-Smith, 1993) and those that focus on “negotiation” (Susskind et al., 1999). This will add additional richness.

Third, we acknowledge that our focus on mainstream and prominent theories on public policy change has led to a relatively strong focus on shock events as explanatory factors of policy change. While the theories considered by us (for instance PEF; ACF) do not conceptualise shock events as the sole cause of change, they do seem to be preoccupied with a view of change as a major disruption. Other relevant strands of literature are those focusing on more gradual institutional change (Van der Heijden, 2010; Van der Heijden and Kuhlmann, 2017; Streeck and Thelen, 2005). A key conceptual framework used in these bodies of literature is Kathleen Thelen's analytical framework consisting of five different modes of gradual transformation: displacement (where new institutions gradually come to dominate old ones); layering (accumulation of institutions); drift (institutions become hollowed out; conversion (institutions are adapted to new goals or interests); exhaustion (institutions gradually disappear) (Streeck and Thelen, 2005). This line of scholarship on gradual institutional change has been subject to constructive criticism, amongst other reasons for the rather descriptive nature of the analyses produced (see Van der Heijden and Kuhlmann, 2017; for an overview). Nevertheless, this scholarship has significant potential to further enrich explanatory studies of modes of environmental governance: it could inspire more detailed and nuanced analyses of the developments in modes of governance to be explained and enrich the set of explanatory factors.

Fourth and finally, we acknowledge that there exist various newer bodies of literature, some of which have been taken on board by scholars in environmental governance to some extent, that can be used to enrich and specify different explanatory factors. Amongst other bodies of literature, nudge theory could offer significant contributions to an understanding of the interplay between human agency and the systems they are part of (Thaler and Sunstein, 2009). In a similar vein, recent theories on urban experimentation (Torrens et al., 2019) could add to such understandings.

We invite scholars working in different scholarly traditions relevant to an understanding of modes of environmental governance to join us in the endeavour to make the study of modes of governance a more concerted effort.

Funding

This research was funded by the EUROPEAN COMMISSION, grant number 308364. This paper has been written in the framework of the EU FP7 project STAR-FLOOD.

Declaration of competing interest

Declarations of interest: none. The authors declare no conflict of interest. The funders had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript, or in the decision to publish the results.

CRediT authorship contribution statement

Dries L.T. Hegger: Conceptualization, Methodology, Investigation, Writing - original draft, Writing - review & editing, Funding acquisition. **Hens A.C. Runhaar:** Conceptualization, Methodology, Writing - review & editing. **Frank Van Laerhoven:** Conceptualization, Methodology, Writing - review & editing. **Peter P.J. Driessen:** Writing - review & editing, Funding acquisition, Supervision.

Acknowledgments

We thank all colleagues inside and outside our department who have commented on earlier versions of this paper as well as Tina Newstead for her language corrections.

References

Arnouts, R., Van Der Zouwen, M., Arts, B., 2012. Analysing governance modes and shifts − governance arrangements in Dutch nature policy. For. Pol. Econ. 16, 43−50. https://doi.org/10.1016/j.forpol.2011.04.001.

Bell, J., Morrison, T., 2015. A comparative analysis of the transformation of governance systems: land−use planning for flood risk. J. Environ. Pol. Plann. 17, 516−534. https://doi.org/10.1080/1523908X.2014.986567.

Brouwer, S., Biermann, F., 2011. Towards adaptive management: examining the strategies of policy entrepreneurs in Dutch water management. Ecol. Soc. 16, 5. https://doi.org/10.5751/ES−04315−160405.

Caldwell, R., 2003. Models of change agency: a fourfold classification. Br. J. Manag. 14, 131−142. https://doi.org/10.1111/1467-8551.00270.

Capano, G., Howlett, M., 2009. Introduction: the determinants of policy change: advancing the debate. J. Comp. Pol. Anal. 11, 1−5. https://doi.org/10.1080/13876980802648227.

Cairney, P., 2013. Standing on the shoulders of giants: how do we combine the insights of multiple theories in public policy studies? Pol. Stud. J. 41, 1−21. https://doi.org/10.1111/psj.12000.

