



Article

Flood Risk and Resilience in the Netherlands: In Search of an Adaptive Governance Approach

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Abstract: In the Netherlands, dealing with the risk of flooding in the face of the current climate change requires a governance approach that is less based upon the long-standing tradition of prevention and protection, and more oriented toward ideas of resilience and adaptivity. Such an approach is assumed to be more resilient compared to static approaches and better equipped to deal with the indeterminate character of a problem like flood risk. This article presents the Dutch attempt to introduce a more polycentric and adaptive governance approach in flood management, called multilayered safety (MLS). We studied this approach via interviews and an extensive document study, and analyzed the institutions governing the issue using the Institutional Analysis and Development (IAD) framework of Elinor Ostrom. For years, the issue was in the hands of a small network of actors, mainly occupied by water experts and governed by a strong lead organization and permanent bodies. While introducing a new, more adaptive policy concept the government encountered both resistance and inability within the existing policy regime. This article shows that the issue of flood safety was successfully ‘tamed’ for decades. Adopting a more adaptive and polycentric approach necessitates ‘untaming’ the issue of flood safety.

Keywords: IAD framework; adaptive governance; multi-level safety; untaming

1. Introduction

The risk of flooding grows because of more extreme rainfall, sea-level rises, higher river water discharges, and more intense storms. Scholars are, therefore, heavily discussing the basic principles of the current approach of dealing with flood risk. For a long time, the Dutch approach to flood-risk management was mainly based upon the idea of prevention [1]. Over the last 10 centuries, a whole system of dikes and dams was developed in order to protect the Low Countries from flooding. This system was further refined following the major flooding of 1953, after which the world-famous delta works were realized, and a whole regime of legal flood-risk norms was established. To date, the Dutch system of protecting a highly flood-prone country against flooding is seen as an international hallmark of flood-risk management.

This system can be described as a ‘domesticated or tamed’ strategy [2]. In such a system, an ill-structured problem, such as water safety, is split up into manageable partial tasks [3] (p. 578), resulting in a lack of reflexivity, resilience, and inclusion of new and local experience and knowledge [2] (p. 11). Problem taming is aimed at reducing and controlling wicked problems, by scoping and delineating the problem in such a way that it fits the existing administrative expertise and policy responsibilities [3]. In other words, the existing organizational structure and body of knowledge define how a problem is dealt with. Roberts [4] adds to this the idea that in the case of taming, authority is transferred into the hands of a few selected actors, based upon their hierarchical position and with

the authority to deal with the (strictly defined) issue. Roberts [4] wrote that these ‘tame’ systems are characterized by authoritative strategies based on preexisting organizational lines of functional specialization [3] (p. 578). Ostrom [5] and also Hardin [6] considered such strategies too narrow to be sustainable. Even agencies involved in water safety feel that taming strategies are undesirable and unsatisfactory, as they are relatively static, difficult to change, and not adaptive to new circumstances.

In the quest for suitable and adaptive governance approaches, we can learn a great deal from the work of Elinor Ostrom [7–9]. She demonstrated that adaptive and polycentric governance systems are able to cope more effectively with such issues [9]. In addition, Ostrom [9,10] asserted that the theoretical support for the positive influence of polycentric and adaptive governance approaches is large (p. 284). She [11] argued that, if governance is adaptive, it will be able to resolve and grasp the issue in a sustainable way.

The Dutch debate on a new approach to flood safety closely resembles the search for a more polycentric governance system. The Dutch Delta Program introduced a new paradigm, called ‘multilayered safety’ (MLS), based upon a more inclusive scope and more integrative collaboration around flood-risk management. It differs quite significantly from the existing policy paradigm, focused upon flood protection, and is aimed at reorienting the flood management system toward a risk paradigm, in contrast to the dominant probability paradigm [12]. However, it turned out to be very complicated to implement this new approach because it necessitates ‘untaming’ of the issue of flood safety. Untaming means acknowledging the multifaceted character of the issue, as well as the complexity and controversy surrounding it, and trying to do justice to its wickedness. This approach is highly controversial because policymakers are insecure about the new strategy and scope of the ‘reframed problem’, and untaming is also very complicated on an institutional level. In this article, we aim to determine whether and to what extent introducing MLS can be seen as an attempt to develop a more polycentric and thus loosely structured institutional regime, as well as to explain its low level of success. In the following chapters, firstly, we address the way in which Ostrom [13] described governance arrangements: the institutional analysis and development (IAD) framework.

Elinor Ostrom et al. developed the IAD framework to assist researchers in studying action situations [8]. According to Ostrom [8], every policy situation has a few general building blocks that can be studied as an action situation, in which actors choose and alternate amongst strategies that lead to changes in the decision-making process [14]. These building blocks include (1) the participants, (2) their positions, (3) and their actions, as well as (4) their control over and (5) information about (6) the cost–benefit analyses and (7) outcomes ([8], (p. 189); [15], (p. 27)). Zooming in on such a specific action situation—such as the flood-safety issue—obviously means a simplification of the complexity inherent in an action situation. However, systematically approaching this action situation and the accompanying governance rules make the IAD framework fruitful when attempting to track changes over time while simultaneously keeping rich descriptions of the case. Understanding such action situations and the related changes is important in efforts to design new approaches [8,16,17]. We deliberately opted for this framework because it offers an extensive typology of (institutional) rules to describe concrete governance situations, but it also helps to distinguish between loose and tighter appearances of such rules. Other frameworks (e.g. [18,19]) mention governance elements as well; however, the IAD framework specifically focuses on the tightness of the rules and thus allows for comparison.

In the following paragraphs, we will first present the material and methods used to analyze the case. Thereafter, we discuss the Dutch case of MLS and study the institutional rules in the case. We end this article with analysis and conclusion.

2. Materials and Methods

To call climate change in the highly flood-prone Netherlands a complicated problem is quite an understatement. Not only is climate change a contested phenomenon but the strategy to tackle its consequences is also highly disputed within Dutch politics (cf. [12]). The exact consequences of

climate change are uncertain, multifaceted, and related to each other in a nonlinear way [20]. There are thus no optimal solutions (i.e., solutions with definitive and objective answers). Climate change adaptation levies enormous costs and has broad consequences for landscape quality and similar issues (cf. [21,22], p. 9).

