

Flood risk management strategies across boundaries: a research approach

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ABSTRACT

Floods are the most frequent and damaging of all types of natural disasters and annually affect the lives of millions all over the globe. Against this background, enhanced climate variability and climate change are expected to increase the frequency and intensity of floods. The situation is further complicated by the Transboundary nature of water, making Transboundary cooperation on integrated flood risk management not only necessary, but highly beneficial as well. Unfortunately, numerous challenges hamper effective Transboundary cooperation in general and cooperation on Transboundary flood management in particular, thereby increasing vulnerability to floods.

Flood Risk Management Strategies (FRMSs) are designed to make vulnerable urban regions more resilient to flooding. This likely requires changes in their institutional embedding. Insights into this institutional embedding of FRMSs so far is, however, rather limited and fragmented. In this paper we argue that such insights can be created by drawing upon and combining public administration and legal expertise. To make a start with the latter, we introduce the Transboundary Flood Risks Governance Arrangements (TFRGAs) approach. In the EU-funded STARFLOOD-project we will use this approach to carry out comparative research to further elaborate the approach.

KEY WORDS: *Floods, flood risk governance arrangements, Transboundary water management, water governance.*

INTRODUCTION

Floods are among the world's most frequent and damaging types of disaster and annually affect the lives of millions all over the globe. Over time and with population growth, climate related factors aggravated by urbanization and social, economic and political processes have massively increased and will continue to increase human exposure and vulnerability to floods. Nonetheless, social-scientific, institutional and legal studies on Transboundary flood risk management are rare, fragmented and limited in scope, while at the same time the governance of Transboundary floods, i.e. floods that originate in one country or jurisdiction and then propagate downstream to another country or jurisdiction, is still poorly understood.

Relevant conceptual work has been done (e.g. the adaptive capacity wheel as developed by Gupta *et al.* as well as Kuhlicke *et al.*'s model of social capacity building). However, the application of these and other approaches to the domain of flood risk governance is still in its infancy (see Van Den Brink *et al.*, 2011). When it comes to vulnerability to floods, previous studies have focused on all flood type data for specific countries or continents (Hoyois & Guha-Sapir, 2003), or looked at general statistics of various natural disasters on a worldwide scale (Haque, 2003; Guha-Sapir *et al.*, 2004; Mutter, 2005). Others have focused on a single (historical) flood event single river, a single country or combinations of these topics. Only recently have researchers begun to analyze flood data on a global scale (Bakker, 2006; Hossain & Katiyar, 2006), and although rivers ignore political boundaries and created 279 international river basins (IRBs) (TFDD, 2006, unpublished data), but few have touched upon the phenomena of shared or Transboundary floods occurring in IRBs (Bakker, 2006; Bakker, 2009; Marsalek *et al.*, 2006) let alone the governance of such events.

The EU funded study STAR-FLOOD will fill this gap in knowledge by focusing on Transboundary river flood events and linking these to social-scientific, institutional and legal studies on the topic. In doing so, insight will be provided in the necessary tools to design appropriate and resilient so-called Transboundary Flood Risk Governance Arrangements (TFRGAs). The study's final goal is to develop policy design principles for TFRGAs and to derive implications for policies and law at the Transboundary level of regional authorities. The main research question is: "What are resilient and appropriate Transboundary Flood Risk Governance Arrangements (TFRGAs) for dealing with Transboundary flood risks?" During the search for the answer to this question, both the quantitative and qualitative side of the story will be told; who is doing what, where and how when it comes to Transboundary flood governance?

Knowledge gaps

Previous research has paid relatively little attention to governance issues, while the institutional embedding of TFRGs through governance arrangements is of crucial importance for their success. In the debate about climate change and climate adaptation, both scientific scholars and policy makers increasingly point at the necessity to develop both appropriate and more resilient flood risk governance arrangements or FRGAs (Termeer *et al.*, 2011). These FRGAs, whether Transboundary or not, can include traditional government-based arrangements, but also more innovative public-private partnerships.

More societal attention to flood prevention, and mitigation, preparation and recovery complementary to traditional flood defence will have consequences for the involvement of citizens, market parties and other local stakeholders (Holling, 2001; Folke, 2006; Raadgever *et al.*, 2008) (see figure 1).

