Risk Management at the Science–Policy Interface: Two Contrasting Cases in the Field of Flood Protection in Germany

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ABSTRACT This paper concerns the way in which the scientific debate on climate change and new risks is being adopted as a basis for political decision making. How does the crucial risk issue ‘diffuse’ into policy, which in turn has to give the public account of the risks of climate change? In discussing the science–policy interface, reference is made to the debate on blurring boundaries between science and policy making. Here, heterogeneous and often competing discourses come into play. This makes discourse analysis an appropriate and well-accepted tool in both conceptual and theoretical aspect. However, which of the competing discourses wins the day can hardly be explained in a discourse analytical way, due to its constructivist bias. Case studies provide some evidence that complex understanding can be obtained when discourse analysis is framed by a more realistic approach, such as Kingdon’s policy window approach.

Two cases are presented. Although representing overlapping policy domains, the risk management differs considerably. In both the state proves to be the pivotal actor. In the first case, on coastal protection in northern Germany, the administrative officers in charge try to transform and to curtail the risk issue and its emphasis on uncertainty in a way that makes it compatible with their own safety discourse, thus generating a scientific–administrative hybrid. The second case, a newly enacted political strategy on riparian flood protection, draws explicitly on uncertainty and risk, thus transferring and integrating the issue firsthand into the political–administrative system. Taking a governance perspective, the explanation refers to different steering contexts in terms of institutional settings, actor constellations, political framings and natural extreme events.

KEY WORDS: Climate change, science-policy interface, governance, policy windows, risk management, discourse analysis, Germany

Introduction
Due to its potential for risk and disaster, climate change can increase the vulnerability of society. Thus, societies have to pursue strategies encompassing...
mitigation as well as adaptation and response. Vulnerability to climate variation is determined in part by the politically adopted strategies in force so far. Flood protection is one of the fields in which to cope with the problem means to seize or to miss the respective chance. According to Paavola & Adger (2004, p. 175), adaptive responses include changes in institutional arrangements or public policies, public and private spending, as well as investments in infrastructure and other durable goods. However, experience also shows that there are constraints on achieving full adaptation. Maladjustments may occur due to decisions that are based on short-term considerations, imperfect foresight, insufficient information and over-reliance on insurance mechanisms (IPCC, 2001, p. 8). Another crucial aspect of adaptation is the generation, dissemination and consideration of climate-related knowledge.

With regard to the latter point, the actors inevitably come up against a dilemma: scientific research on climate change is providing an ever-growing amount of knowledge. However, being based on models and notoriously insufficient data, scientific expertise is bound to uncertainty. Thus, the extent, the date of occurrence and the frequency of extreme climatic events can be foreseen only in a rather vague and fuzzy way. Furthermore, scientific scenarios and prognoses are disputed even within the scientific community. Politicians and administrative officers, however, are obviously strongly interested in basing their decisions on the most reliable knowledge available.

This raises the question: what is and what can be the role of science within the context of political and administrative decision making? This paper discusses whether knowledge plays a role and, if so, how this role influences decision-making processes. Which actors refer to what kind of climate-related knowledge? Under what circumstances can new knowledge ‘diffuse’ into policy, which in turn has to give a public account of the risks of climate change and the inevitably related uncertainties of prognosis. The occurrence of what will be called ‘risk discourse’—in opposition to a ‘safety discourse’—will be the variable to explain.

In discussing the science–policy interface, reference is made to the debate on blurring boundaries between science and policy making. In earlier models science was seen as delivering instrumental knowledge to policy makers, providing a sound basis for the most adequate political decisions. Based on empirical findings, mainly in the field of science and technology studies, this kind of optimistic (and technocratic) understanding has largely been questioned and, in parts, been replaced by a more sceptical and constructivist understanding (Jasanoff et al., 1995; Weingart, 2001). In fact, science is influencing political decision making increasingly, but science is being politicized increasingly, too. However, blurred boundaries do not imply that the two systems, science and policy, are becoming congruent. Due to the different objectives of science and policy, boundaries remain. Their concrete interaction has to be identified empirically. For this purpose a discourse-analytical framework is employed as a tool to analyse conflicting knowledge claims. These are interrelated with existing narratives on how to cope with the threat of climate change. Two cases are discussed. Both focus on the political–administrative system (administrative officers and political authorities) as the most relevant steering authority.

The first case refers to coastal protection in northern Germany. Within the framework of an empirical research project, the aim was to understand to what degree the more recent scientific debate on climate change has brought about new forms of assessing the necessary dimensions of dykes and further protective
structures. In this case, the administrative officers in charge of coastal protection proved to be the key actors, whereas the politicians simply followed and consented to administrative input. Administrative officers were able to play this role due to their specific authority, allowing them to ‘reshape’ uncertainty to match better with the demands of political and administrative decision making. They developed a “scientific-administrative hybrid” (Potthast, 1999).