Delta Committee, 2008. Samen Werken Met Water: Een Land Dat Leeft, Bouwt Aan Zijn Toekomst. Bevindingen van de Deltacommissie. ISBN: 978-90-9023484-7.

Delta Programme, 2013. Werk aan de delta, kansrijke oplossingen voor opgaven en ambities.

Driessen, P.P.J., De Gier, A., 1999. Flooding, River Management and emergency legislation − experiences of the accelerated reinforcement of dikes in The Netherlands. Tijdschr. Econ. Soc. Geogr. 90, 336−342. https://doi.org/10.1111/1467−9663.00075.

Driessen, P.P.J., Dieperink, C., Van Laerhoven, F., Runhaar, H.A.C., Vermeulen, W.J.V., 2012. Towards a conceptual framework for the study of shifts in modes of environmental governance − experiences from The Netherlands. Environ Pol Gov 22, 143−160. https://doi.org/10.1002/eet.1580.

Dupuis, J., Biesbroek, R., 2013. Comparing apples and oranges: the dependent variable problem in comparing and evaluating climate change adaptation policies. Global Environ. Change 23, 1476−1487. https://doi.org/10.1016/j.gloenvcha.2013.07.022.

Edelenbos, J., Van Buuren, A., Van Schie, N., 2011. Co-producing knowledge: joint knowledge production between experts, bureaucrats and stakeholders in Dutch water management projects. Environ. Sci. Pol. 14, 675−684. https://doi.org/10.1016/j.envsci.2011.04.004.

Fischer, F., 2003. Reframing Public Policy: Discursive Politics and Deliberative Practices. Oxford University Press, Oxford.

Giddens, A., 1984. The Constitution of Society. Polity Press, Cambridge.

