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Title: Moving towards adaptive governance in flood management? Catalytic impulses and change of governance structures in the aftermath of extreme events

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1 Introduction: transformation processes in flood management

The increase of extreme flood events within the last decades and the even more significant growth of economic loss in spite of intensive efforts and investments in disaster control and flood protection measures show a crisis of societies dealing with flood. Currently used strategies, instruments, and measures of flood protection and prevention seem insufficient to reduce risks and prevent damage. But natural hazards often not only lead to severe damage for the affected societies but also catalyse societal and political change (Birkland 2006). They open up ‘windows of opportunity’ for socio-ecological transformation and change in governance structures. After extreme events, state and non-state actors involved in flood management question previously accepted strategies and practises of risk prevention and search for adequate strategies to react and to adapt to future extreme events.

Within these discourses, mainly led by practitioners and experts in water management, two main strategies are brought into position: on the one hand technical flood protection as traditional strategy aiming at controlling flood events by technical means; and on the other hand a new integrated approach complementing technical measures with behavioral, communicative and planning activities aiming not at control and security but at reduction of vulnerabilities and adaptation to remaining risks. In this understanding flood management can be defined as the systematic management of flooding and flood risks by state and non-state actors. It includes strategies of short-term disaster control as well as strategies and measures aiming at a middle and long term prevention and reduction of damages and losses. Flood management is following an intersectoral approach integrating different policy fields (e.g. spatial planning, water management, infrastructure, nature conservation).
In contrary flood protection is seen as a mainly technically oriented and sectoral approach to protect economic and societal goods against damage by flooding. This strategy leads to measures such as channelling the course of rivers, controlling the regime of the river by dams and barrages; draining of the floodplains for settlements and agriculture etc. These measures were developed over the last centuries and in the long run finally became a problem themselves as they had severe impact on the riparian and river ecosystems and on the course of flood events.

In flood research (cf. Adams et al. 2004; van der Werff 2004; Penning-Rowsell et al. 2006; Lange, Garrelts 2007) these two principal concepts are described by the following governance characteristics (see table 1):
On the one hand, there are traditional flood protection strategies that aim at setting up a protection infrastructure in a top-down approach ensuring security for people and buildings situated in flood risk areas. The nation state has the control, realizing ‘once and for all’ solutions in form of a master plan and favouring ‘hard’ engineering solutions and technical measures.
On the other hand the vision of an integrated, risk-oriented flood management includes the formulation and implementation of new strategies on different governance levels that include diverse functions of the river environment (nature conservation, recreation, tourism, water resource and finally protection of settlements against flooding). An integrated flood management combines structural and non-structural measures following an incremental planning strategy and considering the

local situation when implementing measures. It refers to existing and changing flood risks and therefore focussing on adaptation rather than protection. There is a wider range of actors dealing with flood management and power shifts from state-run governance to civil society, local authorities and interregional and international cooperation.

Table 1: Characteristics and governance structures of two leading concepts of dealing with floods

	Technical, security-oriented flood protection	**Integrative, risk-oriented flood management**
Rationality	Technical-instrumental, controlling, security-oriented	Risk-oriented, adaptation
Measures	Structural/technical protection measures	Combining structural/technical and non-structural/non-technical measures
Planning strategy	Master plan	Location dependent, incremental planning
Level of governance	National/Federal level	Multi-governance approach

To sum up, on strategic level of leading principles concepts of governance and adaptiveness have recently complemented common strategies of security-oriented schemes of technical flood protection in form of an integrated approach of flood management. If and how these new concepts, which mainly developed in scientific discourses, are implemented in existing policies and practises of natural hazard management is still an open question (Kuhlicke, Kruse 2009). Addressing this research gap I investigate in this paper how this transformation and integration of adaptive governance in flood management policies proceeds in case of the Elbe River in Germany.