The other case study refers to the question of how the political and administrative authorities are coping with the risk of more frequent and more intense flood events in river basins. This project refers to the severe floods in Germany in 2002 and the subsequent policy change towards a more risk-orientated strategy, which is more in line with the emphasis on uncertainty in the ongoing climate-related scientific debate. Thus, this case is an example of steering and ‘real’ action despite incomplete knowledge about the regional impact of climate change (cf. Buchwald, 2008). Policy change clearly resulted from decisions taken by politicians at the federal political level, while the administrations in charge are expected merely to accept and implement these.

Therefore, the focus of either project is on knowledge transfer and/or transformation and policy change, respectively. Whereas the second case led to policy change, the first one did not. Why did the first case lead to developing a scientific–administrative hybrid while the second did not?

The proceeding is as follows. First, a brief overview is given of the complementary tendencies of science being politicized and politics being increasingly influenced by and dependent on science. The two cases are then presented. The findings are interpreted against the background of two different approaches: discourse analysis as emphasizing the constructivist dimension and the policy window approach as emphasizing the importance of political framings and real events. Some conclusions are drawn in the final section.

**Conceptual Framework: the Science–Policy Interface**

In a functionally differentiated society, policy and science are systems among others. They operate on different logics: the political–administrative system is centred on mediating interests and institutionalizing power in law. Science aims at providing plausible and well-proven explanations. While science aims at testing hypotheses, the political–administrative system is centred on political decision making and on developing subsequent concepts. Political and administrative co-ordination of action is organized in a more or less vertical setting, whereas science is organized in a more horizontal and less integrated way.

However, for quite some time the two systems have been less remote from each other than it may appear in a radical view of system theory. Weingart (2001, pp. 14–15, 25) described how science, since the early nineteenth century, has continuously lost its former social isolation. As a consequence, interdependencies and couplings have been increasing. Thus, the distance between science and the public is shrinking. In 1966, Robert E. Lane dealt for the first time with the ‘knowledgeable society’: social actors rely increasingly on scientific knowledge, they expend parts of their resources on scientific research, and they use scientific knowledge in an instrumental manner to realize their goals (Lane, 1966, p. 650). Stehr (1994, 36ff.) mentioned further aspects: the diffusion of science into all spheres of life, the replacement of other forms of knowledge, the development of knowledge production as a new sector and the changes in power relations.
The way science gets integrated into political decision making can be described by two different models: a transfer model and a transaction model. Before depicting these models, the aspect of science and uncertainty mentioned in the introduction is discussed.

**Science Providing Uncertain Knowledge**

Beck (1992) coined the term “reflexive policy”. This term aims at precedent political decisions, intended to ‘modernize’ society constantly in order to ensure a more comfortable life for an ever-growing number of citizens. However, because of an increasing number of more or less unexpected and unwanted side effects, policy making is forced to become reflexive. To what extent is this relevant to knowledge policy as well?

Whereas in the past scientific findings were seen as a ‘delivery’ to policy makers, today, it is commonly held that scientific findings are temporary and fragmentary. Moreover, systematically produced knowledge not only generates more knowledge but also more ignorance. Against the catchword ‘knowledge society’ are positioned other catchwords aiming at different forms of not-knowing, in particular ‘risk’ and ‘uncertainty’, the latter referring to the lack of prognostic power in open systems (Schiller, 2005, pp. 46ff.).

Uncertainty touches on the authority of natural sciences. This is rather contrary to the expectations of policy makers and to public expectations with respect to science. Weingart (2001, p. 20) concluded: “Linking the knowledge production to decisions in political contexts gives an explosive quality to the problem of ignorance. Scientification of policy loses its primary rationalist sense”. How do policy makers deal with this fact?

**Transferring Scientific Findings**

The idea of directly using scientific knowledge simply by applying it in the ambit of decision making has been influential. It originated in the scientific and technocratic optimism in the field of policy advising and science-based political planning (Bontà, 2004; Nullmeier, 1993; Weingart, 2001, p. 12). Recent demands on science to provide knowledge that is actively effective in different areas of society are generally made in the context of political challenges and related controversies (Hirsch-Hadorn et al., 2004, p. 285). Discussing the science–policy interface and analysing the scientific input to politics, Norse & Tscharley (2000) adopted the classical policy cycle as a starting point. According to the authors, science provides an inventory of knowledge dealing with the relevant issue and quantifies data for the purpose of problem identification. These serve as a basis for formulating strategies. The next phase leads to a selection of policy options promising to exert a relevant influence on the issue at stake, followed by modelling possible policy implementations, involving physical and economic models. Finally, science also provides the network needed for monitoring and evaluating the respective policy measures (Hirsch-Hadorn et al., 2004, p. 286).