Hajer, M., Versteeg, W., 2005. A decade of discourse analysis of environmental

politics: achievements, challenges, perspectives. J. Environ. Pol. Plann. 7, 175–184. https://doi.org/10.1080/15239080500339646.
Hegger, D.L.T., Driessen, P.P.J., Dieperink, C., Wiering, M., Raadgever, G.T., Van Rijswick, H.F.M.W., 2014. Assessing stability and dynamics in flood risk governance: an empirically illustrated research approach. Water Resour. Manag. 28, 4127–4142. https://doi.org/10.1007/s11269-014-0732-x.
Hoppe, T., Van der Vegt, A., Stegmaier, P., 2016. Presenting a framework to analyze local climate policy and action in small and medium-sized cities. Sustainability-Basel 8, 847. https://doi.org/10.3390/su8090847.
Howlett, M., Cashore, B., 2009. The dependent variable problem in the study of policy change: understanding policy change as a methodological problem. J. Comp. Pol. Anal. 11, 33–46. https://doi.org/10.1080/13876980802648144.
Huntjens, P., Pahl-Wostl, C., Rihoux, B., Schlüter, M., Flachner, Z., Neto, S., Koskova, R., Dickens, C., Nabide Kiti, I., 2011. Adaptive water management and policy learning in a changing climate: a formal comparative analysis of eight water management regimes in europe, africa and asia. Environ Pol Gov 21, 141–163. https://doi.org/10.1002/eet.571.
Hughes, T.P., 1987. The evolution of large technological systems. In: Bijker, W.E., Hughes, T.P., Pinch, T. (Eds.), The Social Construction of Technological Systems: New Directions in the Sociology and History of Technology. MIT Press, Cambridge, pp. 51–82. ISBN 0-262-02262-1.
Huitema, D., Lebel, L., Meijerink, S., 2011. The strategies of policy entrepreneurs in water transitions around the world. Water Pol. 13, 717–733. https://doi.org/10.2166/wp.2011.107.
Hysing, E., 2009. From government to governance? A comparison of environmental governing in Swedish forestry and transport. Governance 22, 547–672. https://doi.org/10.1111/j.1468-0491.2009.01457.x.
Jorgensen, M., Phillips, L.J., 2002. Discourse Analysis as Theory and Method. Thousand Oaks/Sage, London/New Delhi. ISBN: 0761971122.
Kaufmann, M., 2018. Limits to change – institutional dynamics of Dutch flood risk governance. J Flood Risk Manag 11, 250–260. https://doi.org/10.1111/jfr3.12307.
Kaufmann, M., Van Doorn-Hoekveld, W.J., Gilissen, H.K., Van Rijswick, H.F.M.W., 2016. Analysing and Evaluating Flood Risk Governance in the Netherlands; Drowning in Safety? STAR-FLOOD Consortium, Utrecht, The Netherlands. ISBN: 978-94-91933-11-0.
Kingdon, J.W., 1984. Agendas, Alternatives, and Public Policies. Little, Brown, Boston.
Lange, P., Driessen, P.P.J., Sauer, A., Bornemann, B., Burger, P., 2013. Governing towards sustainability: conceptualizing modes of governance. J. Environ. Pol. Plann. 15, 403–425. https://doi.org/10.1080/1523908X.2013.769414.
Liefferink, D., 2006. The dynamics of policy arrangements: turning round the tetrahedron. In: Arts, B., Leroy, P. (Eds.), Institutional Dynamics in Environmental Governance. Springer, Dordrecht, Netherlands, pp. 45–68. ISBN 978-1-4020-5078-7.
Liefferink, D., Wiering, M., Crabbé, A., Hegger, D., 2018. Explaining stability and change. Comparing flood risk governance in Belgium, France, The Netherlands, and Poland. Journal of Flood Risk Management 11, 281–290. https://doi.org/10.1111/jfr3.12325.
Ostrom, E., 2007. Institutional rational choice, an assessment of the institutional analysis and development framework. In: Sabatier, P.A. (Ed.), Theories of the Policy Process. Westview Press, Boulder, CO, USA, pp. 21–64. ISBN: 9780813343594.
Pahl-Wostl, C., 2009. A conceptual framework for analysing adaptive capacity and multi-level learning processes in resource governance regimes. Global Environ. Change 19 (3), 354–365.
Real-Dato, 2009. J. Mechanisms of policy change: a proposal for a synthetic explanatory framework. J. Comp. Pol. Anal. 11, 117–143. https://doi.org/10.1080/13876980802648268.
Sabatier, P.A., 2007. Theories of the Policy Process. Westview Press, Boulder, CO, USA. ISBN: 9780813343594.
Sabatier, P.A., Jenkins-Smith, H.C., 1993. Policy Change and Learning: an Advocacy Coalition Approach. Westview Press, Boulder, CO, USA. ISBN-10: 0813316499.
Sabatier, P., Weible, C.M., 2007. The advocacy coalition framework: innovations and clarifications. In: Sabatier, P.A. (Ed.), Theories of the Policy Process. Westview Press, Boulder, CO, USA, pp. 189–220. ISBN: 9780813343594.
Schattschneider, E.E., 1960. The Semi–sovereign People. Rinehart and Winston, New York, USA. ISBN 978-0030133664.