Adaptive governance can be understood as the interrelation between policies and agency of different actor groups which fosters adaptation (Brunner et al. 2005; Nelson et al. 2008). Adaptation is the anticipatory or reactive adjustment of in natural or human systems in response to change or unexpected events. The concept of adaptive

governance refers to the complementation of government's regulations, which are mainly based on scientific or expert management, by the civil and local participation of multiple local and regional actors and community based institutional arrangements (Brunner et al. 2005; Nelson et al. 2008). Both, expert management and community-based governance systems, complement each other by integrating scientific and local knowledge.

Taking the extreme flooding in summer 2002 along the Elbe River in Germany as a turning point I examine impacts of the flood as catalytic event on adaptive governance. The focus of analysis lies on two actor groups affected by and involved in adaptation measures and practises against future flooding: *professionals of state authorities,* on the one hand, and the *local population,* on the other. Empirical basis for the study is a qualitative analysis of interviews with both, state and non-state, actors as well as of documents in which the strategies of flood management in the Middle Elbe Region were formulated before and after the flood event in 2002.

2 Methodology: analytical framework and methods

2.1 Analytical model of transformation

In order to analyze how governance structure and agency changes in the aftermath of extreme events and if there is a transformation in form of adaptive governance in flood management a general model of policy transformation is applied. Following different studies in policy research (Kingdon 1984; Baumgartner, Jones 1993; Sabatier, Jenkins-Smith 1993; Birkland 2006), transformation of governance structures and agency are driven by two major forces: a phase of *continuous and incremental change* which is mainly based on existing concepts; and a phase of *rapid change*, which is 'punctuated' episodically by extreme events. Kingdon (1994) speaks of a ‘window of opportunity’ which is opening up in these phases of rapid change which are catalysed by crisis situations or unforeseen events. Studies show that phases of rapid change may have positive effects on the development process as they may for example give the possibility for innovation and change, widen the range of actors involved or increase the number of issues or strategies negotiated (Penning-Rowsell et al. 2006).

These conceptual elements – the phases and dynamics of policy change – form an analytical frame for my research on transformation of governance structures and agency in flood management (see figure 1). Seeking for transformation processes towards adaptive governance I consider both dynamics – the rapid catalytic change and the slow incremental phases – as parts of a continuous process of learning and adaptation. Further I suggest that this process is influenced by different contextual factors: material factors, e.g. technological innovations, artefacts of bio-physical factors and processes; normative and institutional factors, e.g., laws, political guidelines or regulations; social factors, e.g., key actors or organisations; and cultural factors, e.g., values and risk perception of the involved actors.