The theoretical background is the idea of knowledge facing policy and the idea of being able to separate facts and values, scientific input, and policy process from each other (Nullmeier, 1993, p. 177). Scientific knowledge, in this perspective, is an external factor with regard to policy analysis, additional to interests, identities or institutions (Scharpf, 2000).
Transforming Scientific Findings

For quite some time now, science has turned to using the media to present its results and to addressing more or less directly its political relevance. By doing so, scientists turn into political actors, thus breaking with the traditional ‘scientific ideal’ which is the separation of facts and values. Political engagement and even emotions are no longer a taboo. Instructive examples within natural science and environmental policy are the debates and research dealing with biodiversity (Eser, 2001; Takacs, 1996) and the ozone layer (Grundmann, 1999), respectively, and with climate change being of particular interest here (Viehöver, 1997; Weingart et al., 2002). In this perspective, drawing on such issues does not mean to address mere physical phenomena but issues of symbolic meaning, social interest and power as well. This is why, moreover, they can be seen as social constructs, fostered by ‘epistemic communities’ and shaped by common beliefs and norms (Haas, 1992). One of their basic aims is to influence public opinion and political and administrative actors, in particular.

This kind of (re)defining the science–policy interface is done not only by scientists. As scientific knowledge diffuses into many spheres of society, scientific knowledge in return gives access to a multiplicity of actor groups. In other words, the criteria of quality and relevance concerning science are no longer defined exclusively by scientific actors (Weingart, 2001, p. 15). Hence, objects of science are not simply given, but chosen, interpreted and constructed in accordance with and dependent on general beliefs, interests and social conditions (Jasanoff et al., 1995). This is in line with Nullmeier (1993, p. 177) who emphasized that the notion of externally produced knowledge neglects the capacity of policy actors to produce their own knowledge. They are able to develop their own frames of interpretation and specific ‘cognitive representations’, according to the perceived steering context (Voß et al., 2008, p. 6)

These processes have been called “boundary work” (Gieryn, 1983, 1995). The assertion is that the boundary of what can be considered scientific is neither self-evident nor stable over time. Instead, the boundary between scientific and non-scientific is contested and continuously moved.

Discourses and Policy Windows

At this point, discourses come into play as environmental problems are redefined socially and politically (Arts et al., 2000, p. 60). Transferring or rather transforming scientific findings is one crucial part of giving meaning to environmental problems and designing possible solution strategies. This is done through discourses. A policy discourse can be defined as “a specific ensemble of ideas, concepts, and categorisations that are produced, reproduced, and transformed in a particular set of practices and through which meaning is given to physical and social realities” (Hajer, 1995, p. 60). Further, as Dryzek (1997, p. 8) wrote, a discourse “enables those who subscribe to it to interpret bits of information and put them together into coherent stories or accounts”. Discourses, in this context, are ‘knowledge regimes’ which are embedded in scientific practices and techniques and are institutionalized in different policy arenas (Bäckstrand & Lövbrand, 2006, p. 52). This may include either adopting or rejecting uncertainties or risks as constitutive elements of particular policies. As political issues are contested, it is self-evident that discourses also aim at de-legitimizing opposing discourses in order to
obtain discourse dominance. Thus, issues get framed in a purposeful manner (Szarka, 2004, p. 318) to provide answers to four W-questions: ‘What is the problem?’, ‘What information is relevant?’, ‘What has to be done to cope with the problem?’, ‘Who can do it best?’.

However, changes in discourse dominance depend on the wider political context where policy windows are of particular relevance (Kingdon, 1984). Kingdon emphasized that policy change is far from being a linear process as is implied in the context of the policy cycle approach, assuming a target-orientated, co-ordinated process with well-defined stages. Kingdon was especially concerned with the question why, within public policy, some issues and subjects emerge and are given serious consideration while others remain neglected. Promoting the metaphor of three different ‘streams’ as an analytical framework, he distinguished a problem stream, a policy stream and a politics stream (public opinion, election, existence or lack of opposition, etc.). He held that each stream is largely independent of the others and that each of them develops according to its own dynamics and rules (Kingdon, 1984, pp. 20ff). The policy stream refers to instruments and conceptions, which float around in a “primeval soup” (Kingdon, 1984, pp. 21, 122ff.). The most significant policy changes occur when all of the three streams (problems, policies and politics) are “coupled into a package” (Kingdon, 1984, p. 21). Kingdon (1984, pp. 173ff.) called this a “policy window”: an “opportunity for advocates to push their pet solutions or to push attention to their problems”. Policy windows—sometimes predictable, sometimes not—are opened by events in either the problem or the political stream (Kingdon, 1984, p. 213).

The following sections present two case studies. In the first one, scientific findings have been and continue to be transformed in order to maintain a safety approach. In the second case, in contrast, uncertainty is the point of departure for a risk approach. Here scientific findings have been transferred into policy.

The article will begin by summarizing the two cases. The elements considered in order to explain the different ways of coping with uncertainty and risk are principal actors, institutional settings, discourses, real events and further situational factors.

