



Editorial

Flood Risk Governance for More Resilience—Reviewing the Special Issue’s Contribution to Existing Insights

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Abstract: There is lively scholarly and societal debate on the need to diversify flood risk management strategies to contribute to more flood resilience. The latter requires dedicated governance strategies related to which relevant insights are currently emerging. However, more systematic theoretical and empirical insights on how to specify and implement governance strategies are still urgently needed. The Special Issue ‘Flood Risk Governance for More Resilience’ has brought together nine contributions by renowned flood risk governance scholars that together help to unpack lessons about these governance strategies. This Special Issue’s editorial introduces the debate on flood risk governance for more resilience and presents the key findings of the individual contributions to the Special Issue. We show that flood risk governance arrangements in specific regions in the Netherlands, Germany, Switzerland, Bangladesh, France, and Mexico are gradually evolving. A common denominator is that more horizontal forms of governance are under development in which a more diverse array of public and private actors—including citizens, as well as different sectors, is becoming involved. Efforts are underway to establish connectivity between actors, levels, and sectors, both through regional and international exchanges. While lessons on how to do the former successfully are emerging, we notice that these should still be unpacked more fully. Moreover, there is still a need to establish a more open and inclusive societal debate on societal preferences regarding flood risk protection in which all actors with a stake in flood risk governance processes and outcomes can participate.

Keywords: flood risk governance; resilience; adaptation; learning; science-policy interactions; interdisciplinarity

1. Introduction: Debate on Resilient Flood Risk Governance

Flood risks have been increasing worldwide in the last decades. As a result, fundamental and long-lasting assumptions in our understanding of how to deal with floods are being questioned [1–3]. A basic tenet of water managers used to be that physical conditions are relatively stable. However, climate change induces changes in the very nature of these physical conditions [4]. Second, ongoing urbanization exacerbates flood risks in many regions, mostly in deltas [5]. Third, it is increasingly argued that flood risk management cannot be organized solely in a top-down fashion, with national governments, in particular their offices of Public Works, in a leading position [6]. Recent insights show that the long-held belief in our capacity to control natural processes and the wish to adopt managerial reactions have missed the point. Fourth, in accordance with the more general transformation in functioning of public administrations, starting with the participatory revolution in the 1970s, new actors and social groups aspired to have a voice in flood management. On top of all this, since the 1980s,

market-based logics have been introduced to the formerly state-controlled water sector. These four factors challenge the predict-and-control approach that was dominant in flood risk management until recently.

The notion of flood risk governance (FRG) was coined in this respect, depicting a new organizational approach [6], which addresses the turn from flood defense to flood risk management [7,8] and the growing role of previously disregarded stakeholders. Bergsma [3] treats FRG as a distinctly different form of dealing with floods as compared with the welfare state model that forms the backbone of more traditional approaches. First of all, the models differ in terms of the values they rely on. The welfare state model assumes that a centralized actor takes care of the public interest and collects resources to achieve this aim. A basic principle of this model is that flood managers should provide security defined as, ideally, absolute protection. Contrary to the welfare state model, the FRG value system implies that a wide array of public and private actors, including the ones at the local level, becomes involved in FRG. Such diversification of the actor base is expected to allow for cost sharing and more efficient information exchange. Additionally, and more widely debated, the FRG model accepts that not all floods can always be prevented and there will be inevitable losses. The task is to manage these losses by minimizing them in order to make them acceptable. In this respect, Kundzewicz et al. [9] write about the need to move from a 'fail-safe' system to a system that is 'safe-to-fail'.

The involvement of multiple actors, levels, and sectors in FRG implies that multiple types of solutions, but also potentially competing interests, are brought to the table. This makes governance systems more network-like, as opposed to a top-down management setting based on a deterministic view of nature and social life. We witness the effects of this in practice. On the policy level, the discussions on available flood risk management options have started to become more open for stakeholders willing to participate. More often than not, skilled and professionally trained hydrologists have started to be one of the involved groups instead of the ultimate solution provider. As part of this overall shift towards more multi-actor and decentralized governance, as observed in several countries [10], the need for participatory processes has been institutionalized in legal systems. Mandatory stakeholder consultation on implementation, as laid down within the EU Water Framework Directive, is a case in point. Participatory processes in a European context also received a boost through the Aarhus Convention that establishes rights of the public to access environmental information, public participation and justice (<https://ec.europa.eu/environment/aarhus/>).