For a long time, flood safety was considered a technical issue that could be solved by means of technical expertise. There was a normative consensus in Dutch society and strong support for governmental action to safeguard the Netherlands against flooding, especially after the floods of 1953. With the help of a set of clear norms for flood safety, a whole system of dike maintenance, inspection, and enforcement was developed that functioned quite well. These norms were entirely based upon the “probability” of a flood: the dikes have to meet a certain standard that equals the probability of flooding of 1 in 1000, 3000, or 10,000 years (dependent upon population density and infrastructure development).

However, the consequences of climate change (more soil erosion, higher river water discharges, as well as sea-level rises) put this technical system under significant pressure [23]. It becomes increasingly difficult to implement the appropriate measures to meet the norms [23]. Moreover, it is recognized that meeting the norm does not mean that a flood cannot occur. Although the likelihood is low due to the impact of climate change, the risk of a flood increases. Sixty years after defining the legal norms, the consequences of a potential flood (and thus the risk) are much higher because investments in the infrastructure behind dikes (houses, companies, infrastructure, etc.) are enormous, and more people live in flood-prone areas. Thus, a potential flood will cause more casualties and economic losses. Hurricanes Katrina and Harvey were an important triggering event that fueled a discussion about the consequences of such a disaster [24].

At the same time, the normative consensus underlying the traditional ‘protection’ paradigm also eroded to some extent. Citizens increasingly question dike-enforcement projects. They object to the impact of dikes on their environment and the negative consequences for ecological, landscape, and cultural values. In various cases, (recurring) dike-enforcement operations have met fierce resistance from inhabitants who remained unconvinced of the necessity and asked for alternative solutions [25]. In the scientific community, the concern is growing that structural flood-protection measures have ‘created flood disasters’ [26]. The focus has gradually shifted from a ‘protect-and-react’ regime (managing the flood) which results in a ‘safe development paradox’ [27] by continuing the exposure of communities to the changing residual risk (the remaining chance that a disaster will occur), toward a regime in which the changing nature of the risk is managed proactively (managing the risk and strengthening resilience). Many authors have stressed that adapting to climate change for reasons of flood safety necessitates more resilient socio-ecological systems to deal with ‘unexpected’ shocks.

In the context of the Dutch Delta Program, several proposals have been developed to increase resilience and adaptiveness in the Dutch flood domain [28]. However, these attempts have only resulted in marginal changes in the dominant policy paradigm. In this article, we analyze these proposals with the help of the IAD framework of Ostrom [5,8,13] to understand the efforts to realize a more adaptive and polycentric governance approach. The second author of this article extensively analyzed the single case study described in this article. He was involved in two important policy-advice trajectories regarding the revision of Dutch flood-risk management [15,29]. The Dutch Ministry of Infrastructure and Environment commissioned these trajectories to explore the possible governance approaches for implementing the new paradigm of MLS. Furthermore, he was the main evaluator of three pilots in which the new paradigm was tested [30]. The pilots were meant to explore both the physical and technical possibilities of MLS and the possibilities for an alternative governance approach to explore and implement such an alternative flood-risk strategy.

Given the research aim of this study, we opted for a qualitative approach that focuses on how involved actors interpret the change in policy paradigm, as well as how the governance arrangement and accompanying rules evolve. The more factual question about what really changed can be answered by analyzing policy documents and procedures to identify which elements of the Dutch flood

management regime are described therein. To gain additional insights into how these changes were perceived, more than 50 key players were interviewed, and 10 focus groups with experts and officials were conducted. In addition, we analyzed contributions to the debate on flood-risk management reform and entries on diverse professional Internet forums. In the interviews, more than 30 experts, civil servants, and responsible authorities at national, regional, and local levels participated, and some respondents were interviewed twice. Furthermore, a survey was conducted, in which preferences regarding the new flood-risk regime were investigated [15]. In addition, the second author was actively engaged in the case as a participatory observer. He observed meetings among experts, practitioners, and officials who were discussing the issue of multilayered safety. Over 10 interactive meetings were attended between 2012 and 2015 to discuss the concept of MLS.

2.1. The Institutional Analysis and Development (IAD) Framework

Institutional rules consist of procedures and mechanisms that actors agree upon jointly (i.e., rules-in-use in the action situation) and influence how particular positions, actors, information, and actions are defined within the action situation [31]. These rules constitute the capacity ‘to overcome dilemmas and create effective governance’ (Blomquist, as quoted in [11]). In other words, the outcome of an action situation is based upon the extent of organized (or collective) action between independent organizations, in cooperation, to achieve a goal [8].

2.1.1. Operationalizing the Rules-in-Use in Flood Safety

While the IAD framework helps to sketch the action situation and then to study the institutional rules governing the situation, we still need a systematic way to compare how the rules change over time. In this article, we develop the rules-in-use—attached to specific times in the development of the approach to govern flood safety—of the IAD framework (see Figure 1 [8]) to make them suitable to study the case, as well as to compare the governance approach over time. We do not claim that we have found a way to study all types of governance approaches that exist, and we are well aware that this framework can be operationalized in many different ways. As Ostrom [13] concluded, an overall testable set of rules is not achievable, as there are too many rule configurations possible because governance approaches vary too much.