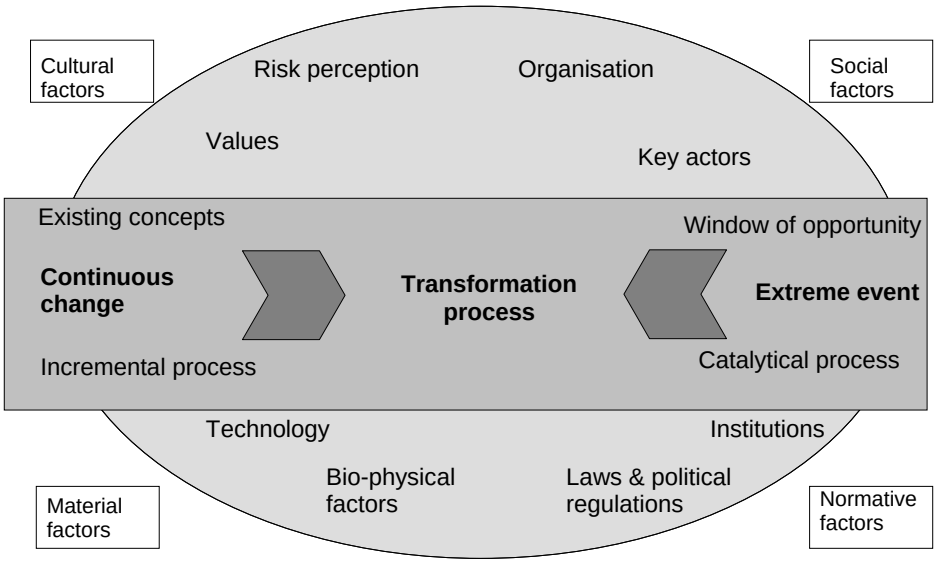

Figure 1: Model of phases and context factors of transformation processes

2.2. Methods

The extreme flood event of 2002 in the Middle Elbe River and its catchment area serves as case study for the investigation of changes in governance structures and agency in flood management. In summer 2002 huge parts of the region were submerged by flooding of the river Elbe and its tributaries. Several dykes broke or were flooded, houses were under water, and people had to be evacuated. The flood in 2002 was the highest on the river Elbe for decades and caused unprecedented

financial and economic destruction. The total damage in Germany amounted to euro 11.6 billion and was the highest loss due to flooding in Central Europe until then.

The research presented in this paper was part of my Ph.D. study on transformation of precautionary flood management conducted at the Leuphana University of Lüneburg, Germany (Kruse 2010). In this context I conducted 21 interviews with different state and non-state actors and one group discussion within the case study region between 2003 and 2008. A qualitative analysis of policy documents complemented the data base (for details on data, methods and research process see Kruse 2010, p. 75 et seq.).

3 Results: Catalytic impulses and change in governance structures

The empirical analysis of transformation processes in the case study "Middle Elbe River" after the extreme flood event of 2002 shows that there is both: continuous, incremental change referring to existing concepts and constellations of actors; and rapid, catalytical change that brings up new policies, actor alliances and organizations.

On the one hand, within the last fifteen years a continuous change can be described where aspects of risk prevention, non-technical measures and ecological functions within the river basin became more important for both professional actors as well as for the local public. On the other hand, the extreme flood event of 2002 sets two catalytic impulses which point in opposite directions:

- In a short term horizon both professionals of state authorities and local population base their adaptation activities mostly on measures and strategies of the security based, technical flood protection and centralized steering structures.
- In a middle and long term perspective though the extreme event fosters strategies and measures that comply with a precautionary and integrative approach. State control and technical measures are supplemented by multiple governance structures and ecological measures.

These overall results are discussed in detail in the following focusing on changes in agency as well as policy and institutional changes. Interrelations between these two aspects of adaptive governance are discussed in the conclusion.

3.1 Change of agency: public authorities and local population

Before the extreme flooding of 2002 only few professional actors dealt with existing flood risks, adequate protection measures, and required preparation activities. The regional authority for flood protection was responsible for the technical infrastructure and followed more or less a top-down approach of expert management. Within the local population only very few were concerned about flood management issues and aware of existing flood risks.

With the hazardous event of 2002 flood protection and flood management suddenly became a central issue for almost all local and regional actors. Still, when the water drew back it were mainly centralized state authorities who took action: federal and regional organisations were responsible for coping with the flooding and reconstructing buildings and technical infrastructure (e.g. the army, the regional authority for flood protection, German Lifeguard Association). Public communication and participation of local governments or population were put on a back seat in the decision making processes in this top-down-approach. After few months this led to major conflicts with the local population, which felt ill-informed and wanted to actively participate in decisions on flood management in its region. Parts of the local population, especially those who were directly affected by the flooding, became very engaged in flood management activities and founded new alliances to gain a stronger voice in the negotiation process. A result of this bottom-up and multi-level governance process was for example the foundation of a regional flood protection association, where local municipalities aligned in order to have more impact on state flood policies. Further a local/civic "water brigade" was founded, a flood commission was build up within the local government including politicians as well as representatives of the local population, and some citizens set up an association for flood protection. These mainly local bottom-up initiatives formed new alliances and became very engaged in local and regional flood management activities. Public risk awareness within the population and the civic engagement of some local key actors, who were able to activate a broad support, has been an important factor within this process.