Within the flood risk governance debate, new concepts were incorporated. Notably, the notion of resilience has been translated from the field of ecology in which it emerged. In the past years, the resilience notion has been specified for the floods domain, systematically unpacked and translated into governance strategies [5,10,11]. A core tenet of thinking in terms of flood resilience is to search for integrated flood risk management approaches that comprise multiple probability and consequence-reducing strategies. These strategies need to be adjusted to local conditions [5,8,10]. A diversity of strategies is key to advancing flood resilience [11]. The discussion on flood risk governance for more resilience requires input from different perspectives and is therefore inherently multi-disciplinary [8]. Besides hydrological and technical sciences, perspectives of public administration, law, human geography, ecology, amongst others also have the potential to contribute to advancements of more resilient governance settings.

The Special Issue 'Flood Risk Governance for More Resilience' aims to build on the emerging insights referred to above. Apart from the editorial, it includes nine papers from diverse geographical contexts that adopt a diversity of multi-disciplinary perspectives. The current paper provides an overview of the Special Issue and reflects on its contribution to the existing state of the art. In order to do so, section two first provides a rough sketch of current knowledge on flood risk governance for more resilience by discussing some recent well-informed contributions to the debate. This leads to the identification of relevant insights, but also apparent knowledge gaps regarding the aforementioned roles of citizens and stakeholders, FRM policies and measures, and tools. Section three presents the key findings of each of the nine papers in the Special Issue. In section four, we wrap up by reflecting on the

papers' joint contribution to the identified knowledge gap and present a revised research agenda for studies into resilient flood risk governance.

2. State of the Art: Knowledge Gaps and Proposed Future Directions in FRG Literature

2.1. Knowledge Gaps in FRG Literature

A growing literature has explored the application and specification of the resilience concept to the floods domain. In 2018, Morrison et al. [12] assessed the last decade of scholarship in this field and from this distilled five key avenues for further inquiry:

1. Stakeholder engagement is an often-explored topic. The role of citizens and stakeholders and methods of citizen and stakeholder involvement in FRM have been investigated in terms of public participation, collaboration, co-production, communication between groups, networks, relations between stakeholders and governmental agencies, and perceptions of flood risk, amongst other themes [13–16].
2. Flood risk management policies and their changes have been analyzed in terms of their assumptions, consequences, and alternatives. This critical literature relies on particular cases or explores possibilities for shallow modifications of FRG policies or more profound paradigmatic change.
3. FRG policies have been analyzed in terms of their implementation, feasibility, performance, investigating their structures, assumptions, and limitations.
4. A significant body of literature focuses on tools for modeling and predicting the direct and indirect effects of flood risk. A large part of this research lies within the natural and engineering sciences.
5. There is an emerging body of literature on governance frameworks. This body of literature analyses integrative organizational, conceptual, and research environments enabling or hampering FRG practices [5].

While Morrison et al. focused on scholarship pertaining to governance for more resilience, McClymont et al. [8] centered more on the dependent variable of what resilience entails and what it is that should be made more resilient. They differentiate between three conceptualizations of flood resilience employed by scholars: engineering resilience, systems resilience, and complex adaptive systems resilience. The authors observe that seldom are all three frameworks taken into account in the analyses, with only 15% of papers covering all three frameworks. In addition, the authors found that studies are restricted in terms of the precise topics they include as elements of resilience. For example, they observe that at larger spatial scales, resilience is often used interchangeably with resistance, a concept with a different normative starting point. Another case in point is that in terms of flood risk management strategies, studies often focus on flood recovery.

According to McClymont et al. [8], a key knowledge gap is the actual and necessary division of responsibilities between actors. They notice a shift in responsibilities from state protection to individual responsibility [3]. They argue, though, that this shift is highly geographically and institutionally situated. Processes leading to or hampering resilience can be strikingly different in the well-developed countries and in the Global South. In addition, across contexts, top-down and bottom-up approaches in building resilience need to be combined in a multi-level governance framework. The authors note that the aforementioned issues are being experimented with in practice, but we still lack systematic insights on how to allocate responsibilities.