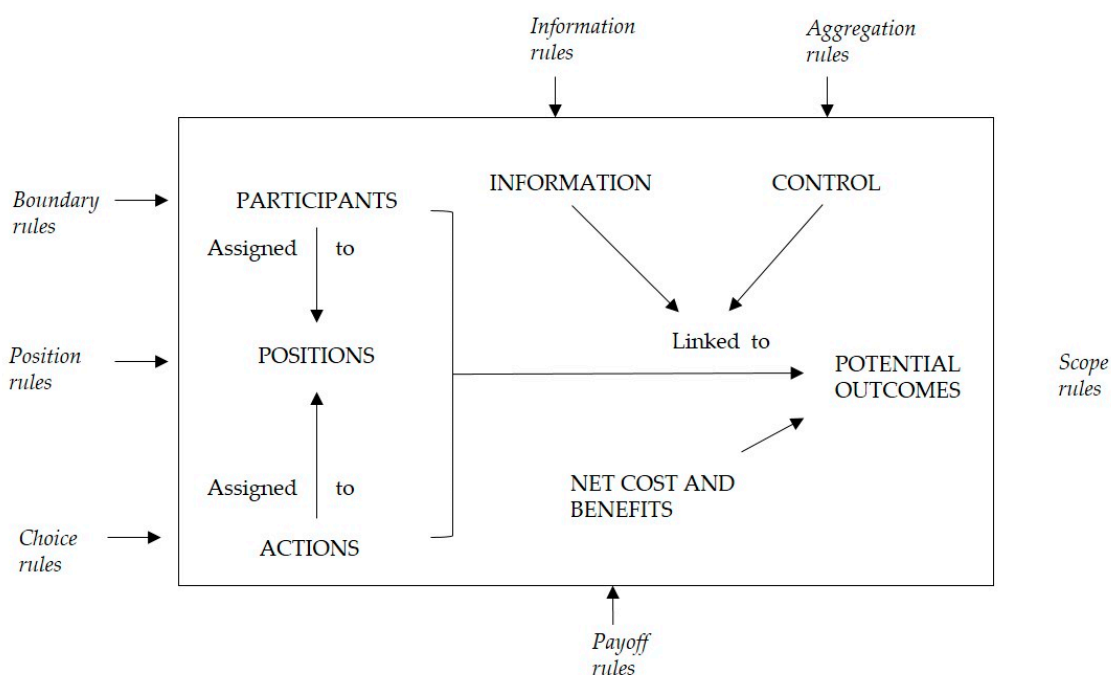


Figure 1. Institutional analysis and development framework [8].

In the end, how loose or tight the approach is, defines how stringently the governance approach presses organizations [32]. Many authors, including Elinor Ostrom herself, have made a distinction between tight, less tight, or lax rules [17,33].

In tight approaches, (self-established) authority is often the way to encourage organizations to follow-up on decisions and objectives [34] (i.e., superiors or lead organizations determine the actions of their subordinates). Tight approaches (or tightly coupled systems) are comparable with what Chisholm [34] called transitivity. A tight approach refers to a hierarchical chain of actors and assumes that, whenever an actor A takes a decision, actor B follows this decision. Translated to the action situation and the rule configuration, an action situation is tightly governed if institutional rules strictly determine how participants should adapt [31]. If rules are tight, participants have limited options, which leads to less uncertainty. Therefore, Roberts [4] called setting up a tight governance approach a ‘taming strategy’. In such situations, power is in the hands of a few actors with authority, and it is much easier to predict outcomes compared to a situation in which rules are less strict [4,33]. It also has a downside. Elmore [35] argued that tight approaches could lead to more checks, norms, and formal decision points, which can create delays. Furthermore, many authors stress that such tight approaches can be met with reluctance or resistance by organizations because tight governance can diminish the autonomy of organizations ([8] (p. 284), [31,36]).

Loose approaches lie on the other end of the scale and are similar to self-organizational networks, in which autonomous—not guided by binding rules—participants discuss and contemplate issues [31]. Which actors are necessary at the table is determined based on the task at hand, not because of the organizational chart [34,36]. Roles and actions are continuously adjusted based on experience, and tasks are generally established by negotiation among the participants. A loose approach is almost like an ‘adaptive device’ ([35] p. 608). Participants have leeway in such approaches, which they can use to deal with conflicting or complex demands. However, not adapting, adhering, or exhibiting deviant behavior may lead to distrust [37]. In this way, a loose approach is almost like a self-reinforcing mechanism because the rules integrate and bind participants based on the issue, trust, and loyalty [31]. As such systems are flat—there is no one ‘center of authority’—they may appear to be disordered ([34], (p. 54), [38]).

Both types have positive sides and challenges [31,39]. Besides the pitfalls per type, Benz [31] (p. 14) also wrote that, if the type of approach does not fit the organizational style, policy implementation and decision-making are both likely to end in an impasse. The tight approach resembles what Rittel and Webber called ‘the systems approach of the first generation’. The second generation resembles a loose governance approach, based upon an open dialogue with participants, explorative argumentation, and an iterative search about the characteristics of the problem and a possible solution [21].

When researchers think of Elinor Ostrom and the IAD framework, studying common pool issues is what immediately comes to mind. Although the IAD framework is often used to analyze common-pool issues like forest, irrigation, or fisheries management, the framework is not restricted to studying common-pool resources. Elinor Ostrom [11] (p. 646) shows that the IAD framework is compatible with *public goods* as well [40]. Furthermore, the framework has been used by many other researchers focusing on flood risk e.g., [41,42]. The following paragraphs describe the elements of the IAD framework and the way we operationalize each element by using the four-point scale, leading to a rich and fine-grained method to score governance approaches on all their rules ranging from (1) tight rules to (4) loose rules.

2.1.2. Boundary Rules

The participants constitute the first element of the action situation [8]. In this article, organizations are considered to be the participants. Boundary rules describe how exclusive or open the collaboration is to participants, in the beginning, or along the way. These rules also indicate who can say something about ‘the water issue’: who is obliged to cooperate, which actors are excluded, and how participants can exit the action situation. Jordan and Schubert [43] described the boundary rules with three dimensions, including the number of participants, whether they are sectoral or trans-sectoral, and the stability.

To operationalize this rule, two aspects were combined: the level of stability (based on [43,44]) and the diversity of participants (based on [45]). How open or closed the boundaries are can be described by the level of stability, which ranges from stable to unstable [43]. For the diversity of the participants, a distinction was made between vertical and horizontal linkages, in line with Bouckaert et al. [45]. One could think of vertical linkages between different hierarchical layers of organizations, as well as horizontal linkages between organizations of different policy sectors, portfolios, or different parts of the triple helix (universities, companies, and governments).