Two Cases: Concerning Scientific-Administrative Hybrids and Policy Change

The Problem of Flooding

Extreme floods are the most common type of natural disaster in Europe. In flood-prone settlements floods can kill people or make them ill and homeless. They can also damage the environment, infrastructure and property. Most types of floods, such as normal and annual ones, are ‘known risks’ as they have occurred over thousands of years (Wisner et al., 2004, p. 205). Floods affect some low-lying inland areas because of rainfall, while some coastlines are liable to both rain flooding and sea invasion (especially under storm surge or unusual tidal conditions). Areas at risk are known from earlier events. What is known as well is the role of human activity. Deforestation in mountainous regions accelerates runoff, thereby increasing the likelihood of flooding. Urban development on former flood plains is expected to increase the magnitude of negative impact in the area and to increase the possibility of floods downstream due to the canalization of rivers (EEA, 2004, p. 2).
Because the relevant parameters of flood events are more or less known, there is little uncertainty about the need to take protection measures. In addition, there is little uncertainty about the effect of different policy options (cf. Voß et al., 2007, p. 8). With the given rainfall or storm conditions, both warnings and self and societal protection measures should be possible (Wisner et al., 2004, p. 205).

However, this basic ‘expectedness’ is reduced by the wide range of intensity and durations of floods that can affect the same area at different times and variation in return periods (the average number of years between the recurrence of floods of a given magnitude). Above all, trends in frequency and intensity of flood events in the future will be related closely to changes in the patterns of precipitation and river discharge and, thereby again, also to other long-term changes in the climate. However, climate change goes along with prognostic uncertainties due to general gaps in knowledge, insufficient data availability and difficulties in attributing an observed change to anthropogenic global climate change. Hence, much is known about the climate system and changes in global mean temperature over the past 100 years, but there is only scarce knowledge of climate sensitivity, regional climate change, climate variability and the frequency and intensity of extreme events (EEA, 2004, pp. 82–3).

Coastal Protection on the German North Sea Coast: Between “Safety” and “Risk”

The principal actor is the public administration in charge. Looked at in more detail, this actor proves to consist of several specialized administrative entities. The core assignments of the administration in charge are threefold:

- technical maintenance of the dykes and other protective structures (such as sluices and water barriers);
- assessing and fixing the necessary height and firmness and related constructive features of the protective structures;
- monitoring and integrating external expertise on technical, meteorological and climate issues.

The most relevant point with respect to our topic is how the necessary height and strength of the protective structures are to be assessed.

The procedure in force is strictly empirical. The highest tide gauge ever reported has served and still serves as a reference point from which all other technical data are derived. The only element without clear empirical basis is a safety margin that is added to the respective gauge. Flood occurrence is conceived as swinging within the boundaries of the highest and lowest tides ever reported. Thus, the procedure is seen as a solid basis that allows for ensuring equal safety at all sections of the coastline. As far as changes in the swing itself are concerned, because of climate change, they are—more implicitly than explicitly—assumed to evolve in a continuous and thus linear way. Actually, this way of assessing the necessary dimensions of flood protection has worked fairly well so far: no dyke failures have had to be mourned.

The formula “Equal safety at all parts of the coastline” has become the general guideline for successfully managing coastal protection. On the political level, it was taken on and enacted by law, thus becoming the official mission of the administrative units in charge of coastal protection in Lower Saxony (Niedersächsisches Deichgesetz). In the analytical terms of discourse analysis the formula can be called a ‘safety discourse’.
However, considering the findings of climate research (see IPCC, 2001, 2007), increasing uncertainty regarding the extent, date of occurrence, frequency and regional specifics of future extreme events have to be envisaged. Against this background, safety proves to be an aim that can no longer be expected to be actually achieved. Instead, risks have to be assessed and determined politically. Risk-related decisions can be seen as decisions following the precautionary principle. In that sense, a ‘risk discourse’ emerged. The core question is whether and how the administrative officers in charge are ready to shift from the firmly established safety discourse to a risk discourse and whether and which decisions have to be taken in order to reassess and to adjust the system of coastal protection, today or in the near future. Here, it is of particular interest how the actors cope with uncertainty as a core element of climate research.

Unsurprisingly, the interviews provide broad evidence that the administrative officers in charge feel very uneasy with such wide-ranging uncertainty. On the one hand, uncertainty about what will and what can happen does not fit at all with the specific responsibility and professional ethos of the administrative officers. They are in charge of and dedicated to ensuring that the protective structures will be strong enough under all conditions. Therefore, it is a matter of professional self-esteem to be able to ensure that this goal will be achieved in actuality. On the other hand, the scientific debate on climate change, with its emphasis on uncertainty as a constitutive element, cannot be contested in general or even be ignored.