The contributions by Morrison et al. [12] and McClymont et al. [8] provide an overview of important knowledge gaps and challenges for research. Morrison et al. emphasize that more specific insights are needed to enhance connectivity in several respects in order to address (institutional) fragmentation: (1) They point at the need to better connect natural and social science-based contributions. Now they are often separated, amongst other reasons because they are fueled by different flows of research funding. (2) They observe that knowledge-action networks need to be strengthened to improve the

science-policy interface in flood risk governance. (3) They point out the need to establish connectivity between professionals and stakeholders and see a lack of tools to address this social dimension of flooding. (4) They point out the need to integrate insights arising from governance research and governance models external to the floods domain into flood risk management literature.

Morrison et al. [12] acknowledge that some progress has been made in relation to the aforementioned knowledge gaps. They show that studies on modeling tools and on stakeholder engagement and public participation have been getting increasing attention. In addition, notable advances have been made regarding the translation of governance-related knowledge to the floods domain. Nevertheless, more progress is still to be made and, in particular, the operationalization of flood resilience requires more research, as also argued by McClymont et al. [8].

2.2. Proposed Future Directions in FRG Policy and Practice

While engaging with the aforementioned debate on flood risk governance for more resilience, Driessen et al. [5] proposed six governance strategies for improving flood resilience in the face of climate change. These have been identified based on comparative empirical research in a European context; hence, these lessons have been empirically validated to some extent, albeit mostly for Europe.

1. Pursue a context-sensitive diversification of strategies: it has been shown that relying on a roster of strategies is conducive to flood resilience, but not all strategies are equally feasible and desirable in all contexts [10].
2. Establish connectivity: flood risk management strategies should be linked together and aligned, not stay isolated. Involvement of different sectors (water management/spatial planning/disaster management) is needed [12].
3. Involve a wide array of public and private actors: flood risk governance, especially the implementation of strategies other than flood defense, requires increased involvement of private actors including residents, businesses, and NGOs.
4. Issue adequate rules and regulations: rules and regulations that provide legal certainty and respect the rule of law, but at the same time, allow for future flexibility are needed.
5. Ensure that a diversity of financial and non-financial resources is present. In terms of finances, partnership funding, as has been thoroughly assessed in a UK context, is a noteworthy development [17]. In terms of non-monetary resources, the development of tailor-made climate services that may help translate science into action is a prominent recent development [18].
6. Initiate open and inclusive societal debate. This is expected to lead to the adoption of certain normative principles as the outcome of a political discussion.

These strategies have some degree of generalizability as they have been validated in different contexts in Europe while their validity in other contexts is plausible. To the best of our knowledge, these strategies constitute the most encompassing overview of necessary improvements in flood risk governance literature and practice. Therefore, the current paper uses these strategies to organize the key findings of the Special Issue.

3. Logic and Outline of the Special Issue

In this Special Issue, nine papers deal with various aspects of 'Flood Risk Governance for More Resilience'. Eight papers cover a variety of cases in different countries while one paper is a review paper. Section 3.1 first discusses the key findings of each of the nine papers in the Special Issue in turn. Next, Section 3.2 links these key findings to the six aforementioned governance strategies for improving flood resilience and discusses the contribution of each paper to these strategies.

3.1. A Summary of Papers of the Special Issue

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

Astrid Molenveld and Arwin van Buuren [19] have analyzed the discursive shift towards more resilience-based approaches in the Netherlands that took place at the end of the 2000s as well as its implications for flood risk governance practice. At that time, the multilayered safety concept (MLS) was coined and started to be discussed. MLS is a policy concept designed for adaptive flood risk management in the Netherlands. The authors took an innovative conceptual approach by using Elinor Ostrom's Institutional Analysis and Design (IAD) framework to analyze this shift. Relying on her polycentric and adaptive governance framework, they were able to point out a concrete timing of the shift, as they compared the FRG approaches before and after the year 2008. The multi-layered safety approach was introduced as a part of the Dutch Delta Program. It aimed to produce more adaptive FRG as it involved a more polycentric and loosely structured institutional regime. This new regime was to be more inclusive and it was to stem from collaboration of wide set of stakeholders. The 'multilayered safety' policy was intended to be loose but in practice it was found to be fairly tight, i.e., a system where rules strictly determine adaptation action. Authors attribute this relative failure to the fact that dealing with floods has deliberately been presented as a 'tame' problem for decades, which means that existing solutions turned into an institutionalized and hard to change routine. As the authors conclude, 'adopting a more adaptive and polycentric approach necessitates 'untaming' the issue of flood safety'. Issues that have been taken for granted need to be put on the table for discussion in an open debate.