A tight participant constellation is highly institutionalized, formal, obliged, and restricted in terms of access to new participants. An open, ad hoc participant constellation, based on voluntary participation, is a loose arena. In loose approaches, the participant constellation is highly diverse, and the boundaries are open, fluent, and accessible to new participants. In tight approaches (see the left column in Table 1), the participant constellation is closed, and clusters' participants from one vertical hierarchy. The four institutionalization forms in Table 1 were borrowed from Van Waarden [44] and [43] combined with the vertical/horizontal linkages of Bouckaert et al. [45]. This dimension does not concern the centralization of power or the positions in the governance approach, it merely concerns the access and boundaries of the constellation.

2.1.3. Positions Rules

Secondly, next to the participant constellation, participants are, because of rules, agreements, and mandates, situated in different positions [8]. The actor's position in an action situation determines the extent of influence, as well as the bargaining and veto power, of a certain actor [46]. The operationalization of this dimension builds on the work of Provan and Kenis [47].

Positions may be, at one extreme, collectively structured (i.e., shared) by a separately created organization that deals with the administration, communication, and coordination tasks [47]. An action situation governed by a separately created administrative organization is the most highly structured and tightest form of governance. At the other extreme, positions may not be structured at all and thus participant governed, which is a very loose type of governance. In such a situation, members themselves govern their actions. Another example of loose governance occurs when the network (or collective body) acts as the basic entity where activities are governed, such as when a network functions as the collective structure in which consensus can be reached. Column 2 of this dimension describes a situation in which a single participant takes on the role of a lead organization [47].

2.1.4. Choice Rules

Choice rules determine the leeway a participant has, as described in the mission of the action arena, in terms of when the participant may, must (not), or should take action. Although Ostrom [8] employed the 'attributes, deontic, aim, conditions, or else' (ADICO) framework [48] as a systematic way to describe the rules-in-form [49], we used it to operationalize the leeway on the organization has. Ostrom distinguished between a rule, a norm, and a strategy (see also [49]). The ADICO grammar can help us determine if the objective is governed by a leading rule, a norm, or a strategy.

- (1) Attributes: Who is addressed by the mission?
- (2) Deontics: The prescriptive nature of a mission statement. If a deontic exists, we know that something is obliged, permitted, or forbidden.
- (3) Aims: What is the aim of the actions in the mission statement?
- (4) Conditions: Under what circumstances should the attribute do something (e.g., in which period, by which deadline, etc.)?
- (5) Or else: The sanction if the participant does not follow the new demands. [49]

An objective containing each of the ADICO components is considered to be a rule. An objective containing the first four components (ADIC, i.e., those without sanction) is characterized as a norm. Objectives that only contain an attribute, aim, and condition (AIC)—and no sanction or

prescription—are considered to be strategies [50]. If there is a tight and guiding rule, there is a strong degree of certainty [51] about what is expected of the participants. The loosest type of rule is a statement, which consists of an attribute (A) and an aim (I).

2.1.5. Information Rules

The fourth element of the IAD framework (see Table 1) is the information a participant has about how to reach the strategy and about the tasks of the other participants. This dimension does not stress the frequency or the amount of information, rather, it stresses the *kind* of information [8]. A situation in which a participant has a unique part of the information can lead to protection and ‘bargaining’, and it is the actor with the most information who has a dominant position [52]. In the situation of incomplete information and deficits, the strategies of the participants are ‘messy’ and uncoordinated [53]. Hood [54] distinguished between information that tightly and loosely presses organizations to adapt. Information is tight when responsibilities are ex-ante thoroughly described, involving the separation of ‘coordination’ and ‘implementation’ activities ([51], (p. 12); [52], (p. 34)). Another tight type also concerns an ex-ante described strategy and tasks, without this separation in ‘coordination’ and ‘implementation’ activities.

Information about the strategy and the tasks set during the process in the core group is looser. The group can agree on the strategy and tasks as a norm, but this can also be left to the participants themselves. In such situations, there is a rich exchange of information, with a lot of leeway for learning or adaptation [55]. Information, here, is seen as a collective asset. Participants of such loose types communicate on a personal, rather than formal, level with each other, which can result in more ‘noise’ and different conceptions of the task at hand [56]. Furthermore, participants who do not participate in the coordination process lack the information of those who do.

2.1.6. Aggregation Rules

The fifth element is the control that participants in the action situation have, how power is played out, how participants can affect the outcome, and how they reach final decisions [47]. Aggregation rules determine, for instance, whether a decision by a participant is needed to proceed to action and the implementation phase. In other words, aggregation rules can be symmetric (e.g., unanimity or voting schemes) or nonsymmetric (e.g., a leader takes a decision on behalf of the others, such as a chairman or lead organization) [8].

Compared to the position rules, which explain how the positions and the approach are structured, this dimension, ‘aggregation rules’, describes how participants come to decisions in the action situation. The literature tends to focus on three distinct forms, unicentric (tight), multicentric (having more than one authority), and pluricentric (loose) [57–59]. The role of the coordinator in a unicentric form is not to gain or to monopolize power but to perform roles that ‘normal’ participants are unable to perform: foreseeing threats, disasters, and deadlock, as well as undertaking long-term planning (Mulgan, 1997, as cited in [60]).

2.1.7. Payoff Rules

The cost–benefit analysis that the participant makes about the utility gained by either cooperation or defection is the sixth element of the IAD framework [8]. The ‘payoff’ can be either an extrinsic reward or sanction or an intrinsic valuation (e.g., joy, shame, or guilt [8]). In government organizations, the payoffs are highly institutionalized through accountability approaches. Accountability can influence policy coordination in different ways. Firstly, making organizations accountable places emphasis on goal formulation and achievement. Secondly, accountability systems can enable participants to comprehend the potential benefits of and pay attention to policy targets. Thirdly, accountability can aid in detecting and resolving overlaps and conflicts amongst policy objectives [61].

Fox [62] helped to operationalize this dimension by discussing two basic dimensions of accountability:

- ‘Soft face’ accountability, peer review, the loosest type of accountability, implies dissemination and access to information (see 4 in Table 1). Answerability to specific coordination function means that organizations have the obligation to answer questions regarding their decisions and actions to a certain coordination function [62,63].
- The ‘hard face’ form of accountability includes answerability plus the possibility of sanctions.