As the safety discourse builds on empirically assessing the required specifications of the protective structures, it is not linked to climate research in any systematic way. In fact, monitoring and assessing the scientific debate, as one of the three core assignments of the administration in charge (assignment 3, see above), initially was only an add-on. Its main purpose was to make sure that new information was assessed continuously in technical respect and, if necessary, adopted for improving the technical quality of the protective structures. Now, faced with the challenge to consider also conceptual readjustments that allow for the emergence of risk instead of continuing to strive for safety, the scientific debate is gaining importance, thus moderately reshaping the responsibilities of the respective divisions with regard to

- assessing the findings of the scientific debate on climate change more systematically and
- filtering and picking up findings of presumed importance for the protection of the German North Sea Coast.

In practice, this tends to boil down to dividing the findings of climate research into two parts: one of relevance and one of no relevance. Basically, there is nothing wrong with that. The important question, however, is, what is the criterion for accepting or rejecting findings of climate research? In fact, there is one general criterion: the degree of certainty associated with data and scenarios.

By looking at the divisions of the administration in charge of the more technical and practical dimensions of coastal protection (assignment 1), another tendency can be recognized: namely, to consider only those findings that have been approved by their above-mentioned ‘in house’ units in charge of monitoring and assessing the ongoing scientific debate (assignment 3).

As a consequence, the dominant tendency in both the divisions in charge of monitoring and assessing new scientific and technical knowledge is to avoid
direct reference to the general scientific debate on climate change as institutionalized in the framework of IPCC; this is the case as well as in the divisions of more practical and technical responsibility. The exception is in the event of ‘our own experts’ confirming and accepting the findings of the general debate as sufficiently certain.

Thus, a particular corpus of expertise takes shape. Being an aggregate of scientific knowledge, practical experience and administrative forehandedness, it can also be seen as a scientific–administrative hybrid. Its (expected) practical use is generally to hold off uncertainty from administrative planning and especially the demand for costly additional investments without being able to present well-grounded reasons in terms of safe knowledge. But, at the same time, it is an example of a rather paradoxical transformation of knowledge: striving for precaution without accepting uncertainty (as a core element of the precautionary principle), thus retaining the deterministic and empirically based safety discourse and the related routines of assessing and safeguarding coastal protection on the one hand, but—on the other hand—without openly rejecting the probabilistic approach of the risk discourse that has become dominant within the framework of today’s climate research community.

On the level of political decision making in the domain of coastal protection within the costal area under investigation, this procedure continues so far to be accepted—even at the price of apparent conceptual inconsistencies with regard to the (more risk-orientated) concepts in other federal states (Länder) in charge of other parts of the rather narrow German North Sea coast (most notably Schleswig Holstein). The reasons for this might be that this does not require additional investment and that the authorities do not have to intimidate the public with bad news about expected risks or those already in existence. Another very probable reason is that, so far, no extreme events have had to be dealt with in the area since the debate on human-induced climate change has gained momentum. Consequently, the dominant safety discourse had not yet to pass a ‘reality test’.

Flood Protection in German River Basins, Incorporating Risk and Uncertainty

In August 2002 heavy rains led to unprecedented floods in Central Europe and caused severe damage and the loss of 100 human lives in Austria, the Czech Republic and in south-east Germany. Compared to floods in the past (along the River Rhine in the 1990s, for example), the damage was much greater. Around 100 000 people had to be evacuated. The total economic losses due to natural disaster in that year were estimated at about 15–16 billion euros, much of it uninsured. The highest losses occurred in Germany, at nine billion euros (Becker & Grünwald, 2003). The biggest losses refer to damage to private property, with a portion of 45.6 per cent (Nachtnebel, 2003). Loss of infrastructure (18.4 per cent) included damage to railway lines, highways and regional traffic lines, electric supply networks, communication networks and pipelines. Bridges, mostly built over the last twenty years, were destroyed to a large extent. Damage from water (and sewage) brought health hazards from contamination by chemical leaks, fuel and other pollutants leaking from damaged industrial plants and enormous amounts of garbage (Wisner et al., 2004, p. 203). The severe flood event was caused by a so-called ‘V-b circulation’, a cyclone that developed in the northern Mediterranean and travelled north-east from Genoa to the concerned countries. Some areas of Saxony, the region hit hardest, experienced the heaviest rainfalls ever reported in Germany. The rainfall caused extreme floods in the basin of the
River Elbe; the floods were considered rarer than a 100-year event (an event that statistically occurs every 100 years). Others even considered them as rare as a 1000-year event. Either way, many hydrological records were broken (Mechler & Weichselgartner, 2003; Nachtnebel, 2003).