3.1.2. Social Learning in Multilevel Flood Risk Governance: Lessons from the Dutch 'Room for the River Program'

Learning and accumulation of knowledge among actors is widely acknowledged [20] as crucial for water and flood risk governance in particular. Jacomien den Boer, Carel Dieperink and Farhad Mukharov [21] looked at factors influencing learning processes. The authors analyze the example of the Dutch 'Room for the River Program' to identify enabling conditions for social learning in multi-level flood risk governance arrangements. They integrated concepts present in FRG: adaptive co-management, sustainable land and water management, and integrated flood risk management, concluding that all these concepts assume that social learning is a multi-level and multi-stakeholder governance challenge. Thus, cooperation occurs between different sectors, including those of water management, spatial planning, and disaster management. Cross-sectoral cooperation is arguably challenging in itself. It appears even more difficult though, if multilevel cooperation is involved. The study differentiates between four types of factors influencing a cooperation and learning process: attributes of engaged individuals; collaborative arena factors (e.g., mutual trust, communication); organizational factors (e.g., cooperation structures, knowledge sources); and external factors (e.g., crisis events, administrative procedures). Examination of the Dutch Room for the River Program showed that a strong personal commitment to learning and mutual inter-personal trust in working groups were key conditions for successful social learning. External factors played a less significant role.

3.1.3. City-To-City Learning for Urban Resilience: The Case of Water Squares in Rotterdam and Mexico City

Similarly to den Boer et al. [21], Silvana Ilgen, Frans Sengers and Arjan Wardekker [22] have studied city-to-city learning for urban resilience. They assessed the on the ground implementation of water squares in Rotterdam and Mexico City and therewith provided important insights about the functioning of knowledge-action networks (in Morrison et al.'s terms [12]). A key finding of the paper is that city-to-city learning took place within identifiable phases: exploration and marketing (phase 1), building pipelines (phase 2), translation and adoption (phase 3), and internalization and reflection (phase 4). The authors point out that it was critical in a first phase to analyze one's own

systems, strengths, and weaknesses, rather than performing an outward-looking search for knowledge or mentees. Next, cities reframed their own narratives to match those of their counterparts as a way to create a mutual understanding of each other's developments. A process of policy and knowledge exchange could take place because of that. However, strong leadership turned out to be necessary to make sure that the acquired knowledge was implemented and retained. Fourth and finally, the authors stress that 'by internalizing such lessons, cities might strengthen not only their own resilience, but also enhance future exchanges with other cities'.

3.1.4. Pluvial Flooding in Utrecht: On Its Way to a Flood-Proof City

Citizen engagement is recognized as an important issue in order to make progress in flood risk governance and hence a recognized study area in flood risk governance analyses. Romy Brockhoff, Steven Koop, and Karin Snel [23] have assessed the topic in the case of pluvial flooding in Utrecht. They assessed to what extent the necessary governance capacities to make the city prepared for pluvial flooding have been developed within the city. The authors depart from the viewpoint that pluvial flooding can be addressed by a single actor that is in the lead, such as the municipality, and indicate that addressing pluvial flooding requires the involvement and engagement of a diverse set of actors, including citizens. Applying the governance capacity framework to the city of Utrecht, the authors found that most governance capacities needed to address pluvial flooding have been relatively well-developed: 'collaboration between public authorities is advanced, sufficient financial resources are available, and smart monitoring that enables high levels of evaluation and learning.' Citizen awareness and engagement is, however, in need of further development. The authors recommend developing financial incentives that invite citizens to take measures to address pluvial flooding on their own properties and advise to further develop arrangements for active citizen engagement. The authors argue that these recommendations are valid for other urbanized areas that will face increased problems with pluvial flooding.