Types (2) and (3) in Table 1 are types of institutional answerability of the involved organizations to the coordinating actor: one type without an inspection, sanctions, or rewards, and the other type with these elements. The tightest form is what Fox [62] called the ‘hard’ accountability type: performance-based accountability to the coordinating actor with sanctions and the possibility to investigate actual institutional behavior.

2.1.8. Scope Rules

Lastly, the scope describes the range of possible outcomes that could be affected, and it specifies the ultimate goal that must be achieved [8]. How the scope is seen affects what is needed to reach the outcomes. These are the envisioned outcomes—not on the level of the participants but on the level of ‘the collective’. The scope is, in the majority of instances, explicated in general mission statements.

According to Alter and Hage [64], the scope is the extent to which participants frame and see the mission they want to achieve in the action situation in a comprehensive way. On the one hand, this can be done broadly and holistically by seeing the problem and solution in a multidimensional and multidisciplinary way. First of all, ‘multidimensional’ means that the solution is the extent to which the problem and solution are seen ‘holistically’, for instance, that an area is a social, natural, geographical, and a political place. Secondly, ‘multidisciplinary’ means that the expertise of different professions is needed to understand the problem and find a solution. A broad framing leads to a wide-ranging assessment about which services, programs, and objectives should be met by the participants to target a particular problem. On the other hand, the problem and the solution can be seen more narrowly. A narrowly defined scope leads to objectives being unambiguous and more straightforward [64], as well as monodimensional and monodisciplinary goals and outcomes. In such a situation, it is clear who is responsible, who should take action, and how the goal must be achieved. Hence, monodimensional monodisciplinary goals and outcomes often explicitly link lead organizations to a problem, in which the organizations have a (self-established) authority over the action situation, and subsequently, the relations in the action situation are more tightly structured. Table 1 presents the various rules, using the IAD framework of Ostrom [8], and the different gradations between loose and tight versions of these rules.

Table 1. Rules in a governance action situation (based on [13]).

	Tight Coupling	←—————→		Loose Coupling
	1	2	3	4
Boundary rules	Closed/restricted, ordered coalition, multi-level (more than two) vertical linkages	Permanent coalition multi-level (more than two), vertical linkages	Ad-hoc relationships (based on committee-, advisory work). multiple juxtaposed, organizations (or actors), horizontal linkages	Open/fluent, ad-hoc temporary, horizontal linkages, multiple juxtaposed organizations (or actors), horizontal linkages
Position rules	Administrative organization governed (separately created)	Lead organization (either department or agency) governed	Network governed	Internally participant governed
Choice rules	Rule (ADICO): All the elements	Norm (ADIC) attribute, aimAttribute, Aim, condition, and deontic	Strategy (AIC): Attribute, aim, and condition	Statement (AI): Attribute, aim
Information rules	Strategy and tasks are ex-ante formally described, information separated per task (e.g., ‘coordination’ and ‘implementation’).	Strategy and tasks are ex-ante formally described, not specified per specific task.	Strategy and tasks developed within the core group as a guiding norm, relatively rich exchange of information.	Information is a collective asset, information with slack.
Aggregation rules	Unicentric, coordinator makes decisions, with mandate, sanctions–incentives	Unicentric (e.g., coordinator without sanctions–incentives)	Multiple participants, democratic decision making	Pluricentric, coordinators in multiple organizations
Pay-off rules	Performance-based accountability, with sanctions or rewards, with possibility to investigate actual institutional behavior (e.g., inspections)	Institutional answerability to specific coordination function, with sanctions or rewards	Institutional answerability to specific coordination function, no inspections, sanctions, or rewards	Dissemination and access to information, no sanctions or inspections—Peer review
Scope rules	Narrowly defined mission—monodisciplinary and monodimensional	Narrowly defined mission—monodimensional, but multidisciplinary	Broad defined mission – multidimensional and multidisciplinary	Open ended

3. Results

When we try to deduce the rules that structure the action situation sketched above, it becomes clear that the governance approach governing flood safety until 2008 was rather tight (see Table 2 second column). For a long time, the governance regime regarding flood safety can be characterized as a highly tight governance approach that consists of a small coalition of interconnected actors with clear jurisdictions, which uses a highly formalized and detailed set of rules in order to realize a clear objective. Thus, there is a robust system of legal norms for flood protection. This system is embodied in a quite independent network of autonomous organizations responsible for implementing these norms. Within this network, there is a strong sectoral focus upon one dominant idea, namely prevention by means of protective measures.

This approach resembles the idea that flood management is a complicated, but technical, issue that can be dealt with in a well-structured way (a problem that can be 'tamed' [21]). The National Ministry of Infrastructure and Environment is responsible for flood management. The National Agency of Public Works and the regional water boards are responsible for implementing the norms. They focus their activities on the dikes, and only in very exceptional cases, a more spatial perspective is used to think about flood management strategies. The Room for the River program (2003–2016) can be seen as a first attempt to apply a more integrated focus by including aspects of discharge capacity and water levels in the decision to replace or to enforce the dikes along the main rivers [65]. When it comes to implementation (e.g. dike-enforcement projects or maintenance activities), other actors are informed or consulted, but they are not in a position to alter or to veto what has to be done in the eyes of the water authorities, the scope they use, or the alternatives they select. The maintenance of the flood defense system is based upon periodical inspection reports (every six years). In Table 2 (second column) we summarize the various rules that characterize the traditional approach of flood management.

3.1. The Delta Program and the (Envisioned) Concept of Multilayered Safety (MLS)

In 2008, a second Delta Commission was appointed to prepare advice about how the Netherlands could deal with the consequences of climate change. The report of the Veerman Committee stimulated the Dutch government to rethink the current methods of flood management. In 2009 the National Water Plan put the quest for another flood-risk policy on the national policy agenda and introduced the idea of MLS. The concept of MLS is based upon the idea that flood management has to become more risk-based and thus must have an open eye regarding the following question: What if a flood actually does happen? The concept grants a more prominent role to measures mitigating the impact of a possible flood by emphasizing the importance of risk management and planning strategies. It distinguishes amongst three layers of safety. The first layer includes dikes and other means to prevent flooding (the traditional approach of flood protection). The second layer consists of spatial measures that can help to reduce the impact of a flooding event. The third layer has to do with all sorts of activities regarding crisis and disaster management. Figure 2 presents this idea of MLS.