When it comes to legal frameworks, the scientific

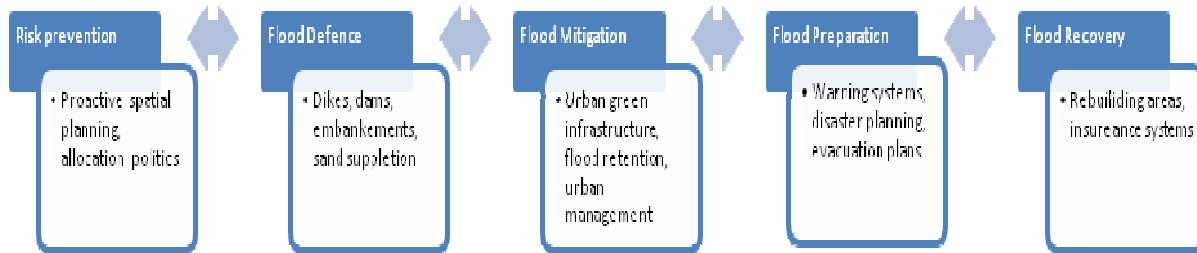


Figure 1: Five Flood Risk Strategies (FRSs) and associated typical measures

knowledge gap is even more serious. On a European level for instance, we do know that the EU has many ambitions regarding flood risk strategies (FRSs), which are exemplified by the implementation of the EU Floods Directive (2007/60/EC), the financing of projects on flood issues and adaptation, and the publication of a White Paper on climate change adaptation (2009). However, the Floods Directive and EU adaptation policies, influenced by the subsidiarity principle, leave much policy discretion in Flood Risk Governance to individual Member States. Hence, there is a substantive lack of understanding as to whether, to what extent and how legal frameworks could allow for the implementation of new FRSs. Worse still, we lack knowledge on how these legal frameworks relate to other issues, such as the involvement of communities and market parties in Flood Risk Governance. In short, there is a lack of systematic comparative empirical research on:

- The comprehensive mix of TFRGs;
- The governance arrangements through which the strategies are institutionally embedded, and
- The *appropriateness* and *resilience* of governance arrangements.

There is thus an urgent need for an integrated framework for analysing, evaluating and designing TFRGAs, bringing together all potentially relevant factors. The STAR-FLOOD research team will develop such a framework.

This paper is structured as follows. The Floods – general synopsis section introduces facts and figures on (Transboundary) floods, which is then proceeded by a brief overview of Transboundary flood management. The Methodology introduces the Policy Arrangements Approach (PAA), an analytical model from the field of environmental governance. The paper will end by explaining why Transboundary flood risk management is critical.

FLOODS – GENERAL SYNOPSIS

Judged by its likelihood and impact, climate change is number 1 and flooding number 9 in the 2011 top 10 of global risks (WEF, 2011). Last year, 100-200 million people per year were victims of floods, droughts and other water-related disasters (affected or killed); almost two-thirds could be attributed to floods. The economic value of assets at risk is expected to be around USD 45 trillion by 2050, a growth of over 340% from 2010. Floods made up well over 40% of all weather-related disasters between 1980 and 2009, storms nearly 45% and droughts 15%. The number of victims ranges between about 100 million and 200 million per year, with peaks of 300 million or more. Almost two-thirds of the victims can be attributed to floods. Droughts

and other temperature extremes account for 25% and storms the remaining 10%. Economic losses are estimated to range between USD 50-100 billion per year between 1980 and 2009. A peak of USD 220 billion reflects the Katrina disaster in the United States in 2005. Storms account for half of all losses, floods one-third and droughts almost 15% (OECD, 2012). Note that vulnerability to floods is not evenly distributed within countries and often the poorest suffer disproportionately. For example, Dhaka, Kolkata, Shanghai, Mumbai, Jakarta, Bangkok, and Ho Chi Minh City represent the cities with most people at risk to flooding and all are also situated in countries with low national GDPs per capita now and as projected in the future (OECD, 2012). Next to the millions of people exposed every year to catastrophic flooding, many more are exposed to minor or localized flood hazards that can have a cumulative dampening impact on development, but do not cause major human losses in single events. Consequently, very few countries and very few parts of the world's population are spared the effects of floods. In the period 1985-2005, a little more than 85% of all countries have experienced one or more flood events. When focusing on river floods, it is clear that the total number of river floods differs per year, but a steady increase is visible. In the period 1985-2005, river floods alone (1,760 in total) caused over 112,000 people their lives, affected more than 354,000,000 people and resulted in US\$6.9x10¹¹ in financial damages (Bakker, 2006). The number of people at risk from floods is projected to rise from 1.2 billion in 2012 to around 1.6 billion in 2050 (nearly 20% of the world's population) (OECD, 2012).