3.1.5. Exploring Science-Policy Interactions in a Technical Policy Field: Climate Change and Flood Risk Management in Austria, Southern Germany, and Switzerland

Science is an important factor in FRG. Scientific evidence and expertise deliver solutions and justification for FRG policies and management. Ralf Nordbeck, Lukas Loeschner, Melani Pelaez Jara and Michael Pregernig [24] in their paper on science-policy interactions in the field of flood risk governance analyzed three Alpine regions, in Switzerland, South Germany, and Austria. They assess science-policy interactions from three perspectives: (i) dynamics of knowledge creation; (ii) institutionalization of the science-policy interface; and (iii) pathways of influence of expertise on policy development. The authors found increasing influence of climate change on flood risk governance in the selected regions. Policies to address climate change were supported by evidence-based arguments. The influence of experts was significant; however, it was mediated by national factors. This social embeddedness of expertise was heavily mediated by the 'political climate'. Scientists had to adjust their knowledge to have their expertise recognized. Notably, in South Germany, the high political profile of the climate change issue inclined scientists to recommend climate change as a significant factor despite a very uncertain scientific basis.

3.1.6. The Costs of Living with Floods in the Jamuna Floodplain in Bangladesh

Ruknul Ferdous, Anna Wesselink, Luigia Brandimarte, Kymo Slager, Margreet Zvartheven, and Giuliano di Baldassarre [25] assessed how residents of the Jamuna floodplain in Bangladesh responded to flood events. Flood resilience literature often stresses that external shocks can induce learning and therewith facilitate adaptation and transformation, ultimately leading to a more resilient state [26]. A study by Ferdous et al. [25] challenges this assumption. They found that Bangladeshi people do develop strategies to cope with floods, such as relocation, temporary evacuation, change in cropping patterns, and supplementing their income from migrating household members. While these

strategies facilitate short-term coping and reduce the negative impact of floods on their livelihoods, they do not prevent impoverishment. The authors conclude that the inhabitants of the Jamuna floodplain do not achieve successful adaptation and that gradually their situation worsens.

3.1.7. Adaptive Capacities for Diversified Flood Risk Management Strategies: Learning from Pilot Projects

The development of diversified flood risk governance is a process that requires both a vision and capacities. Flavia Simona Cosoveanu, Jean-Marie Buijs, Marloes Bakker, and Teun Terpstra [27] focus on adaptive capacities observed in the implementation of two pilot projects: 'Alblasserwaard-Vijfheerenlanden' (The Netherlands) and the 'Wesermarsch' (Germany). The projects aimed at enhancement of the integration of mitigation and preparedness measures. The authors looked for capacities that were missing, employed, and developed throughout the implementation, via the lens of the Adaptive Capacity Wheel that identifies 22 adaptation capacities instrumental in organizational adaptation, and the Triple Loop Learning approach, that measures the depth of learning in an organization. The study found three capacities particularly important to diversify the current form of Flood Risk Management: the capacity to develop a greater variety of solutions, continuous access to information about diversified FRMS, and collaborative leadership. The authors furthermore found that, in both cases, mostly shallow as opposed to deep learning took place. The study suggests that changing FRG to make it more diversified faces organizational hurdles, as in any organizational change. Thus, any process of updating FRG requires taking into account and anticipating a certain level of organizational resistance.

3.1.8. Reducing Hydro-Meteorological Risk by Nature-Based Solutions: What Do We Know about People's Perceptions?

The recently developed concept of Nature Based Solutions (NBS) points at the possibility of developing approaches 'to sustainably reduce hydro-meteorological risks, providing co-benefits for both ecosystems and affected people'. This way, such approaches are supported by nature, and are cost-effective and conducive to resilience. Sungju Han and Christian Kuhlicke [28] reviewed factors shaping people's perceptions of NBS as a means to reduce hydro-meteorological risks, including floods. The authors identified the following six core topics within which perceptions of NBS were discussed: (1) valuation of the co-benefits; (2) evaluation of risk reduction efficacy; (3) stakeholder participation; (4) socio-economic and location-specific conditions; (5) environmental attitude, and (6) uncertainty. The authors noted ambiguous and even contradictory results of the studies and propose a conceptual model for future research. The model comprises socio-economic-demographic conditions, operational knowledge, trust, threat appraisal, environmental attitudes, and direct interaction with NBS.