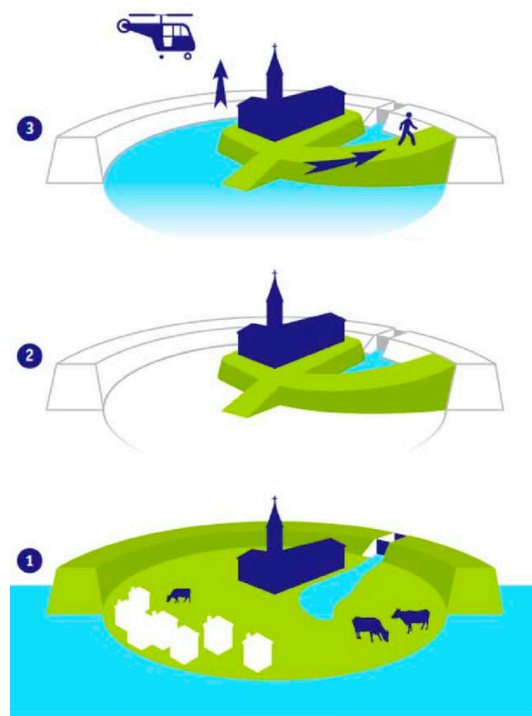


Figure 2. Multilayered safety (MLS). Source: Foundation for Applied Water Research Meerlaagsveiligheid (2014) *Waterrobuust bouwen in stedelijk gebied*, June 2014.

In 2010, the Dutch Cabinet appointed the national Delta Commissioner, and he started in 2011 by preparing the national Delta Program. The aim of this Delta Program was to develop a strategic policy plan for the long term that has to safeguard the Netherlands from the consequences of climate change related to floods, extreme rainfall, and droughts. One of the main characteristics of the Delta Program was its openness for other than traditional actors to get involved in drafting long-term policy strategies regarding flood risk management. This openness came with a more spatial perspective on flood management because regional and local authorities added their (spatial) agenda to the discussion about flood risk norms and ways to achieve these norms. Opening up the policy arena thus meant a more inclusive problem definition on flood risk and management.

In late 2014, the main results of the Delta Program were laid down in the so-called Delta Decisions. As van Buuren et al. [1] stated, two of the elements of multilayered safety were included. One Delta decision was devoted to the issue of ‘land-use adaptation’ or water-robust planning (to come to more risk-neutral spatial development on a voluntary basis), and the Delta Decision on ‘flood-risk safety’ incorporated the possibility of ‘smart combinations’. The latter is aimed to provide the opportunity for exceptional situations in which dike enforcement can be replaced by a combination of measures in the first, second, and third layer: partial dike enforcement, measures in the spatial domain (compartmenting, waterproof development), and evacuation or risk reduction [1].

This Delta Program also laid the foundation for a new set of flood-risk norms in which the element of risk was much more emphasized than in the former norms. This new approach also resulted in a search for alternative governance approaches at the local and the regional levels to give meaning to this new philosophy and to enable a search for solutions at all three layers. In the six regional sub-programs of the Delta Program, the possibilities for MLS were explored. More specifically, the potentials of the concept were explored in three regional pilot projects to see whether it was possible to replace dike enforcements with a ‘smart combination’ of measures in all three layers [30].

The new policy paradigm, as proposed in the Dutch Delta Program, thus implies a couple of significant adjustments of the ‘old’ paradigm. These adjustments are at least threefold. First of all, the norms for flood-risk safety were adjusted in order to make them really “risk-based”. The norms

are now based upon two elements: the probability of a flood in relation to the expected impact of it in terms of economic losses and casualties. Secondly, by introducing the concept of MLS, the Delta Program ensures that flood-risk safety is no longer solely approached from the perspective of 'prevention'. It also draws attention to the so-called 'second layer', the spatial planning of an area, and the 'third layer', the possibilities for disaster and risk management. The Delta Program created the possibility to regionally explore the most suitable way of realizing the norm: an integrated package of measures of dike enforcement, spatial planning, and disaster management. Within the Delta Program, the importance of explorative searches at the local or regional level in order to find out which combination of measures fits best into the local context, the foreseen spatial developments, and the agendas of stakeholders was emphasized. This was framed as a joint responsibility of all regional actors.

The Delta Program also added the possibility of a 'smart combination'. Within a specific situation in which the norm necessitates dike enforcement, it became possible to exchange dike enforcement with a specific combination of measures in the first, second, and third layers. Such a combination should result in a lower norm for the dike and a formal commitment among the various responsible authorities to implement and maintain this combination of measures.

When we analyze the way in which the concept of MLS was used in the context of the Delta Program in the period between 2011 and 2014, we refer to the last column of Table 2, in which we sketch the various rules (in theory) the concept of MLS imply. In theory, the idea of MLS implies a fundamental shift toward a more loosely organized governance system. It implies that all actors that can possibly contribute to risk reduction at one of the three layers are welcome in a regional policy arena around a diked area (boundary rules: 4). It also presupposes that all these actors (e.g., the water boards, public safety regions, the municipalities, and other actors) internally develop a set of rules to set up a regional dialogue to discuss the way in which flood risk is dealt with (positions rules: 4). Regarding boundary rules, the idea of MLS can be seen as an open invitation to all actors within a certain region to bring in their ideas that could function as a building block at one of the three layers.

Developing a MLS strategy necessitates a regional dialogue in which all relevant stakeholders can contribute their ideas. It requires a very knowledge-intensive search in which an open and creative search can emerge toward innovative and integrative solutions. In various pilots, such a search was organized, and actors developed ideas about how to give meaning to this idea [30,66,67].