While Europe has never been exempt from floods (see above), the severity of the recent series of disasters seemed to shock not only the victims, but governments, planners and insurers as well (Wisner et al., 2004, p. 201). “It was as if wealth, infrastructure, and order were being unfairly challenged by nature, in societies that considered themselves immune or robust, unlike the less developed countries” (Wisner et al., 2004, p. 201). Immediately afterwards the discussion about the causes of such an extraordinary flood started. Two streams of argument can be differentiated. As both the frequency of floods and extreme rainfall events have increased, frequently raised arguments—especially the popular and mass media perception—referred to the impact of global warming and climate change (see Nachtnebel, 2003, pp. 6–8; Wisner et al., 2004, p. 201). The second point of reference is direct human interventions in the river basin as an additional and worsening cause—a shift explaining flood disasters as caused by people and not just by water. The consequence of those manifold interventions became obvious. In summary: modified and intensified land use, including urbanization, sealing off large areas in the basin, river engineering works such as canalization of rivers, and losses of the retention capacity in the basin due to flood protection measures (for example dykes), increases the flood damage potential. In fact, people have settled in the historical flood plains over the past decades, leading to economic values accumulating in prone areas. Entire suburbs, for example in the city of Dresden, have been built on flood plain areas (Mechler & Weichselgartner, 2003). For the most part, these are associated with inappropriate reliance on the safety provided by flood protection measures (ZENEB, 2002).

After 2002, discussions on flooding intensified in several affected European countries, dealing with the question of how to cope with flood risk in future. At the same time awareness arose that “rivers should be allowed to flow freely within their valleys, enabling the flood plains to be restored to exactly that: flood plains” (Wisner et al., 2004, p. 202). Here again, the media and popular conceptions of floods gained influence acknowledging respective “needs of nature” and drawing on inappropriate behaviour of people (Wisner et al., 2004, p. 202).

In Germany the situation was special since general elections took place shortly after the flood event. The elections were in their final stage and they were perceived as a very close race. Intensive and immediate financing and assistance during the floods “boosted the government’s poor standing in the polls during the run-up to the elections” (Mechler & Weichselgartner, 2003, p. 2). Such firm handling of the flood crisis was accompanied by a package of measures. The so-called Five-Point-Programme was presented at a national conference on floods after the disaster. Therewith the German government asserted to avoid such devastating floods from happening again. The programme was to “draw the lessons from the flood disasters of the last few years, rather than merely paying lip service” (BMU, 2003b).

Meanwhile (10 March 2005), these measures entered into force as the ‘Flood Control Act’ (BMU, 2005). Under the new Act the Länder are obliged to designate more areas as flood plains than before. Water segments, where flood plains can be selected to lower the risk of flood damage, have to be identified. The Länder are obliged to inform the public about their decisions, and the concerned public
has to be integrated into the decision-making process. For areas with a high potential of damage, flood plains have to be designated within five years, in flood-prone areas within seven years.

The Länder have to draw up plans co-ordinating flood protection along the rivers within four years. In the process of developing these plans, the interests of upstream and downstream users of a water body will be harmonized. The underlying insight is that every construction of flood defence built upstream may increase the risk downstream. In addition, the Länder have to designate flood-prone zones. This intends to raise awareness among the general public and the planning authorities, as more than 200 dam failures along the rivers Elbe and Mulde proved that dams and walls do not provide absolute protection against floods (BMU, 2003b, 2005). Flood plains and flood-prone zones have to be marked in spatial plans and development plans in order to point out the danger of flooding at an early stage. The basis for designating flood plains is the so-called 100-year flood (BMU, 2005). Since the Act has entered into force, planning new housing areas in flood plains is for the first time prohibited by federal law. No new buildings may be planned in these areas. Another ‘innovation’ of the Flood Control Act is its appeal to make sure that potential damage to individuals will be as low as possible. In flood zones, computing centres and oil-fired heating systems, for example, should not be located in basements (BMU, 2003b).

The key message of the Five-Point-Programme consists of two aims. According to the slogan, “Give our rivers more space—before they take it themselves” (BMU, 2003a, 2003b), the German federal government insisted publicly on the necessity of prevention and precaution. Since flood protection was defined as an issue of spatial planning, thus setting up flood-risk regions as priority areas, any planning action must be compatible with this priority purpose (Friesecke, 2004, p. 10). In addition, more weight was added to participatory procedures. The message is ‘precaution as process’ (cf. Stirling, 2003). The second message is that there remains an amount of risk, since flood protection measures cannot guarantee absolute safety.

However, the content of the Five-Point-Programme was not novel at all. It is very similar to guidelines recommended by the Working Group on Water of the German Federal States (LAWA). These guidelines depict a forward-looking model of flood protection. Already in June 1994 the German Ministers for the Environment had instructed the LAWA to develop the guidelines, which were drawn up in November 1995 (see ZENEB, 2002). However, unlike the governmental programme of 2002, its stipulations never became mandatory regulation due to political resistance. It needed exceptional political circumstances to disprove and to de-legitimize the safety discourse, dominant also in this domain until then.

Discussion

A comparison of the two cases reveals striking similarities and differences. Options to address risks and uncertainty, although in a different way, exist in case A as well as in case B. But in case A, basic assertions of the general debate on climate change and risk are downplayed and partly transformed; in case B they have been accepted widely and transferred, thus leading to a substantial and concrete action programme.
Similarities and differences reflect particular features of the steering context. Three dimensions turn out to be relevant: different institutional settings and related actor settings within the political–administrative system (I), the occurrence or non-occurrence of ‘reality tests’ to be passed (II), and particular external situational factors (III).