3.1.9. What Can We Learn from Planning Instruments in Flood Prevention? Comparative Illustration to Highlight the Challenges of Governance in Europe

Planning is crucial for flood governance. Mathilde Grapois, in her paper [29], examines flood prevention planning instruments in three European countries: England, France, and the Netherlands. Maps were shown to be a vital and powerful tool in flood governance, in accordance with the Flood Directive requirements. Maps were not only geographical representations of territories, but—more importantly—a part of legal zoning, excluding certain types of land use. However, as socio-technical objects, flood maps are negotiated by actors engaged in their preparation and application. Grapois claims that this process laid bare tensions that hamper a potentially beneficial role of planning in flood risk governance. Firstly, local spatial planning often conflicts with flood prevention policies implemented by national authorities. Local bodies often have more precise data and expertise and challenge the strict approach of the central administrations. In England, local planning authorities often disregard the non-mandatory recommendations of the central authorities, in order to continue local development. The situation in France is a manifestation of local authorities' pursuit to extend

their autonomy. In the Netherlands, the situation is more balanced. The Water Impact Assessment is a mandatory procedural instrument to ensure that local plans fit the national criteria, but it is non-binding. Secondly, there is tension in professional culture between planning and prevention, which results in different preferences concerning instruments. The flood management administration prefers instruments referring to hydraulic models. Within the planning domain, allocation of land for different purposes and local development is the main concern. As a result, establishing a platform allowing debate and reconciliation of interests and expertise could contribute to balancing flood prevention and development needs. In France the Flood Risk Prevention Plan, and in the Netherlands, the Water Impact Assessment can play such a role.

3.2. Contribution of the Special Issue to the Discussion about Governance Strategies for Improving Flood Resilience

3.2.1. Context-Sensitive Diversification of Strategies

Several papers in the Special Issue contributed insights to the governance strategy of achieving a context-sensitive diversification of strategies. Molenveld and Van Buuren [19] illustrated the challenges of discussing and implementing such a diversification in the Netherlands, a country that had relied on predict-and-control approaches and flood defense for decades. They showed that several path-dependency mechanisms may have a tendency to reduce the scope of the debate on diversification of flood risk management strategies and may water down its implementation in practice. In the words of the authors, multi-layered safety was introduced at a time in which flood risk governance was a 'tame' issue, while the issue would have needed 'untaming' first. Regarding context-sensitivity, Ilgen et al. [22] identified an interesting mechanism. They showed that city-to-city learning processes can induce processes of international inter-city comparison, in which actors analyze their own systems and deliberately reframe their own narratives. Gralepois [29] showed that the difference in professional culture between planning and prevention hinders flexibility in applying instruments. In addition, in centralized flood risk governance, actors tend to favor the application of standardized instruments. However, the tension between the need for coordination and the necessity to take local interests into account needs to be acknowledged and addressed. In line with this claim, Cosoveanu et al. [27] showed that pilot projects can provide learning experiences for achieving diversified flood risk management. However, it remains challenging to achieve forms of second order learning that invite actors to reconsider dominant approaches and assumptions. There is a tendency to return to business as usual since higher order learning may lead to resistance. The papers together focus mainly on the policy side of FRG. In particular, factors hampering and enhancing the diversification of flood risk governance strategies have been revealed.

3.2.2. Involvement of Different Sectors in Flood Risk Management Strategies

Ilgen et al. [22] concur with the need to involve a wide range of sectors. They point at mechanisms that can enhance city-to-city learning. They show that what is first needed is to enhance connectivity within and knowledge of their own water governance system. This is a prerequisite to engage in city-to-city learning. In addition, den Boer et al. [21] unpack this key governance strategy. They claim that flood risk management strategies should be linked together and aligned, not stay isolated. Involvement of different sectors (water management/spatial planning/disaster management) is needed. Den Boer et al. argue, on the one hand, that social learning requires multi-sector and multi-level cooperation. On the other hand, they presuppose that integration between different sectors requires and to some extent enables social learning. Gralepois [29] underlines difficulties in cooperation between planners and flood prevention specialists. Examination of the Dutch Room for the River Program showed that a strong personal commitment to learning and mutual inter-personal trust in working groups were key conditions for successful social learning. External factors played a less significant role. This lesson also recurs in the paper by Brockhoff et al. [23]. They show that pluvial flooding requires

the engagement of a diverse set of actors from different sectors and reveal the challenges related to their involvement. These papers explore the topic of stakeholder engagement in FRG. Barriers in engagement of sectors have been indicated as well as difficulties related to an engagement process. The need for learning is articulated in particular.