3.2. *The Concept in Practice*

However, in practice (the third column of Table 2), it proved very difficult to implement the concept of MLS as originally envisioned (the fourth column of Table 2). The concept was translated in such a way that it was more or less compatible with the current institutional practice. In the final Delta Decisions, the first layer was said to safeguard a 'basic level of safety'. The new norms for the dikes have to ensure that the mortality rate due to flooding is 1 in 100,000, thus 0.001%. A strong bias in favor of legal norms regarding the dikes dominated the ultimate Delta Decisions: The idea of flood-risk management was entirely translated in a system of new norms for the dikes and thus not for the second or third layer (which were deemed too difficult to control). The more conservative community of national policymakers, civic engineers, and legal experts played an important role in this translation process. In the implementation phase, the policy arena was much more closed compared to the policy formulation stage. Regional and local actors were not in the position to defend or enforce the original concept. As a result, the idea of MLS was severely downsized because the norms for flood-risk safety are entirely focused upon the first layer, and all measures in the second and third layers are framed as complementary but not substitutive for the first layer. They seemed as 'nice to have' but not necessary. After the Delta Decisions were made, the new norms were implemented and translated by the water authorities in a strategy for planning the necessary measures to meet the norms in time. In this implementation process, many elements of the original concept (aimed at including the possible consequences of a flood- which depend upon the spatial characteristics of an area - in the calculation

of the strength of the flood defense needed) were skipped in order to simplify the implementation challenge. At the moment, regional governance approaches around flood-risk management are less tight, but the focus remains on flood prevention by means of hard structures (the first layer).

Thus, although the new system enables the water authorities to opt for more tailor-made interventions to realize the norms, the actual resulting governance approach exhibits much more tight characteristics and thus a hybrid mix. Table 2 (column three) presents the various rules as they are currently in place regarding MLS. The current system of flood-risk management thus exhibits an interesting division between the strategic level (which is about programming measures) and the operational level (which is about implementing measures). At the strategic level, some regions invest in an intergovernmental dialogue between water authorities, provinces, and municipalities. The scope of such a dialogue differs in practice. In other regions, this dialogue is much less substantive and mainly used by the water authorities to present their intended measures regarding dike enforcement. Their plans are no longer only based on the technical specifications of the dike but also on the possible consequences of a dike breach. At the operational level, the water authorities organized a participation trajectory in order to fine-tune the way in which they implement dike enforcement. Within the domains of spatial planning and disaster management, other authorities (with different ambition levels) explore the possibilities for risk mitigation, but these trajectories are not entwined with the implementation efforts of the regional water boards. These attempts differ not only when it comes to how ambitious these are but also to what extent they are actually implemented. The latter mainly depends upon opportunities for coupling these types of measures to other spatial developments.

Table 2. Changes in the flood safety governance approach.

	Flood-Safety Governance Approach until 2008: Tight	Flood-Safety Governance Approach after 2014: Fairly Tight	Envisioned Flood-Safety Governance Approach
Boundary rules	1: Closed network of the Ministry of Water Works, Inspection, regional water boards, and Rijkswaterstaat, no access to new participants.	2: Before programming dike enforcement, a regional dialogue has to be organized in order to explore, at a more strategic level, which flood-risk strategy is suitable. The scope of this dialogue differs among regions.	4: Regional networks of all relevant actors are open for every actor who can contribute to MLS strategies or a 'smart combination' of measures in the first, second, and third layers.
Positions rules	2: Rijkswaterstaat and water boards are the lead organizations and entirely responsible to do what is necessary for safeguarding flood safety. Provinces do have the opportunity to overrule, but this is exceptional.	2: At the strategic (regional) level, the coalition of involved actors is broadened, but at the implementation level, the position of the water authorities has not changed.	4: Within the regional actor network, the possibilities for MLS options are explored. The set-up of this exploration is arranged by the network actors themselves.
Choice rules	1: The norms for flood safety include all elements (ADICO) and are elaborated in detailed technical standards and procedures. The rules to receive funding from the Flood Protection Program are strict.	2: The norms for flood-risk safety are focused on the first layer. There are no norms or standards for the second and third layers, but actors look for ways to make those types of measures less voluntary.	3: The norms for MLS are open and do not contain a norm or a sanction when it comes to the second and third layers.
Information rules	1: Formalized and standardized formats are used to collect and share information (between Rijkswaterstaat, water boards, funding programs, and ministries, ministry).	2: At the strategic level, more information about future dike enforcements and spatial developments is shared in order to align these agendas better. In many instances, this information is still quite formal and strictly task focused.	3: The regional exploration is aimed at generating as much (potentially) relevant information as possible from a variety of sources and is shared in an open, collaborative way.
Aggregation rules	1: Water boards decide unilaterally to disqualify a dike and to prepare a proposal for enforcement. The Flood Protection Program decides which projects are funded, RWS and the water boards decide how the enforcement is designed and implemented.	1: The process of dike enforcement is uncoupled from activities aimed at organizing climate robustness.	3: The regional processes result in a 'preferred alternative' that has to be ratified by the actors that have to realize the various building blocks.

Table 2. Cont.

	Flood-Safety Governance Approach until 2008: Tight	Flood-Safety Governance Approach after 2014: Fairly Tight	Envisioned Flood-Safety Governance Approach
Payoff rules	1: independent inspection is executed by the Human Environment and Transport Inspectorate. They inspect whether the regional water boards realize their duty of care.	1: The system of inspection did not change fundamentally.	4: No rules have been developed yet. Part of the exploration was to find out which type of rules could be formulated regarding inspection and compliance, especially regarding the second and third layers.
Scope rules	1: The scope of flood management is narrowly defined and monodimensional, focused on safeguarding the norms on flood defenses and thus focused on the dike and its direct context.	2: The scope for flood-risk management entails realizing the norms regarding flood defense.	4: The scope of flood management is focused on regions: Diked areas are integrally approached to determine which combinations of measures (technical, spatial, or managerial) are possible and feasible. If desired, the scope can be adjusted (broadened or tightened, both in terms of the geographical scale and of focus on specific measures).