Schmidt, V.A., 2008. Discursive institutionalism: the explanatory power of ideas and discourse. Annu. Rev. Polit. Sci. 11, 303–326. https://doi.org/10.1146/annurev.polisci.11.060606.135342.
Schmidt, V.A., 2011. Speaking of change: why discourse is key to dynamics of policy transformation. Crit. Pol. Stud. 5, 106–126. https://doi.org/10.1080/19460171.2011.576520.
Sevä, M., Sandström, A., 2017. Decisions at Street Level: assessing and explaining the implementation of the European water framework directive in Sweden. Environ Pol Gov 27, 74–89. https://doi.org/10.1002/eet.1734.
Smedby, N., Quitzau, M., 2016. Municipal governance and sustainability: the role of local governments in promoting transitions. Environ Pol Gov 26, 323–336. https://doi.org/10.1002/eet.1708.
Susskind, L.E., McKearnan, S., Thomas–Larmer, J., 1999. The Consensus Building Handbook. Sage Publications, Thousand Oaks. ISBN: 978-0761908449.
Streeck, W., Thelen, K., 2005. Beyond Continuity: Explorations in the Dynamics of Advanced Political Economies. Oxford University Press, Oxford, UK.
Tennekes, J., Driessen, P.P.J., Van Rijswick, H.F.M.W., Van Bree, L., 2013. Out of the comfort zone: institutional context and the scope for legitimate climate adaptation policy. J. Environ. Pol. Plann. 16, 241–259. https://doi.org/10.1080/1523908X.2013.836961, 2013.
Thaler, R.H., Sunstein, C.R., 2009. Nudge: Improving Decisions about Health, Wealth, and Happiness. Penguin.
Torrens, J., Schot, J., Raven, R., Johnstone, P. Seedbeds, 2019. harbours, and battlegrounds: on the origins of favourable environments for urban experimentation with sustainability. Environmental Innovation and Societal Transitions 31, 211–232. https://doi.org/10.1016/j.eist.2018.11.003.
Treib, O., Bähr, H., Falkner, G., 2007. Modes of governance: towards a conceptual clarification. J. Eur. Publ. Pol. 14, 1–20. https://doi.org/10.1080/13501760601071406.
True, J.L., Jones, B.D., Baumgartner, F.R., 2007. Punctuated–equilibrium theory: explaining stability and change in public policymaking. In: Sabatier, P.A. (Ed.), Theories of the Policy Process. Westview Press, Boulder, CO, USA, pp. 155–187. ISBN: 9780813343594.
Van Buuren, A., Teisman, G.R., Verkerk, J., Eldering, M., 2014. Samen verder werken aan de delta: de governance van het nationaal Deltaprogramma na 2014. Erasmus University, Rotterdam, Netherlands.
Van der Brugge, R., Rotmans, J., Loorbach, D., 2005. The transition in Dutch water management. Reg. Environ. Change 5, 164–176. https://doi.org/10.1007/s10113-004-0086-7.
Van Der Heijden, J., 2010. A short history of studying incremental institutional change: does Explaining Institutional Change provide any new explanations? Regulation and Governance 4, 230–243. https://doi.org/10.1111/j.1748-5991.2010.01075.x.
Van der Heijden, 2019. J. Studying urban climate governance: where to begin, what to look for, and how to make a meaningful contribution to scholarship and practice. Earth System Governance 1. https://doi.org/10.1016/j.esg.2019.100005.
Van der Heijden, J., Kuhlmann, J., 2017. Studying incremental institutional change: a systematic and critical meta-review of the literature from 2005 to 2015. Pol. Stud. J. 45, 535–554.
Van Herk, S., Rijke, J., Zevenbergen, C., Ashley, R., Besseling, B., 2015. Adaptive co–management and network learning in the Room for the River programme. J. Environ. Plann. Manag. 58, 554–575. https://doi.org/10.1080/09640568.2013.873364.
Van Staveren, M.F., Van Tatenhove, J.P.M., 2016. Hydraulic engineering in the social-ecological delta: understanding the interplay between social, ecological, and technological systems in the Dutch delta by means of “delta trajectories. Ecol. Soc. 21, 8. https://doi.org/10.5751/ES-08168-210108.
Van Rijswick, H.F.M.W., Havekes, H., 2012. European and Dutch Water Law. Europa Law Publishers, Groningen, Netherlands. ISBN: 9789089521071.
Weber, M., Driessen, P.P.J., Schueler, B.J., Runhaar, H.A.C., 2013. Variation and stability in Dutch noise policy: an analysis of dominant advocacy coalitions. J. Environ. Plann. Manag. 56, 953–981. https://doi.org/10.1080/09640568.2012.711246.
Wiering, M., Arts, B., 2006. Discursive shifts in Dutch river management: “deep” institutional change or adaptation strategy? Hydrobiologia 565, 327–338. https://doi.org/10.1007/1–4020–5367–3_22.
Zahariadis, N., 2007. The multiple streams framework, structure, limitations, prospects. In: Sabatier, P.A. (Ed.), Theories of the Policy Process. Westview Press, Boulder, CO, USA, pp. 65–92. ISBN: 9780813343594.