3.2.3. Involvement of Private Actors Including Residents, Businesses, and NGOs

Iligen et al. [22] note the need to involve private actors in building urban resilience. In addition, Molenveld and Van Buuren [19] have seen increased involvement of other types of actors in flood risk governance. They note, though, that it is difficult to involve these private actors in a Dutch context. Often, newly entering actors are still public rather than private ones. Broadening the actor base—referred to by the authors as achieving more polycentricity as well as becoming more adaptive and less static—is not something that can be achieved overnight. The authors show that in the Dutch case this requires a re-politicization or, in the terms of the authors, an un-taming of a tame problem. Brockhoff et al. [23] claim that pluvial flooding requires the engagement of citizens. Amongst all resources, the substantive contribution that citizens can offer to address pluvial flooding is most in need of improvement. Han and Kuhlicke [28] contributed to the theme of actor involvement by studying a specific response to flood risks: nature-based solutions. They highlighted several relevant elements that co-determine the perception of different types of actors of these nature-based solutions as described in the previous sub-section. These papers contribute to the research gap concerning stakeholder engagement and the reshuffle of responsibilities, from the state to private actors and residents. The studies note both pulling and blocking factors in this respect. The studies suggest that engagement of private actors can be a postulate difficult to achieve due to institutional, economic, and social reasons.

3.2.4. Rules and Regulations

Gralepois' paper [29] focuses on instruments applied in flood risk governance in England, France, and the Netherlands. In all three countries, legal instruments dominate. Moreover, the hierarchical legal structure leaves limited space for diversification of policy instruments. Rules and regulations are implicitly discussed in the papers of the Special Issue, although Molenveld and Van Buuren [19] touch upon this issue when they point at a 'loose' vs. a 'tight' implementation of the multi-layered safety policy, which alludes to the fact that existing rules and regulations in some cases may have a tendency to reinforce stability and path dependency. These papers contribute to the research gap concerning flood risk management policies. The dominant role of legal instruments and their stabilizing character are noted.

3.2.5. Financial and Non-Financial Resources

Ferdous et al. [25] point out the fact that dealing with flooding in a Bangladeshi context can also lead to a vicious circle where coping strategies cannot prevent negative long-term outcomes such as impoverishment. In terms of strategy number five: the resource base (in particular: human capital, but also livelihood resources) is steadily declining, which undermines communities' resilience.

Nordbeck et al. [24] shed light on specific resources for improving flood resilience in the face of climate change. They point to the importance of science-policy interfaces and their role in making flood risk governance climate-sensitive. They show how climate-related information is used in Switzerland, South-Germany, and Austria. The mechanisms through which this information was used differed in the three countries, but in all cases reliance on experts and on evidence-based information was high. The paper shows, however, that the extent to and ways in which scientists' expertise was recognized depended on the political climate in the different countries. Brockhoff et al. [23] in their paper write, amongst other resources, about the substantive contribution that citizens can offer to address pluvial flooding. This resource is said to be most in need of cultivation. Cosoveanu et al. [27] in their assessment of adaptive capacities for diversified flood risk management in two case studies

found that three types of capacities are particularly important: the capacity to develop a greater variety of solutions, continuous access to information about diversified FRMS, and collaborative leadership. The issue of resources dealt with in the papers refers to the division of responsibility between state and non-state actors and flood risk governance policies in general. The studies reveal that significant resources can be found in the state, and in the private sector, the use of the private sector resources is conditional. Moreover, the resources are vulnerable.