TRANSBOUNDARY FLOODS

Floods are often ignored in Transboundary water management. Yet, floods pose a real risk for downstream riparian nations and are expected to increase in frequency and intensity in some regions as a result of climate change. The failure to manage these risks can have catastrophic consequences. In a recent analysis, Bakker (2006) examined how often the phenomenon of Transboundary floods occurs. She found that, while only ten percent of all floods were shared, 75% of countries that experience river floods share this event with other countries. In a follow-up study, Bakker (2009) found that flood losses were higher in shared basins that lacked the institutional capacity, i.e. international water management bodies and freshwater treaties, for managing these events. An overwhelming 43 international river basins where Transboundary floods were frequent during the period 1985–2005 lacked the institutional capacity for managing these events.

Conversely, coordinated flood management can greatly reduce the risk of these events. Basin wide coordination of flood-management activities is critical, and integrating flood-management protocols into all Transboundary agreements could prove an effective risk-reduction tool.

FLOOD MANAGEMENT

Extreme flood events and the economic, social and environmental impacts and losses in human life they cause have significantly increased in recent years. Against this already serious background, enhanced climate variability and climate change are expected to increase the frequency and intensity of floods. On the other hand, floods are natural phenomena that can also bring benefits: seasonal floodplain inundation is essential to maintaining healthy rivers, creating new habitats, depositing silts and fertile organic material, and sustaining wetlands. The vulnerability to floods mainly depends on human activities – the location of buildings and infrastructure, the existence of early warning systems and emergency planning, appropriate legal and institutional frameworks, etc. An integrated approach to flood management – one that recognizes both the opportunities provided by floodplains for socio-economic activities and that manages the associated risks – is essential for the sustainable development of river basins.

However, flood management is complicated enough in river basins controlled by a single authority, and becomes even more challenging when dealing with Transboundary floods. Under such circumstances the demands on international cooperation and management in all aspects of flood management are particularly important, especially because institutional capacity in an international river basin (IRB) should be able to absorb changes in the basin in order to decrease the chances for conflict (Wolf *et al.*, 2003) and enhance the chances for fruitful cooperation.

But although floods are basin wide phenomena that do not respect administrative, cultural, tribal, linguistic, religious, political, or other humanly devised borders, whether they are national, regional, local, or institutional, flood management at root is and ought to be a national endeavour, especially as the sovereignty principle advocates that each nation has the right to develop its own policies, laws and institutions, and its own strategies for natural resources development and utilization principles. However, local or national flood protection measures can have negative effects both downstream and upstream. Therefore, national flood protection measures ought to always take into account possible impacts on the other riparian states they share the watercourse with. That way, measures taken within the catchment area and along the main rivers to improve safety against flooding will, theoretically, not lead to negative effects downstream. Furthermore, national efforts to protect citizens from floods need to maintain synergy with efforts at bilateral and regional levels.

Flood management should preferably have a solid national foundation with firm within-country policies, but ought to be based on the boundaries of the river basin, not on administrative or country borders. Transboundary cooperation between local and regional flood management authorities has the ability to improve the overall effectiveness of flood management services, which will eventually result in better protection of citizens and the environment and a reduction of risks and damages. To be

sure, the only way to truly approach basin-wide events like floods in an integrated manner is via Transboundary cooperation. However, Transboundary water cooperation can only emerge through efforts made by the riparians themselves. Examples of how this widely accepted vision is being implemented can be found in the Danube river basin (Tóth, 2004), the Rhine river basin (Becker *et al.*, 2007) and the Mekong river basin (MRC, 2012), to name but a few. In addition, the inclusion of water cooperation issues in institutional frameworks such as the G8 Africa Action Plan and the EU Flood Directive provide riparians with incentives for cooperation.

POLICY ARRANGEMENT APPROACH

As indicated, previous research has paid relatively little attention to governance issues, while the institutional embedding of FRGs through FRGAs is of crucial importance for their success. FRGs are – in one way or another – institutionalized in society (Ostrom and Crawford, 1995). To conceptualise FRGAs, we will develop an integrated framework, based on the Policy Arrangements Approach (PAA). The PAA is a way to analyse processes of institutionalization. We will use the PAA to analyse the emergence of TFRGAs in the different countries and regions. This approach has been applied in earlier studies of environmental policies, nature conservation and water management (Van Tatenhove and Leroy, 2000; Wiering and Immink, 2006; Arts *et al.*, 2006; Wiering and Arts, 2006). The approach builds upon different frameworks of policy analysis (e.g. policy network models, discourse analysis, the advocacy coalitions framework and regime theory in international relations). All these models have their strengths and weaknesses, but because of their specific emphasis, none of them give a comprehensive view of all dimensions of policy that are relevant for a more sociological understanding of institutionalisation processes.