4. Discussion

Although the need for a more adaptive, integrated, and risk-oriented way of dealing with the issue of floods seems to be increasingly recognized, it remains very difficult to be freed from the classical idea of controlling floods by maintaining a system of dikes and dams only. The responsible actors in the Dutch flood-risk domain continue to tame the issue of flooding along three lines, which clearly reflect the taming strategies of Roberts [4].

Firstly, by relying on experts in one particular issue arena, the legal and regulative capacity remain in the hands of a few. The national government legally anchor new norms that are entirely translated into standards for dikes, and the very controversial idea of ‘risk acceptance’ is averted. As a result, all measures in the second and third layers are framed—by these actors who narrowly focus on flood safety as the one issue—as voluntary additions to the first layer, which is, in principle, sufficient to meet the norm. This is the second taming strategy of Roberts [4]. Thirdly, although a participative trajectory was organized, the original lead organizations decided on the strategy. By formally stating that a base level of safety is guaranteed by the first layer, the complexity of flood-risk management (in terms of scope, involved actors, available options, etc.) is reduced to the simplified question regarding the quality of flood defenses. This finding clearly supports the point of Daviter [3] that, via taming, problems are not dealt with in a holistic way but result in a solution that fits the functional specialization of a particular group of people. This taming strategy hinders reflexivity, as well as the inclusion of local experience and knowledge [2]. Certainly, the absence of a learning attitude can be explained by the rather strong path dependency that dominates this domain (cf. [1]) and the closed epistemic community that, for a long time, dominated the knowledge base of Dutch flood policies [68].

The introduction of the concept of MLS implies a search for more polycentric approaches in which the dominant position of the water authorities is reduced in favor of other actors who are responsible for planning and disaster management. Although the uncontrollable character of flood-risk safety is increasingly recognized, it is very difficult to acknowledge these unpredictable consequences in terms of how flood risk is dealt with. Given the risk-averse opinion of the public in the Netherlands, the strong normative consensus that the government is responsible for public safety, and the fact that people perceive themselves safe behind the dikes makes it nearly impossible to communicate that protection will never be perfect, that risks cannot be eliminated, and that it is important to think about more integrated strategies instead of focusing on the height and thickness of the dikes. Moreover, the consequences of a flood are, for most Dutch policymakers and citizens, too severe to accept. Therefore, it has proved to be highly controversial to untame the issue of flood-risk safety and to successfully implement MLS.

Two aspects make untaming very complicated. First of all, the current paradigm of flood-risk management by protection—essentially built on the simplifying idea that flood management is about protection—is seen as a very successful strategy that can be maintained even when the sea level rises by several meters [69]. With the help of tight rules, the choice menu for participants is limited, which leads to less uncertainty for those authorities responsible for maintaining flood-risk norms. Adopting MLS requires the courage to be open to a more ambiguous problem definition that necessitates mutual adjustment, exploratory strategies, and solutions that can only be realized with the help of all actors involved. Furthermore, the current governance approach is not only the simpler one; it is also a deeply embodied, path-dependent repertoire within the flood-risk domain [1]. There are strong self-reinforcing mechanisms in this domain. Not only high sunk costs (because of the existing infrastructure of flood defenses) but also learning and coordination effects make it difficult to leave the existing path [70]. The Dutch excel at flood protection, which causes a classical success trap [71].

5. Conclusions

In this article, we have developed a refined way to study governance approaches by distinguishing several dimensions, which together define and form tighter or looser approaches. The seven rules developed in this article, on the basis of the IAD framework [8], provide more insight into different

elements of what can constitute a more polycentric and adaptive governance approach that can enhance resilient socio-ecological systems confronted with climate-related risks, and this approach proved to be a suitable analytical lens to study such issues. The seven rules give rich and in-depth insight into a complex governance arena. It has shown to be a holistic framework that can grasp the hybridity of governance arrangements and allows for comparison of approaches and over time.

By means of these rules, we have described the attempt to reinvent the governance of flood risk in the Netherlands. Following advice from the Dutch Delta Commission to reframe the issue, to re-configure the governance approach, and to have an open eye for new problem frameworks and solutions, an innovative policy concept was introduced: MLS. This concept, envisioned to enlarge the adaptivity of the Dutch flood-risk governance approach, was built on the idea that the core of the existing policy paradigm, focusing upon prevention, had to be exchanged for the idea of risk reduction, meaning that both the probability of a flood and its consequences are leverage points for measures. Policymakers saw MLS as a way to enlarge the scope of possibilities beyond the traditional focus on dike enforcement. Furthermore, it began a search for more polycentric and regional governance approaches, in which various actors can develop ideas or take measures that contribute to flood-risk reduction. In a couple of cases, this idea was piloted, and many interesting ideas were developed. However, the ultimate governance approach that resulted constitutes a much less adaptive and loose approach compared to the one envisioned.

The Dutch case of flood safety governance serves as a poignant example of an attempt to introduce an alternative governance approach based upon the idea of Ostrom to promote polycentricity and adaptivity in governance approaches. However, as demonstrated, this attempt also presupposes that previously successful taming strategies and paths have to be abandoned once a new approach is decided upon. Our case illustrates that untaming is not only highly controversial (because of the current frame that the government has to safeguard the people against flooding) but also institutionally very difficult due to the high institutional density and opacity of the current flood-risk domain. Taming strategies are firmly anchored in existing institutional practices. Therefore, the lead actors—the small group of established actors—demarcated and reframed the problem again as a tame issue to ensure safety by means of protective measures.

Presenting only one single case study from a rather particular domain (flood management) in a country with a strong tradition in this respect (the Netherlands), we must be cautious about drawing strong conclusions regarding the possibilities for untaming complex issues. The question becomes how we can successfully ‘untame’ different issues in different contexts in such a way that people dare to adopt the new kind of governance approaches that allow for exploration and deliberation. The answer to this question will differ amongst policy domains. Future research can focus on the untaming issue in other domains, to see whether this approach is attainable in other ways, by other actors and other approaches. However, from our case, we can conclude that acknowledging the power of path-dependency mechanisms and thinking about a strategy to mitigate them are indispensable steps for successfully untaming issues that (apparently) were successfully tamed for a long time.

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