3.2.6. Open and Inclusive Societal Debate

The paper by Molenveld and Van Buuren [19] is the only paper that explicitly addresses the need for an open and inclusive societal debate. The forms of re-politicization or un-taming pleaded for by the authors can be seen as a specific way to implement governance strategy number six of Driessen et al. [5]: to achieve an open and inclusive societal debate that leads to the adoption of certain normative principles as the outcome of a political discussion. While the other papers do not address this last governance strategy explicitly, they all implicitly hint at it. Recurring issues in all contributions are that different types of actors are becoming and have to become involved in flood risk governance; that these may have different viewpoints and often vested interests; that institutional change is necessary, and that there are various mechanisms that make institutions relatively inert to change. This is a setting in which, arguably, the need to put un-debated issues up to deliberation again becomes increasingly important. Moreover, the paper by Ferdous et al. [25] strongly points to the potential detrimental and/or distributive effects that a resilience discourse may have, in addition to several positive effects. This shows all the more how important it is that flood risk governance is debated by diverse societal actors.

4. Concluding Remarks and Suggestions for Future Research

The nine contributions to the Special Issue 'Flood Risk Governance for More Resilience' together have advanced the state of the art in scholarship on flood risk governance. At the same time, they have also laid bare the limitations that this literature still has. A dominant message that can be derived from the papers is that more horizontal forms of governance are being developed in which a more diverse array of public and private actors, including citizens as well as a diverse array of sectors is becoming involved. Efforts are underway to establish connectivity between actors, levels, and sectors, both through regional and international exchanges. The diversity of lessons provided by the papers in the current Special Issue signals the even larger diversity existing in empirical reality. Despite recent progress, including in this Special Issue, it is safe to say that the empirical knowledge base regarding governance strategies for achieving flood resilience still needs to be significantly expanded, whereby different aspects of the six governance strategies for more resilience should be further unpacked. We also note that there is still a need to expand the geographical scope.

Secondly, although the papers demonstrate engagement of various actors within FRG, analyses of the mechanisms through which participation is taking place and the underlying power relations remain a bit shallow. It seems that actor participation often takes place through mechanisms close to cooptation, but these mechanisms are not yet systematically unpacked. In particular, within and between actor conflicts are hardly explored. It is an open question whether these issues of power in participation are missing because they would add too much complexity to research, or that conflicts are "suppressed" in FRG and do not appear as an issue. In any case, it seems unlikely that FRG is always a non-zero-sum game with winners only. Exploration of this aspect is an area for future studies.

A third key message, one closely related to the second, is that the scope of normative debates on what flood resilience entails and who should be resilient to what is still too limited in scope, both in literature and in practice. The Special Issue reconfirms the finding of Driessen et al. [5] that normative debates are often absent or not accessible to all actors with a stake in flood risk governance processes and outcomes. Further lessons on how to improve this practice need to be drawn.

An element in scholarly literature that is relevant here is that insights from the natural and social sciences are often still separated. While flood perception is addressed in FRG studies, most literature adopts a ‘realist’ approach to the environment. We endorse the suggestion by Birkholz et al. [30] to add more constructivist studies that try to unpack how flood risks and flood risk management approaches are understood, interpreted, framed, and given meaning and how this influences the terms of the debate, including the substantive outcomes for different types of stakeholders in terms of dynamics in power relations and in terms of actual flood protection. Another aspect of the uneasy relation between the social and the natural sciences that appears in the papers is a weak reference to the concepts worked out in the water management literature. For instance, the concept of Integrated Water Resource Management necessitates looking at the processes using the river basin scale as a unit of analysis. This is hardly done in the studies.

The Special Issue combines the notion of flood risk governance with the notion of resilience. The papers discuss several factors enhancing resilience: necessity of learning [22,27]; organizational capacities [22,27]; the role of changes in narratives [22]; infrastructural individual/communal capacities [25]; the role of citizens’ engagement [23]; citizen awareness and engagement [23]; “taming” of new policies [19]; problem solving capacities [23]; knowledge/expertise production and application [24]; personal commitment to learning and mutual interpersonal trust [21]. Whether the analyzed influence of particular factors is idiosyncratic or representative of more general patterns is an issue to be corroborated. Notably, the claim by Ferdous et al. [25] that presence of diverse strategies does not automatically imply resilience is deserving of further research.

The papers of this Special Issue rely mostly on case studies. They offer in-depth insights into the process and organization of flood risk governance. A problem with case study research is its limited external validity. In terms of the need for cumulative research, some sort of meta-language would need to be used by researchers to make findings comparable. The key themes of Section 3.2 may provide a first exploration towards such a meta-language.

We encourage scholars and practitioners from diverse scientific perspectives to contribute further to these debates.

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