The PAA claims to link up all relevant dimensions of a policy domain and enables a study of dynamics in the institutionalisation of societal phenomena. According to the PAA, a policy arrangement can be considered as “a temporary stabilisation of the content and organisation of a policy domain” (Arts *et al.*, 2006). Similarly, we conceptualise TFRGAs as (the result of) a dynamic interplay between:

- Actors and actor coalitions, including partnerships;
- Dominant discourses, including scientific and policy debates;
- (Formal and informal) rules of the game; (North, 1990) and
- The power and resource base of the actors.

Liefferink (2006) visualises a policy arrangement as a tetrahedron, with these four dimensions connected to each other as the four angles of this tetrahedron. Each angle can be an entry point to start analysing the policy domain (see figure 2).

The study's final goal, to develop policy design principles for TFRGAs and to derive implications for policies and law will be reached by completing the following steps:

- Identifying which FRGs are applied
- Analysing the emergence of current FRGAs by studying stability and dynamics in these arrangements in at least the past two decades;

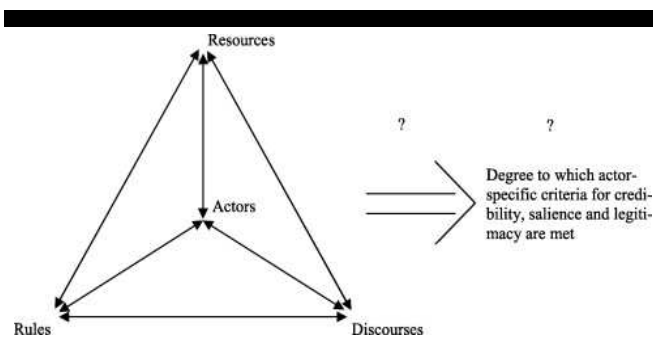


Figure 2: The structure of a policy arrangement can be analysed along the four dimensions of this tetrahedron (Lieverink, 2006).

- Explaining stability and dynamics in these FRGAs by identifying explanatory factors and determining the relative importance of each of them;
- Evaluating the extent to which these FRGAs are resilient (i.e. manage to develop, implement and align different FRGs) and appropriate (i.e. legitimate, efficient and effective) and distinguishing good practices for flood risk governance.

Analysing governance arrangements using the PAA will be an important first step in our research. This step is necessary, before we can explain the emergence of these TFRGAs, evaluate their success in terms of appropriateness and resilience, and derive design principles and other recommendations for appropriate and resilient TFRGAs.

A comparative case study analysis will be carried out, involving three urban agglomerations in six countries in the EU. For the Transboundary aspects of this study, several basins shared by two or more countries in the EU will be selected. The comparative analyses of TFRGAs in different countries and IRBs will identify best practices that can be translated into policy design principles as well as concrete recommendations for policy and law across boundaries, whether sub-national or international.

THE NECESSITY OF TRANSBOUNDARY FLOOD RISK MANAGEMENT

Improved management of Transboundary flood risk is a matter of urgency. Multinational frameworks are in place to share information but accountabilities are less clear. Whatever the direction of climate change, rapid economic and population growth in mega-deltas and floodplains is increasing flood risk exposure and has to be managed with the full cooperation of all riparian interests. Discordant monitoring systems and inconsistent planning approaches reveal boundary constraints within nations. Institutional boundaries and limited capacities may hinder adaptation at local scales. More generally, policies for improving food and energy security could work in tension with policies designed to manage land use in ways that reduce flood risk. Such conflicts are likely to have complex, multiscale dimensions that merit further research to help bridging organizations integrate adaptation responses across different tiers of governance.

Global climate change will pose a wide range of challenges to freshwater resources, altering water quantity, quality, system operations, and imposing new governance complications. Among the many unresolved challenges is

how to integrate information on future hydroclimatological conditions into Transboundary flood risk management, the politically complex system of Transboundary water agreements, including formal treaties, international agreements, and transnational management institutions. A number of important elements, especially water quality and flood management, are commonly excluded from Transboundary agreements. The expansion of existing agreements to include all elements of the hydrological cycle should be explored. Transboundary watershed countries should consider incorporating joint management institutions into existing treaties to allow for flexibility in the face of change.

Given the uncertainty inherent in climate model forecasts, though, improving the governance institutions for international river basins is a no-regret strategy. In the event that the effects of climate change are less severe than predicted, either globally or in specific river basins, the establishment of institutionalized river treaties will have very few drawbacks. Coordinated flood management can greatly reduce the risk of these vents. Basin wide coordination of flood management activities is thus critical.

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