**Dimension I**

Within the case of coastal protection (case A) public administration spans the ‘boundary’ between science and policy in the sense that it predominantly accepts those findings of climate research which match with the ‘safety discourse’. This discourse is based on experience and routines regarding dyke safety and on a more or less linear understanding of climate change. Elements of the ‘risk discourse’, which in contrast underlines the potential non-linearity of further climate change and related effects such as sea-level rise, are doubted or ignored unless they can be categorized as proven results. Thus, risk is not addressed publicly and uncertainties are not considered publicly. In contrast, the ‘risk discourse’, as pursued in the IPCC-community, emphasizes prognostic uncertainties due to general deficiencies in knowledge and insufficient data availability as a starting point. Actually, in case B the federal government addressed the precautionary principle and publicly made clear that risky constellations cannot be avoided once and for all and that flood protection measures guarantee only limited safety.

In case A, a particular administrative facility responsible for assessing findings of the general scientific debate on climate change (with relevance to coastal protection) has proven to be the key actor. Here, administrative actors in charge have successfully assumed the authority to make political decision makers accept a perspective focused on the safety discourse. In fact, there is no institutional equivalent in case B. Here, the pivotal role of political (governmental) actors is evident. This might be the very reason why in this case it proved possible to quickly institutionalize the risk discourse and to oblige the administration responsible for flood protection to adopt it. However, this is only one out of several explaining factors.

**Dimension II**

The case of coastal protection on the North Sea coast, whilst staying within the boundaries of a deterministic and more or less linear perspective, can be explained by the fact that up to now—fortunately—the protective systems in the area did not have to pass a ‘reality test’.

As for case B, in contrast, the severe riverine floods of 2002 can be interpreted as such a reality test, disproving the idea that it is possible to calculate and to ensure ‘safety’ under all realistic circumstances. Comparing both cases provides strong arguments that real disasters, such as the extreme floods in Germany in August 2002, may help to undermine the so far dominant safety discourse and to establish elements of a risk discourse, demonstrating that risks are real and that ignoring them can lead to severe damage—not only in the future but even today—and that extreme events may occur anew even tomorrow. The “collapse of confidence in engineered flood protection” (Wisner et al., 2004, p. 203) fostered a paradigm shift towards ‘living with floods’—an idea to be considered normal, which can be and must be accepted.
This shift includes the opinion that rivers, their banks and their flood plains provide valuable ‘ecological services’ (which can include the absorption of some flood water). This encompasses a growing acceptance of the need to understand the function of rivers and their flow regimes in relation to the wider environment. Following the precautionary principle, adaptive measures have to be considered and decided upon today. Thus, the flood-protection issue is not framed any longer as a mere engineering challenge, but as a task for and responsibility of spatial planning. In fact, the risk discourse no longer seems to be questioned effectively publicly.

Dimension III

A further decisive factor in case B derived from the approaching elections. There can be no doubt that the coincidence of the damages produced by the floods in August 2002 and the upcoming elections as a specific challenge to the political class to demonstrate commitment worked very much in favour of accepting the risk perspective at the political level. In fact, the combination of spatial planning and precautionary principle fitted very well in the discourse of ‘ecological modernization’, pursued by the government in charge during that period, a coalition of Social Democrats and the Green Party. Thus, the Five-Point-Programme was accepted without any major problems.

Summary

Table 1 summarizes the configuration discussed so far. Policy change has proven to be no linear problem-solving process. Rather, one witnesses a dependency on different contextual factors. This is in line with Kingdon’s (1984) policy window-approach. In case B, in which policy change occurs, Kingdon’s problem stream refers to the flood disaster in 2002. The equivalent of the policy stream is represented by the LAWA guidelines of 1995, as an innovative concept available immediately after the extreme event. Public opinion, the elections and—at that time—the lack of discursive opposition represent Kingdom’s politics stream. The policy window consists of a coincidence of a publicly perceived problem, that is, an event in the politics stream, and political actors willing to implement a risk discourse.

Conclusion

Climate change can be explained only as a result of many different elements interacting with each other. Thus, the knowledge so far available remains limited and bears fundamental uncertainties in prognosis. More sophisticated models may reduce uncertainty. However, with regard to climate change and its potential threats to society there is no way to substantially avoid or even overcome uncertainty.
It goes without saying that political decision makers and administrative officers, for example those in charge of coastal protection and (riverine) flood, feel uneasy with such a constraint. But in order to develop and implement effective strategies they have to deal with uncertainty anyway.

Doing so, they can pursue different strategies. They can, for example, reject assertions of climate research as insufficiently confirmed by empirical evidence. Referring to their particular knowledge and skills, they can even be successful in making political decision makers adopt this perspective. But equally they can be compelled by political coercion to adopt an uncertainty-perspective to substantially reset protective schemes in force so far.