After some conflicts and intensive negotiations in the years after the flood event the state authorities became more open for these local, community-based activities. They appreciated the local engagement and knowledge and tried to integrate local actors in the decision making processes. Therefore after some years both, the top-down activities of state authorities and the bottom-up initiatives of the local population formed some new (more or less stable) constellations of agency, decision making, and implementation, where expert management and local knowledge and engagement were combined

3.2 Policy and institutional change

In the institutional dimension the extreme flood of 2002 had major influence on the governance of flood protection and management both on regional scale of the Middle Elbe River as well as on national and EU level. Before the extreme event flood protection was governed by the regulations and political activities of the state/province, Land Saxony-Anhalt. During the 1990ies the overriding aim in Saxony-Anhalt was to integrate the different existing flood protection concepts and to realize the regulations of the Federal Water Act (*Wasserhaushaltsgesetz*) of the reunified Germany.

With the extreme event 2002 three strands in policy development influenced the institutional transformation on different policy levels:

- On the regional level the authority for flood protection of Saxony-Anhalt and the provincial government conducted a fundamental analysis of the catastrophic situation during and after flooding, the current institutional regulation and the success or failure of the flood protection infrastructure. This situation analysis by the government of Saxony-Anhalt led to a critical and fundamental review of the political and legal regulations for flood management (MLU 2003; IKSE 2004).
- On the federal level Germany's Government launched a legislative initiative which led to the review of the German Federal Water Act. A supplementing act on precautionary flood protection was passed in May 2005; it focuses on non-technical measures, such as flood management plans, flood plain management,

and improvement of flood warning systems. Further, it introduces a new planning instrument, the "potential flood areas" (*überschwemmungsgefährdete Gebiete*) which would be affected by flooding if the existing protection measures failed. Lange and Garrelts (2007) consider this instrument as reflecting a new risk-oriented paradigm in German flood policy and legislation.

- On the supranational level the European Union launched and passed the European Framework Directive on the Assessment and Management of Flood Risks (Directive 2007/60/EC) in 2007 (Breuer 2006; Nacken 2007; Wagner 2008). Like in the amendment of the German Water Act the focus of the directive lies on non-technical and precautionary measures. As the directive is built on the same management structures as the Water Framework Directive, presumably also the flood risk directive will influence governance structures and foster a broad participation of stake holder groups within the flood management process (Kuhlicke, Steinführer 2007; Dworak 2008). The implementation process until 2015 will tell if this expectation proves to be true.

Considering these initiatives on all three administrative levels institutional regulations not only were "punctuated" by the experience with the extreme event; also the focus of institutional governance has shifted: state regulated policies favouring technical measures are now complemented by regulations putting forward the principle of precaution and fostering a broader stakeholder involvement.

4 Conclusion: Moving towards adaptive governance in flood management?

The case study in the Middle Elbe River shows that an extreme event can cause considerable change in governance structures. The extreme flooding of 2002 catalyzed a transformation within the actor constellation and institutional dimension of flood management. We can find two paths of development:

- The immediate response to the flood event showed that state actors reacted in a centralized way and strengthened the formal top-down approach of security driven flood protection. This can be interpreted as a form of expert

management considering mostly professional and scientific knowledge in a state-run management of flood events.

- In medium and long term a broad stakeholder involvement in the Middle Elbe River replaced this centralized expert management of flood protection by forms of multi-level governance. New community-based initiatives aimed at strengthening the preparedness and coping capacities of the region by introducing new alliances for disaster management like the local "water brigades" or initiatives for inter-communal cooperation in flood management. In the long run the amendments of institutional regulations in flood legislation seem to strengthen this participative approach of flood management.

Therefore a preliminary answer to the question if flood management in the Middle Elbe River is moving towards adaptive governance can be answered positively. The observed development suggests that the broad involvement of non-state actors has complemented the expert management of floods since the extreme flood event in 2002. Following the question how this transformation is taking place two phases can be identified when differentiating between the immediate response and the medium and long term development. Previous studies have shown that risk awareness - a major factor for this transformation in the case study - is diminishing the more time has pasted after the last extreme event. Therefore the coming years will show if this transformation will consolidate.

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