Accepting or rejecting uncertainty as a core message of climate research means transferring or transforming respective knowledge as a part of ‘boundary work’, thus maintaining or developing different perceptions of risk and related risk cultures. Here, institutional settings and professional cultures seem to be of particular relevance.

Differing risk perceptions are far from being unequivocal and undisputed. Rather, they should be seen as competing discourses striving for dominance within a discourse arena. This applies likewise to the ‘safety discourse’ and the ‘risk discourse’ outlined above. Which of them successfully prevails does not necessarily mirror the quality of its particular arguments. Actually, different settings of arguments prove relevant and convincing for different categories of actors being bound to different frameworks of interest and rationalities (especially scientists vs. political decision makers vs. administrative officers). Moreover, which of the competing discourses wins the day depends largely on whether and what kind of window of opportunity is open or not. In other words, which of the competing discourses will prevail can hardly be foreseen.

Nevertheless, the outcome can be influenced substantially by societal actors. Two aspects seem to be of paramount importance. The first of these is preparedness on a conceptual level in order to present a particular option at the very moment when the window of opportunity starts opening; this particular option must have been developed in advance and held ready. Secondly, the actors must have at their disposal means to immediately propose decisions when the window of opportunity opens. Here, although dependent in many respects on other societal actors, the state, as formally legitimized (by constitution) and having the legal means and the power to enact its option, continues to be a key actor.

There is some empirical evidence that once such a policy change has taken place and subsequent concepts have started to be enacted, the effect is not confined to the domain of the individual case to which it refers. As a matter of transversal shifts within the broader arena of public discourse, changes brought about in particular areas may also contribute to making changes easier in other sectors of the arena that are similarly dealing with controversies concerning how to cope with the scientific debate on climate change. This seems to apply not least to the fields of riverine flood protection on the one hand and to coastal protection on the other. In fact, five years after the flood events that hit the German midland in 2002 the former stiff reluctance against accepting uncertainty and risk as core issues of today’s climate research is also losing ground on the German North Sea coast. This can be explained against the background of a conjunction of heterogeneous factors: the general rise of the debate on climate change (in particular referring to above average temperatures during the last few years in Central Europe and as a response to the 4th Assessment Report of the IPCC) and
significant changes in the political–administrative system of Bremen (personal replacement due to the regular retirement of a leading coastal protection officer on the one hand and the recent formation of a new government in Bremen based on a ‘red–green’ coalition replacing the more conservative former ‘red–black’ coalition on the other hand).

If similar shifts could be confirmed in comparable constellations, this would mean that paradigm shifts (from ‘safety discourse’ to ‘risk discourse’) do not necessarily presuppose ‘reality tests’ in the sense of experiencing damage and harm produced by unexpected extreme events. In other words, it could be possible to prepare for and adapt to the occurrence of novel extreme events as long as there is still enough time left to avoid disasters by thorough and comprehensive precaution.

Notes

1. For further information relating to the two cases see www.krim.uni-bremen.de and www.innig.uni-bremen.de.
2. Their work is based on their experience in the context of the FAO and refers to the global nitrogen cycle.
3. The empirical basis of the finding consists of 50 interviews conducted in 2003 and 2006. They included officers in charge of different subtasks in the realm of coastal and flood protection at all levels (local, district, federal state) and the involved political entities in terms of geography: the federal states, so-called Länder, Niedersachsen, Bremen, Hamburg. In addition, political actors (parties represented in parliaments, NGOs) were interviewed as well as further non-state actors, such as dyke associations. The interviewees—and further analysed documents—were selected in a way that ensures a complete coverage of the political–administrative system of coastal and flood protection in the area. In analysing these sources, Keller (1998, 2004) was referred to.
4. http://www.artec.uni-bremen.de/files/projekte/Endbericht_KRIM.pdf; subsequently quoted as Lange et al. (2005). The area under investigation comprises the coastline of the mainland around the Jade Bay and the respective administrative districts (Landkreise) Friesland, Wesermarsch and Cuxhaven, including the island of Wangerooge and the estuary of the River Weser up to the city of Bremen. Large parts of the area are situated at up to 2 m below the mean high tide margin. Because of this topology and because it consists largely of supple marine sediments, the coastal area is prone to erosion and flooding.
5. Coastal protection in Germany is planned and executed at three administrative levels (nation state, federal states, local/municipality level) covering four different federal states—each of them following more or less different planning concepts including different forms of providing information and allotting responsibility to citizens living in flood-prone areas (Lange et al., 2005, pp. 22 ff.).
6. In detail, the procedure is actually more sophisticated (see Lange et al., 2005, p. 31.)
8. See note 5.
9. Exceptions are possible if nine closely defined requirements are met. All of them have to be fulfilled completely in every individual case. They include that the municipality concerned has no alternative for human settlement development, that no lives are at risk and no significant property damage is to be expected, and that the structure of new buildings is adapted to flood events (BMU, 2005).

References

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